

CHANGES IN WOMEN'S FERTILITY IN THE BALTIC COUNTRIES OF THE EUROPEAN UNION – QUANTITATIVE APPROACH

Elżbieta Sojka

ORCID: <https://orcid.org/0000-0002-9487-8214>

University of Economics in Katowice

Faculty of Economics, Department of Statistical and Mathematical Methods in Economics

1 Maja 50, 40-287 Katowice, Poland

E-mail: elzbieta.sojka@ue.katowice.pl

Abstract: *The main objective of the article is to assess changes in women's fertility in the Baltic countries of the European Union in the years 2012-2021. Fertility as a demographic phenomenon is approached through the intensity of live births in the population of reproductive age, i.e., women aged 15-49. The characteristics used included the distribution of birth intensity by mothers' age, also summarized using the average age of mothers at childbirth, and the level of fertility measured by the theoretical fertility rate. The analysis of changes in women's fertility was preceded by an illustration of changes in the intensity of live births in the studied populations and changes in the structure of women's reproductive age. The similarity of age structures was also examined using the taxonomy of structures method.*

In all the studied countries, there was a decline in the partial fertility rates in three reproductive age groups, i.e. 15-19, 20-24 and 25-29 years, with these unfavourable changes being more intense in Finland, Sweden, Lithuania and Latvia. These changes prove further progressive transformations in the fertility pattern of women, observed since the early 1990s. The level of the total fertility rate (TFR) does not guarantee simple generational replacement. In 2021, the highest fertility was observed in 3 countries, i.e. Denmark (1.72 children per 1 woman aged 15-49), Sweden (1.67) and Estonia (1.61), but only in Sweden, which has long been a leader in fertility-friendly policies, has observed a clear downward trend in the TFR in the last 10 years. In this ranking, Poland, with the lowest fertility rate (1.33), ranks last. The long-term persistence of low fertility rates and the resulting low number of births leads to irreversible changes in the age structure of the population and, consequently, to population decline.

Key words: female fertility, taxonomy, Baltic countries, European Union

JEL codes: J100, J110, J130

1. Introduction

The number of births and the number of deaths are components of the population growth.

The formation of these demographic facts determines changes in the population size and structure by sex and age. In the 1990s, the number of births observed the strongest fluctuations in European countries, especially in countries that underwent socio-economic transformation. Moreover, favourable changes in mortality, as reflected in the systematic increase in average life expectancy, were accompanied by irreversible changes in the fertility pattern. Fertility is one of the most frequently studied problems in contemporary demography, which is expressed both in the development of analytical techniques of fertility and the emergence of new theories in this area (Fihel et al., 2017; Balbo, Billari, Mills, 2013).

Over the past two decades, European countries have experienced a sharp decline in total fertility rates to low levels observed never before. Within this overall downward trend, fertility behaviours vary significantly across countries (Freja & Sobotka, 2008).

The exemplary family and social policy pursued in the Scandinavian countries has so far allowed for maintaining the periodic fertility rate at the replacement level. However, this picture seems to be changing now (McDonald, 2000). Since 2010, a decline in fertility has been observed in the Nordic countries, which many researchers associate with the global financial and banking crisis, which peaked in 2008-2009. The most common justification for the decline in fertility during periods of economic turmoil has an economic basis and concerns the financial costs of having children and the opportunity costs for women and families (Becker 1960).

Economic theories assume that having children involves immediate expenses and long-term financial and time commitments. Therefore, as uncertainty in the financial and labour markets increases, incomes fall, and career prospects deteriorate, decisions about having children are postponed. The economic crisis is directly affecting many families and individuals, reducing their incomes but also fuelling a general perception of uncertainty about future economic conditions.

The theory of low fertility also deals with understanding the motives of people's decisions regarding the number of children. This group includes, among others: the rational choice theory, the post-materialist theory of value, and the theory of gender equality (Waśniewska, 2013; Frączak, 2003). According to the rational choice theory, the decision to have a child is based on a calculation of the benefits and costs associated with having a child. The maximum level of benefits is achieved by an individual at the birth of the first child and decreases with subsequent births. The decision to have more children is postponed with the increase in the

economic costs associated with having a child. The post-materialist theory of value concerns the second demographic transition, which is characterized by a decrease in fertility, with a very low mortality rate. Changes in social behaviours were caused in this case by the increased importance of such values as self-fulfilment, individualism, and liberation from traditional patterns imposed by traditional authorities (family, school, religion). On the other hand, the essence of the theory of gender equality is to increase women's decision-making power regarding fertility, which affects the low fertility rates. Universal access to education, increased professional activity of women, emancipation of women are changes related to this theory, observed in many countries of Europe and the world already in the 1960s (Frątczak, 2003). The theories of low fertility presented above can be successfully applied to the societies of European countries.

This article is a quantitative analysis and assessment of changes in women's fertility in the Baltic countries of the European Union in the years 2012-2021. The study covers the following countries: Denmark, Finland, Germany, Sweden, Estonia, Lithuania, Latvia and Poland. It attempts to answer several research questions: What changes have occurred in the structure of women of reproductive age? In which countries are the age structures most similar? How has the pattern of women's fertility changed over the studied period? Do Nordic countries (Denmark, Finland, Sweden), which are widely known for their generous family policies, social welfare systems oriented towards employment and protection, and high rates of participation in the labour market, still have high fertility rates?

2. Methodology and Data

Fertility as a demographic phenomenon is measured by the intensity of live births in the reproductive-age population, which represents women aged 15-49.

The characteristics used included birth rates, distribution of birth rates by mothers' age (fertility pattern) also summarized by the average age of mothers at childbirth, and fertility level measured by the total fertility rate (TFR). The analysis of changes in female fertility was preceded by illustration of changes in the intensity of live births in the studied populations and changes in the structure of women's reproductive age.

The similarity of the structures of women's reproductive age was also examined using the vector elimination procedure (Chomątowski, Sokołowski, 1978). This is a taxonomic algorithm that allows for the division of the studied objects (structures) into homogeneous

groups, at a given critical distance level d^* . The similarity is determined for pairs of structures using the similarity measure:

$$P_{ij}^* = \sum_{k=1}^r \min(p_{ik}, p_{jk}) \quad (1)$$

where: i and j represents object numbers, k – structure component number, p_{ik} – share of k -th component in the structure of object i , p_{jk} – share of k -th component in the structure of j object. If the structures are completely different, then $P_{ij}^* = 0$, and if identical, then $P_{ij}^* = 1$. The critical distance level d^* , i.e. such a distance value above which two objects will be treated as belonging to one group, was determined according to the formula:

$$d^* = \min_i \max_j d_{ij} \quad (2)$$

where $d_{ij} = 1 - P_{ij}^*$.

The study covered 8 countries, including four countries of the "old EU", i.e. Denmark, Finland, Germany and Sweden, as well as Estonia, Lithuania, Latvia and Poland - post-communist countries that joined the Community in 2004¹. The analysis was performed using statistical data for the years 2012-2021 taken from Eurostat resources [www1].

3. Results and Discussion

3.1. Changes in the number of live births and the structure of women of reproductive age

The number of live births provides initial information for studying the reproductive behaviour of the population.

Analysing the overall (absolute and relative) changes in the number of births in the years 2012-2021 (Table 1), we can see significant spatial differentiation of this phenomenon. The fewest live births per 1,000 inhabitants (8.3 - 8.8) were observed in 2021 in Lithuania and Poland. The highest level of this rate (10.8 - 11.0 live births per 1,000 inhabitants) occurred in the Scandinavian countries, i.e. Denmark and Sweden). In absolute terms, the largest increase in the number of live births in 2021 compared to 2012 was recorded in Germany (by 18.1%) and Denmark (by 9.6%), which was reflected in the fertility rate.² The decrease in the birth rate

¹ The choice of the countries for the study is not accidental, because analyses of mortality are conducted for the same group of countries.

² Over of ten years, the population in Germany grew by 3.5%, in Denmark by 4.7% and in Sweden by as much as 9.5%. In Finland, despite the decline in the birth rate, the population grew. This growth was driven to a greater extent by net migration.

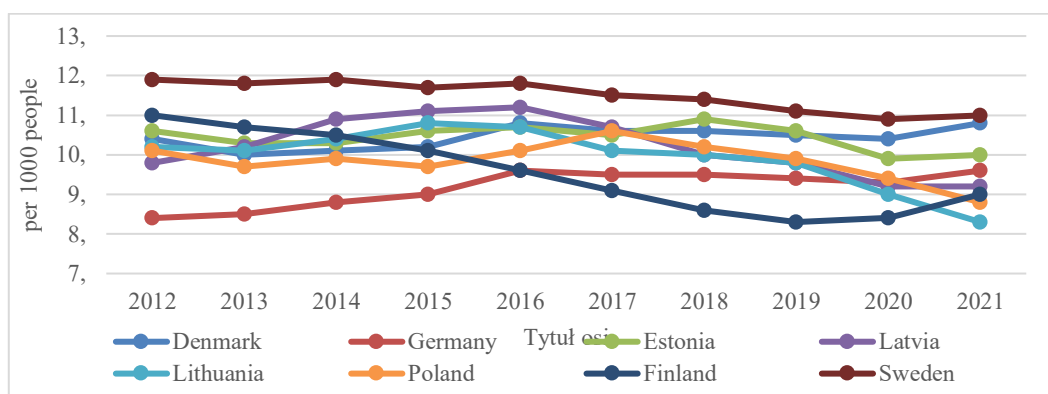
could be observed in the countries of the former Eastern Bloc, since 2016 in Estonia, Lithuania and Latvia, and in Poland since 2017, which translates directly into birth rate values which are decreasing over time (Fig. 1). In the last year of the analysis, the birth rate values were as follows: Lithuania – 8.3; Poland – 8.8; Latvia – 9.2; Estonia – 10.

Tab. 1 Changes in the number of live births in the Baltic countries in 2012, 2016, 2021

Country	2012	2016	2021	Increase/decrease	2012	2016	2021
	In absolute numbers			2021/2012 w %	per 1000 people		
Dania	57 916	61 614	63 473	9,6	10,4	10,8	10,8
Estonia	14 056	14 053	13 272	-5,6	10,6	10,7	10,0
Finland	59 493	52 814	49 594	-16,6	11,0	9,6	9,0
Lithuania	30 459	30 623	23 330	-23,4	10,2	10,7	8,3
Latvia	19 897	21 968	17 420	-12,4	9,8	11,2	9,2
Germany	673 544	792 141	795 492	18,1	8,4	9,6	9,6
Poland	386 257	382 257	331 511	-14,2	10,1	10,1	8,8
Sweden	113 177	117 425	114 263	1,0	11,9	11,8	11,0

Source: own elaboration based on [www1]

Fig. 1 Live births per 1000 people



Source: own elaboration based on [www1]

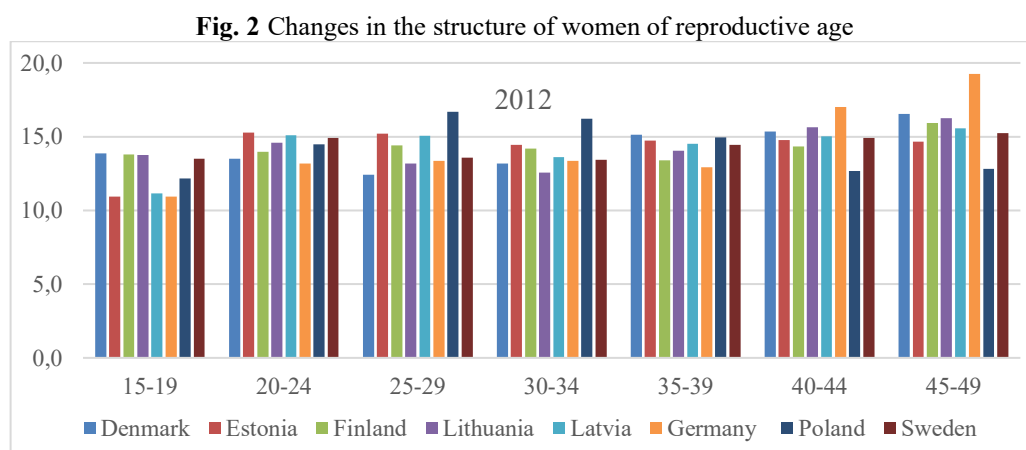
The number of births depends on the number of women of reproductive age and their fertility. In turn, the level of women's fertility is determined by their age structure. Therefore, the structure of women by reproductive age, i.e. 15-49 years, significantly affects the level of births in a given population.

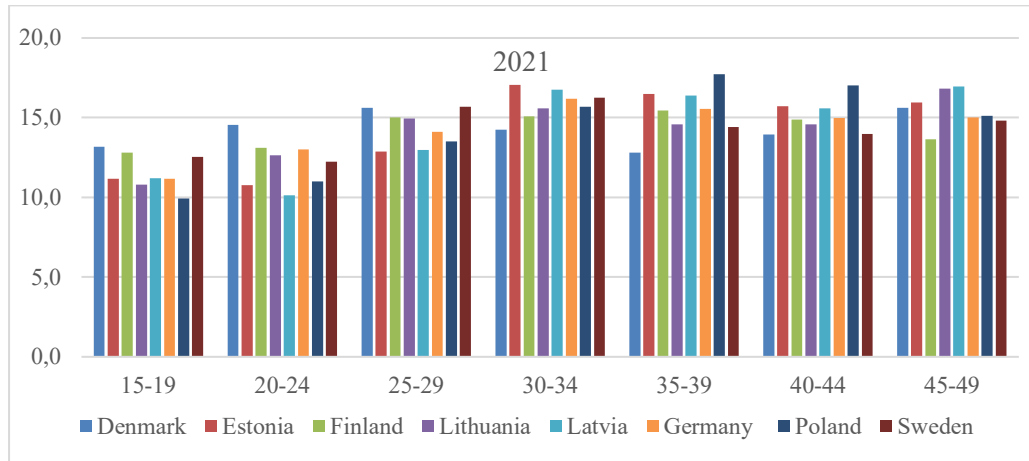
In the years 2012-2021, the number of women of reproductive age decreased in all countries except Denmark and Sweden, and the largest declines of 18%-20% were observed in Lithuania and Latvia (Fig. 2). Only Sweden recorded a significant 4% increase. However, in all studied countries, the shares of women aged 15-49 in the total female population of a given

country decreased by 2 percentage points in Denmark, Finland and Sweden; by 3 percentage points in Estonia and Poland, whereas in Germany, Latvia and Lithuania by 4, 5 and 6 percentage points, respectively.

In 2012, the most favourable reproductive age structure was observed in the female population in Poland, where there was a relatively high share of 25-29, 30-34 and 35-39 age groups, i.e. those characterised by the highest fertility (Fig. 2). The share of these three groups together amounted to approx. 48%. After ten years, the percentage of women in these age groups decreased by 1 percentage point. Similar shares of 46% - 47% were recorded in Estonia, Sweden, Germany and Latvia. Only in Denmark the percentage of women aged 25-39 did not exceed 43% in 2012.

Looking at the changes in these shares over time, only in three countries, i.e. Finland, Lithuania and Germany, an increase in these shares in each of the three age groups mentioned above (25-39 years old) can be seen. In the case of Poland, increases of 2-4 percentage points were observed in the older age groups, i.e. 35-39, 40-44 and 45-49. In the 15-29 age group, the shares of women of reproductive age in Poland were lower in 2021 compared to 2012. These unfavourable changes in the age structure of women in Poland are also well reflected in the value of the median, which increased from 32 to 35 years in 2012-2021. This was the highest increase of all median values in this group of countries. By 2021, in the Scandinavian countries, half of women of reproductive age were under 32 years old in Denmark and 33 years old in Sweden and Finland.





Source: own elaboration based on [www1].

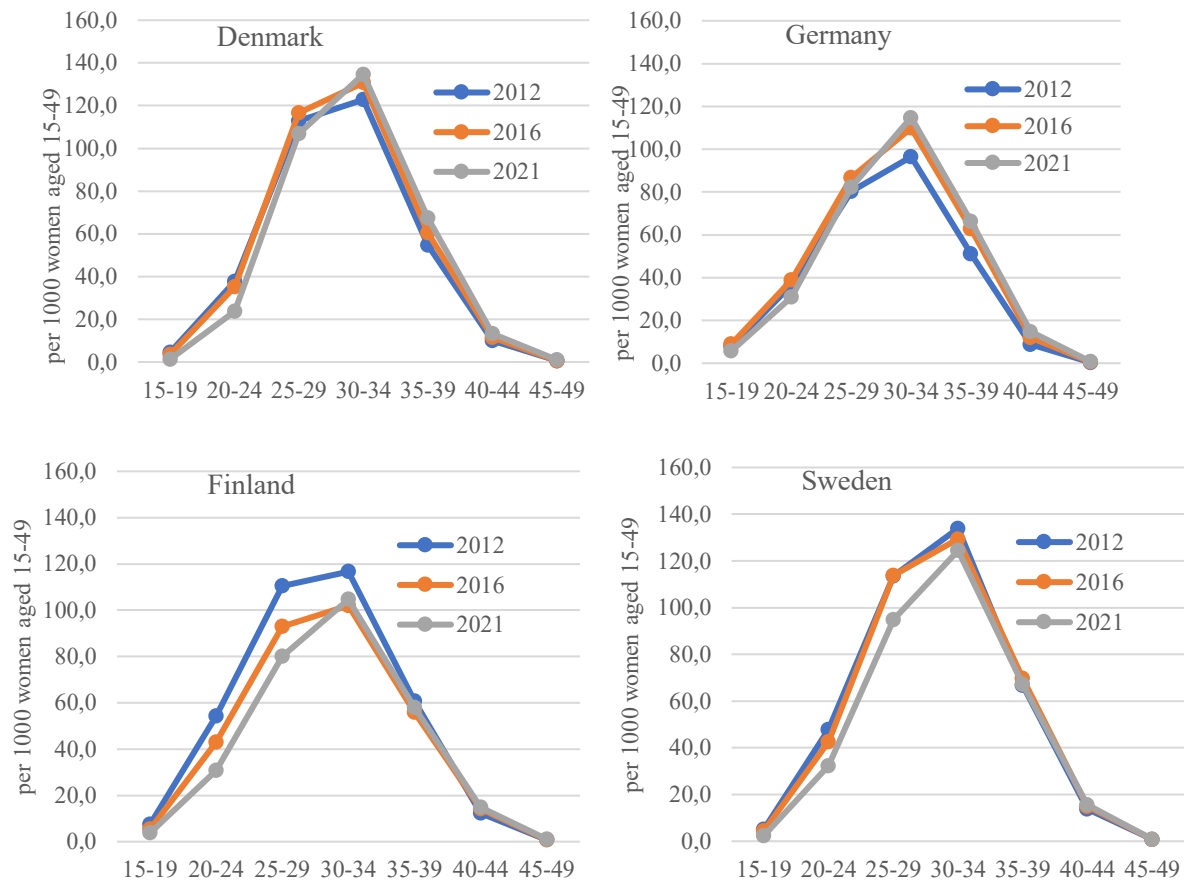
The values of the similarity measures of women's reproductive age structures determined for 2021 indicate a relatively low similarity of women's age structures in Denmark and Latvia (0.9096), while the structures of women living in Latvia and Estonia were the most similar (0.9888). Assuming the critical distance level $d^* = 0.0567$, the age structures were divided into two homogeneous groups. The first group included three Nordic countries: Denmark, Finland and Sweden, while the remaining countries, i.e. Estonia, Lithuania, Latvia, Germany and Poland, formed a separate second group.

3.2. Changes in fertility pattern

The current number of births depends not only on the number of women of reproductive age and its structure; the level of births is also significantly affected by the reproductive attitudes and behaviours of the population.

The values of partial fertility rates (fertility pattern), i.e. the intensity of births in individual age groups of mothers in a given year are a measurable indicator of these behaviours. The values of these partial measures do not depend on the size of the population or its age structure, they reflect procreative behaviours in a given period, making up the total fertility rate (TFR). For better clarity, Figures 3 and 4 present changes in the fertility pattern in selected years for two groups of countries.

Fig. 3 Female fertility rates by age (countries of the so-called "old EU")



Source: own elaboration based on [www1].

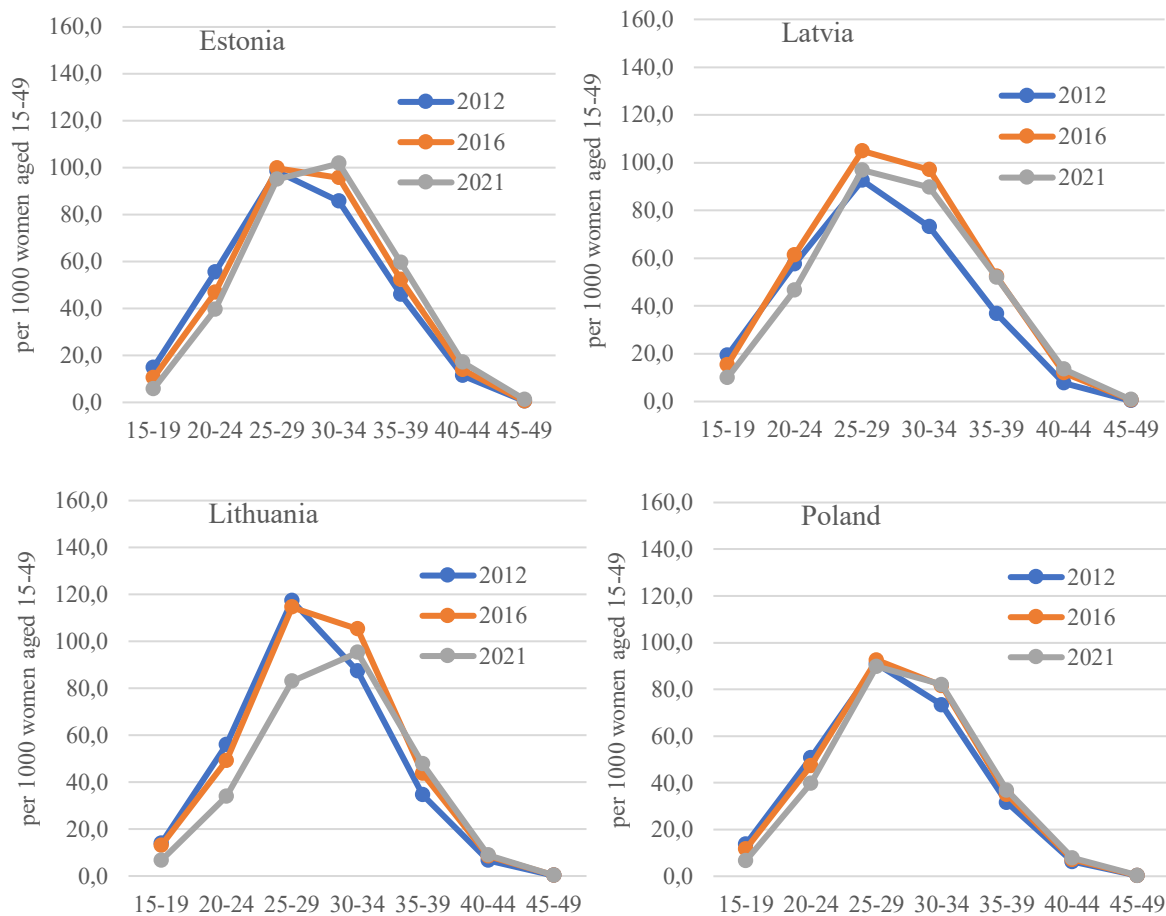
The analysis of the above graphs allowed for drawing several important conclusions:

1) In all studied countries, there was a decrease in the partial fertility rates in the first three reproductive age groups, i.e. 15-19, 20-24 and 25-29, with these unfavourable changes being more intensive in Finland, Sweden, Lithuania and Latvia. These changes prove further progressive transformations in women's fertility pattern, observed since the beginning of the 1990s. Economic and professional stabilization often requires postponing the decision to have a child until later. On the one hand, people want to have children, but they are aware that this involves their maintenance and education, which costs money³. It seems that quality of life plays an important role here. The pursuit of work and improving material conditions, as well as

³ According to the CBOS [Public Opinion Research Center] survey on the assessment of the government's family policy and the satisfaction of the reproductive needs of Poles, almost half of Poles would most like to have two children (46%), and the second most common answer was three children, as indicated by over one fifth of adult Polish residents (22%). Every fourteenth person stated that they did not want to have a child (7%), less than every tenth would most like to have one child (9%), and 6% - four children. It should be emphasised that the share of people who do not want to have children at all, in the age group of 18-24 is 21% (www2).

a consumerist lifestyle and uncritically accepted patterns of conduct from the West, have led to certain changes in mentality, especially among the younger generation.

Fig. 4 Female fertility rates by age (new EU countries)



Source: own elaboration based on [www1]

2) The changes in fertility patterns observed in the studied decade are visible primarily in the two Baltic republics, i.e., Estonia and Lithuania. While in 2012 the highest fertility occurred in the 25-29 age group, followed by the 30-34 age group, in 2021 the age of maximum fertility in these countries currently falls in the 30-34 age group, which indicates that having children is being postponed. In the case of Latvia and Poland, the age of maximum fertility is in the 25-29 age group. Currently, in all countries except Denmark, Finland and Sweden, fertility is almost 2-3 times higher in the 30-34 age group than in the 20-24 age group. In the Scandinavian countries, this ratio is even higher and amounts to 4.

3) In Poland, female fertility in the 30-34 and 35-39 age groups was the lowest in comparison to other countries.

4) Another sign of demographic changes in Eastern European countries is the change in the share of fertility of each reproductive age group in the value of the total fertility rate. The share of 15-19, 20-24, 25-29 age groups decreased, while the share of older groups of reproductive age of women, i.e. 30-34 and 35-39 years increased.

The fertility calendar is described by the distribution of partial fertility rates by mother's age in the calendar year. It is most often summarized using the average age of mothers at the time of childbirth. In 2021, the average age of mothers exceeded 30 years in Denmark and Germany, while in Sweden and Finland it was 29.8 years, which were higher values compared to those recorded for Eastern European countries: Estonia - 28.5 years; Lithuania - 28.3 years; Latvia - 27.7 years; Poland - 28.1 years. However, it was in the Eastern Bloc countries that the largest increase in the value of the average age at which women gave birth to their first child was recorded (an increase of 1.5-2 years), which is the result of delaying having children.⁴

3.3. Changes in the fertility rate

Based on cross-sectional total fertility rates (TFR), it is possible to assess generational replacement, i.e. to answer the question of whether the currently living generations will be replaced by future generations, provided that the fertility pattern in a given period remains constant (Fig. 5).

Fig. 5 Total fertility rate in the EU Baltic countries

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Denmark	1,73	1,67	1,69	1,71	1,79	1,75	1,73	1,70	1,68	1,72
Estonia	1,56	1,52	1,54	1,58	1,60	1,59	1,67	1,66	1,58	1,61
Finland	1,44	1,52	1,65	1,70	1,74	1,69	1,60	1,61	1,55	1,57
Lithuania	1,60	1,59	1,63	1,70	1,69	1,63	1,63	1,61	1,48	1,36
Latvia	1,44	1,52	1,65	1,70	1,74	1,69	1,60	1,61	1,55	1,57
Germany	1,41	1,42	1,47	1,50	1,60	1,57	1,57	1,54	1,53	1,58
Poland	1,33	1,29	1,32	1,32	1,39	1,48	1,46	1,44	1,39	1,33
Sweden	1,91	1,89	1,88	1,85	1,85	1,78	1,76	1,71	1,67	1,67



Source: own elaboration based on [www1].

In all the studied countries, the fertility rate does not guarantee simple generational replacement. In 2021, the highest fertility was observed in three countries, i.e., Denmark (1.72),

⁴ Poles' declarations regarding the number of children they have are a confirmation of statistics showing the growing average age of having their first child in recent years. 92% of people aged 18 to 24 do not have children yet, and among people aged 25 to 34, this is about half (51%). Only in the 35–44 age group do the majority of respondents declare that they have children (22% do not have any) (www2).

Sweden (1.67) and Estonia (1.61), but only Sweden, which has long been a leader in fertility-friendly policies, has had a clear downward trend in the TFR observed in the last 10 years. The decline in fertility in Finland is also noteworthy.

The decline in total fertility in the Nordic countries after 2010 surprised many scientists and attracted the attention of the media and decision-makers in the region. The timing of the decline in the fertility rate suggests a link with the global economic and financial crisis that hit most developed economies in 2008 and a few years later. Studies have shown that fertility rates in developed economies are procyclical, so they tend to rise with economic growth and fall with stagnation or recession (Sobotka et al. 2011; Comolli 2017; Goldstein, Sobotka et al. 2009).

In Nordic countries (e.g. Finland, Sweden), there has been a shift towards women having children at an older age, which contributes to lower fertility rates. Qualitative research conducted in Finland has highlighted that economic and social uncertainty and lifestyle factors seem to shape young adults' plans to have children more strongly than before. It is likely that childlessness and having fewer children are becoming more accepted in Nordic countries. Moreover, the decline may be partly explained by changes in partnerships. For example, in Finland, the majority of childless men and women have never lived in a long-term cohabiting relationship, and the proportion of people living alone has recently increased, especially among men (Hellstrand et al., 2021).

In 2020-2021, Lithuania had a fertility rate no higher than 1.5, just like Germany in the first four years covered by the study. However, throughout the entire period under study, it was Poland that observed low or extremely low fertility. The range of variation of this rate ranged from 1.29 in 2013 to 1.48 in 2017. In the coming years, the number of births will be determined by the decreasing population of women of reproductive age. Therefore, a further decrease in the number of births should be expected in Poland, but also in Lithuania. In addition, the percentage of women in younger reproductive age groups (up to 34 years), but also the percentage of women in the age of highest fertility, i.e. 29–35 years, will be decreasing, while the share of women in older reproductive age groups (40–49 years), characterized by low fertility, will be increasing. The long-term persistence of low fertility rates and the resulting low number of births leads to irreversible changes in the age structure of the population and, consequently, to population decline.

Numerous studies show that increasing the availability of childcare facilities clearly contributes to an increase in fertility. A study conducted by P. Baizan in Spain showed that an increase in the percentage of children attending nurseries by one percentage point increases the

probability of a woman giving birth to a child by 5%. In turn, studies conducted in Norway show that a gradual increase in the percentage of children attending nurseries and kindergartens from zero to 60% results in an increase in the total fertility rate by 0.5-0.7 children per woman. In the Social Diagnosis of 2013, respondents were asked which of the pro-family solutions are, in their opinion, the most important. Women most frequently indicated more flexible working hours (56.9%), improved opportunities for care outside the home for children up to 7 years of age (37.1%), the possibility of doing part of the work at home (24.1%) and extending maternity leave (24%) (Baranowska-Rataj, Matysiak, 2012).

Differences in fertility across European countries are often correlated with differences in the timing and intensity of transition to adulthood, such as leaving the parental home, forming a stable partnership, getting married, and becoming parents (Nishikido et al., 2022).

4. Conclusions

It is interesting for Europe that it is the continent most advanced in extending human life, while at the same time many countries have experienced a transition to low or very low fertility.

The total fertility rate (TFR) values that remain below 1.5 for a longer period of time lead to irreversible changes in the age structure of the population and pose a risk of entering the so-called low fertility trap (Lutz et al. 2006), from which it is very difficult to escape. The longer the fertility rate remains at a very low level, the smaller the chances of increasing it. Lower fertility means fewer children born, which in turn leads to a decrease in the percentage of young people in the population, which results in increasing social benefits for older people, a worsening of the economic situation of young people and, as a result, maintaining low fertility or its further decline.

There is no doubt that in the near future Poland and Lithuania will have to face the problem of low fertility.

References

- Balbo, N., Billari, FC i Mills, M. (2013). Fertility in Advanced Societies: A Review of Research, *European Journal of Population* Volume 29, 1–38: DOI 10.1007/s10680-012-9277-y.
- Baranowska-Rataj, A., Matysiak A. (2012). Czy znamy lekarstwo na niską dzietność. Wyniki międzynarodowych badań ewaluacyjnych na temat polityki rodzinnej, *Polityka Społeczna*, vol. 39.
- Becker, G. S. (1960). An economic analysis of fertility. In NBER (ed.): *Demographic and Economic Change in Developed Countries*, Columbia University Press, New York, 209–240.

- Comolli, C. L. (2017). The fertility response to the Great Recession in Europe and the United States: Structural economic conditions and perceived economic uncertainty. *Demographic Research*, 36(51), 1549–1600.
- Chomątowski S., Sokołowski A. (1978). Taksonomia struktur, *Przegląd Statystyczny* z. 2.
- Fihel A., Kiełkowska M., Radziwinowiczówna A., Rosińska A. (2017). Determinanty spadku płodności w Polsce – próba syntezy, *Studia Demograficzne*, 2 (172), 35-69.
- Frątczak E. (2003). Teorie niskiej płodności, [in:] Z. Strzelecki (ed.). Problemy demograficzne Polski przed wejściem do Unii Europejskiej, PWE, Warszawa.
- Frejka T., Sobotka T. (2008). Fertility in Europe, *Demographic Research*, 19(3): 15-46.
- Goldstein J. R., Sobotka T. Jasilioniene A. (2009). The end of ‘lowest-low’ fertility? *Population and Development Review* 35(4): 663–699.
- Hellstrand J., Nisen J., Miranda W., Fallesen P., Dommermutha L., Myrskylä M. (2021). Not Just Later, but Fewer: Novel Trends in Cohort Fertility in the Nordic Countries, *Demography*, nr. 58(4).
- Lutz W., Skirbekk V, Testa M.R. (2006). The Low Fertility Trap Hypothesis: Forces That May Lead to Further Postponement and Fewer Births in Europe, *Vienna Yearbook of Population Research*, Vienna.
- McDonald, P. (2000). Gender equity, social institutions and the future of fertility. *Journal of Population Research*, 17, 1–16.
- Nishikido M., Cui Q., Esteve A. (2022). Partnership dynamics and the fertility gap between Sweden and Spain, *Genus*, 78 (26).
- Sobotka, T. Skirbekk, V. Philipov D. (2011). Economic Recession and Fertility in the Developed World. *Population and Development Review*, 37 (2), 267-306.
- Waśniewska A. (2013). Tendencje demograficzne dotyczące zmiany liczby ludności regionu Morza Bałtyckiego w latach 2000-2010, *Przedsiębiorstwo we współczesnej gospodarce. Teoria i praktyka* nr. 2/5, 62-73.

Online sources

- (www1) <http://ec.europa.eu/eurostat/data/database> (accessed: 20.07.2023)
- (www2) https://www.cbos.pl/SPISKOM.POL/2022/K_104_22.PDF (accessed: 25.07.2023).