

FERTILITY TRENDS UNDER MODERN PUBLIC POLICY IN CENTRAL EUROPE'S CHANGING SOCIO-ECONOMIC LANDSCAPE

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Purpose: This article aims to investigate the relationship between total fertility rates and selected socio-economic indicators in Poland, Czechia, and the Slovak Republic from 2009 to 2023.

Design/methodology/approach: The analysis follows a dual-track approach: it includes a literature review using bibliometric analysis of scientific publications on fertility, as well as a quantitative analysis of statistical data.

Findings: A comprehensive review of the literature, along with an analysis of empirical data underscores the critical importance of addressing the issue of low fertility in Central European countries. The findings of this article confirm that fertility in selected countries of Central Europe is shaped by a complex interplay of socio-economic factors rather than by any single economic indicator.

Research limitations/implications: The limitations of this article are primarily related to constraints in the availability and completeness of statistical data.

Practical implications: An important practical implication of this study is that economic indicators exhibited divergent effects on fertility levels across different countries. This highlights the need for a more nuanced and in-depth examination of the economic determinants of fertility.

Social implications: The social relevance of this study lies in the fact that low fertility is closely linked to broader societal challenges, including population aging, increasing public healthcare expenditures, and the need for pension system reforms. These interrelated issues underscore the social importance of continued research and the urgency of identifying practical solutions to address the declining fertility trend.

Originality/value: This article may serve as a recommendation for the optimization of public policy. The analysis of empirical data on selected economic indicators revealed their multifaceted relationship with fertility levels across different countries, indicating their

potential influence. These findings provide a basis for adjusting public policy in a targeted manner to address better and manage the issue of low fertility.

Keywords: Total Fertility Rate, modern public policy, macroeconomic variables, inflation, public expenditure on education.

Category of the paper: research paper.

1. Introduction

Fertility, defined as the average number of children born to a woman over her lifetime, has been declining steadily across most European countries for several decades. This trend has significant demographic, social, and economic consequences. In many countries, fertility rates have dropped far below the replacement level of 2.1 children per woman, leading to the ageing of societies, increasing dependency ratios, and mounting pressure on pension and healthcare systems (McDonald, 2006).

This topic has been selected in response to the ongoing debate concerning the causes of low fertility in Europe and the possibilities of counteracting this trend through public policy interventions. Academic literature highlights numerous determinants of fertility decisions, including cultural, psychological, economic, and institutional factors (Mills et al., 2011). This article focuses on the socio-economic variables whose effects can be assessed quantitatively.

Falling fertility rates are not only a demographic issue but also a serious challenge for sustainable socio-economic development. Countries with low birth rates must reform pension systems, stimulate migration, adapt labour markets, and develop long-term demographic strategies (Lutz et al., 2008). Public policies, especially those supporting work-family balance, childcare availability, parental leave, family transfers, and housing, are of growing importance (Gauthier, 2007).

European governments have undertaken a variety of initiatives aimed at reversing fertility decline. Some studies show that family-friendly policies can positively affect reproductive behaviour, especially when they are comprehensive, long-term, and inclusive (Luci-Greulich, Thévenon, 2013). However, there is still no consensus on which socio-economic variables are most relevant and whether their effects are consistent across countries.

This study aims to examine the relationship between fertility rates (Total Fertility Rate – TFR) and selected socio-economic indicators in Central European countries between 2009 and 2023. Variables commonly considered in the literature as important for fertility choices were selected: GDP growth, inflation, unemployment, education expenditure, and social transfers.

The study covers both correlation analysis and interpretation of these relationships within the literature and policy context. It addresses the question of whether the fertility decline is accompanied by significant macroeconomic changes and which variables are most explanatory for cross-country differences in fertility levels.

The analysis covers the years 2009-2023 for Poland, Czechia, and the Slovak Republic, representing countries of Central Europe. This timeframe includes the aftermath of the 2008 financial crisis and the COVID-19 pandemic (2020-2021), both of which introduced economic uncertainty and disruptions in social services that may have affected fertility decisions (Sobotka, 2021).

The study adopts a dual-track approach. First, a bibliometric analysis of fertility-related academic publications was conducted using the Web of Science database and the VOSviewer software. This provides insight into the most frequently researched themes, leading academic centres, and publication trends. Second, a quantitative analysis based on statistical data from the World Bank, Eurostat, and OECD assesses the relationships between fertility and socio-economic indicators.

Combining these two approaches allows for a comprehensive evaluation of the topic and strengthens the reliability of the conclusions. The comparison of academic focus with empirical data supports better alignment of future research directions with real-world demographic challenges.

This article uses comparative analysis and trend analysis as the main research methods. The first stage involved a review of family policies implemented in Poland, the Czech Republic, and Slovakia over the past two decades. Subsequently, demographic data—particularly fertility rates—were compared alongside selected socio-economic indicators. This approach enabled an assessment of the effectiveness of public actions in light of ongoing social and economic transformation.

2. Literature Review

A bibliometric analysis was conducted in April 2025 by retrieving data from the Web of Science database based on the following search parameters by topic meaning by title, abstract, keyword plus, and author keywords using the following combination of words "fertility decline*" and "Europe" or "fertility rate*" and "Europe " or "fertility level*" and "Europe" or "fertility reduction*" and "Europe" or "fertility transition*" and "Europe".

By choosing the Web of Science database, researchers ensure that the literature they draw from is based on credible and trustworthy sources. A total of 690 articles published between 1970 and 2025 were collected, complete with full records and citation details. The gathered data was then further examined using VOSviewer software.

To begin their examination of fertility decline in Europe, the authors of this paper conducted a keyword co-occurrence analysis, as shown in Figure 1. The criteria indicated in co-occurrence analysis was “minimum number of occurrences of a keyword is 3”. Of the 274 keywords identified, only 28 met this criterion.

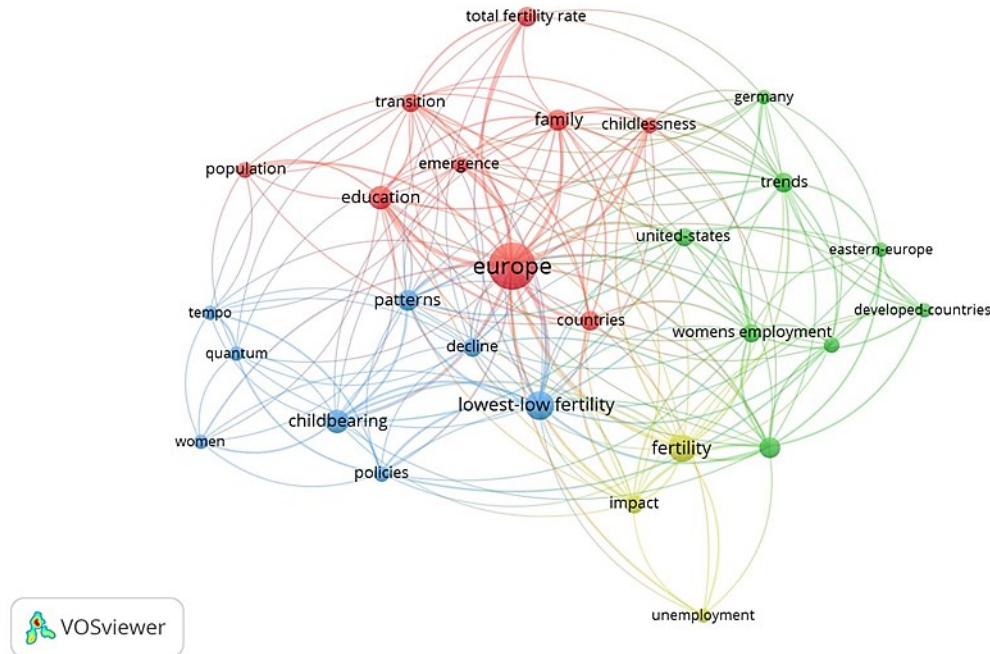


Figure 1. Keyword co-occurrence analysis.

Source: Authors' own research.

The most frequently occurring terms in the analysis were: Europe (total link strength = 98), lowest-low fertility (47), education (34), fertility (34), family (32), family policies (34), pattern (29), countries (28), women's employment (28), impact (25), childbearing (29), transition (23), United States (23), childlessness (22), emergence (22), second demographic transition (19), decline (18), policies (18), developed countries (15), Germany (15), total fertility rate (14), Eastern Europe (13), tempo (13), population (11).

The emerging trends are illustrated in 5 clusters in the overlay visualization for the years 2014 to 2024, presented in Figure 2.

To carry out a co-authorship analysis, the authors of this paper investigated how researchers from various countries are connected through shared publications on fertility decline (Figure 3).

The criterion indicated in the co-authorship analysis was: “minimum number of documents by a country is 3”. There were 9 countries out of 25 which fulfilled the above-mentioned criteria divided into 3 clusters namely: cluster 1 (England, Scotland, and Sweden), cluster 2 (Austria, Germany, and Netherlands), cluster 3 (Italy, Spain, and USA). The countries with the highest number of articles were Austria (10), USA (16), and Germany (5).

The criterion indicated in citation analysis was: “minimum number of documents by a country is 3”. There were 10 countries out of 25 that fulfilled the above-mentioned criteria divided in 3 clusters: cluster 1 (England, Germany, Scotland, Sweden, USA), cluster 2 (Austria,

Italy, Spain), and cluster 3 (Czech Republic and Netherlands). The Czech Republic had 3 documents, according to the criteria above.

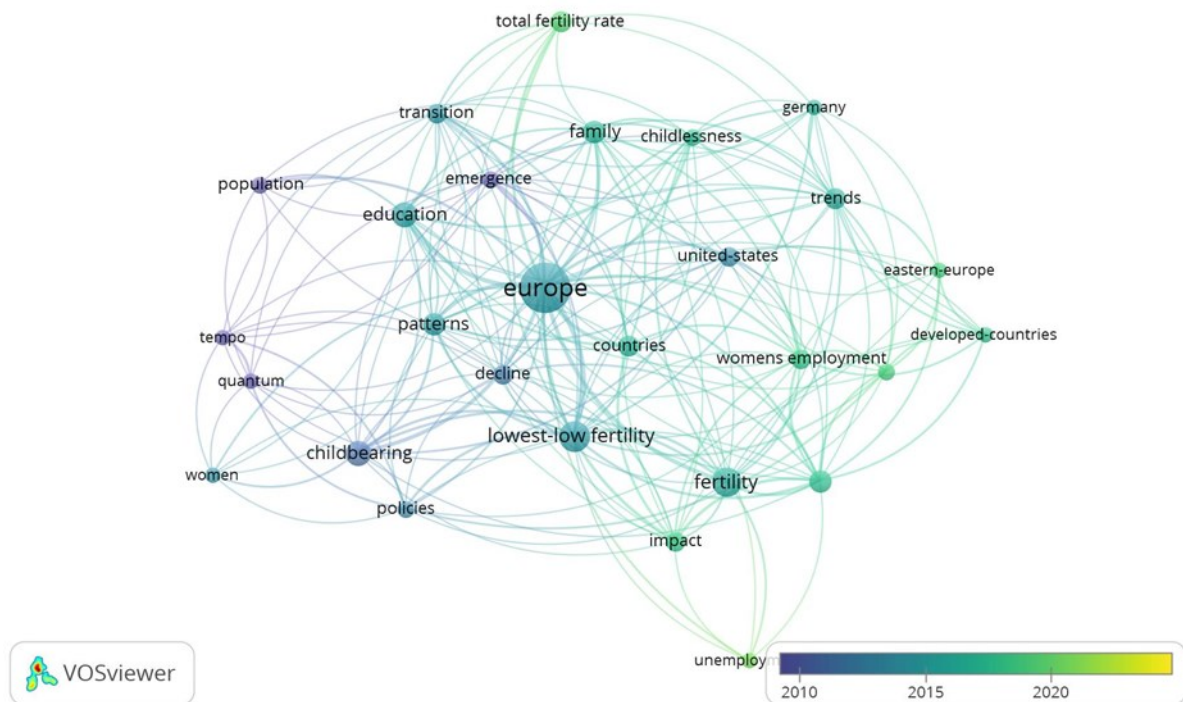


Figure 2. The emerging trends in fertility issues.

Source: Authors' own research.



Figure 3. Co-authorship analysis.

Source: Authors' own research.

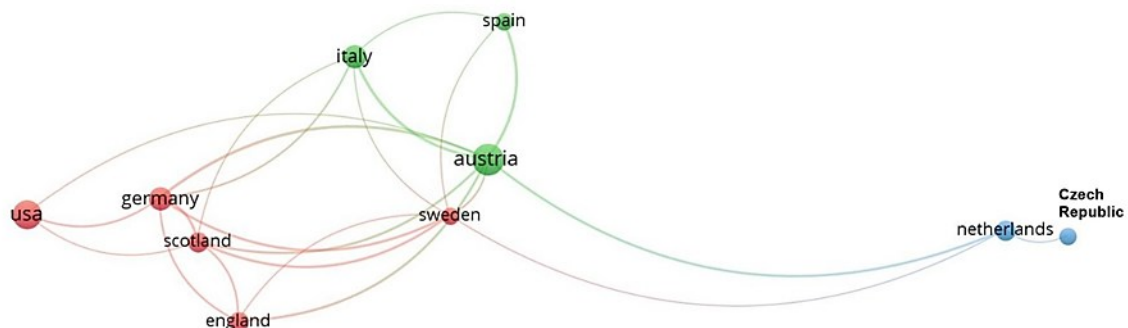


Figure 4. Citation country network analysis.

Source: Authors' own research.

The bibliographic analysis conducted revealed a relatively limited academic interest in the issue of fertility in Central European countries, with the notable exception of Czechia. This gap in the literature motivated the authors to contribute to addressing this underexplored area. For the purposes of comparative analysis, the authors selected Poland, the Slovak Republic, and Czechia as representative countries of Central Europe.

According to data from Statistics Poland (GUS, 2025), the total fertility rate in Poland in 2024 was only 1.099. In the same year, the number of births in the Slovak Republic fell to just 46,000 — the lowest level since the establishment of the independent Slovak state in 1993 (Statistical Office of the SR, 2025). Similarly, in Czechia, only 84.3 thousand live births were registered in 2024, marking the lowest figure in the country's statistical history (CZSO, 2025).

These alarming statistics highlight the urgent need to investigate this negative fertility trend and identify the potential economic factors associated with it in these countries.

3. Methods

This study employs a two-track methodology approach that integrates qualitative bibliometric evaluation and quantitative statistical analysis to analyze the relationship between fertility and certain socio-economic indicators in three of the Central European countries: Poland, Czechia, and the Slovak Republic from 2009 to 2023.

In the initial step of the study, a bibliometric analysis was applied to map scholarly interest in issues concerning fertility across Europe. Data were accessed in the Web of Science database using keywords like "fertility decline*", "fertility rate*", "fertility level*", "fertility reduction*", and "fertility transition*", each preceded by the term "Europe". Searches were limited to publications between the years 1970 to 2025 and yielded 690 hits. Full records and citations were imported into VOSviewer software to generate keyword co-occurrence analysis, co-authorship mapping, and citation network analysis. This allowed the determination of key research clusters, leading countries and institutions, and budding thematic fertility patterns.

The second approach used quantitative statistical analysis of macroeconomic indicators to examine their statistical relationship with the Total Fertility Rate (TFR). The countries analyzed were selected based on their shared geographic location, socio-political histories, and divergent fertility outcomes.

The following socio-economic indicators were addressed: GDP growth, GDP per capita growth (% annual), unemployment rate (% of labor force), inflation rate (% annual CPI), government expenditure on education (% of GDP), and subsidies and other social transfers (% of total government expenditure). Variables in the above data were drawn from reputable international databases like the World Bank, Eurostat, and the OECD. Fertility data were

available for all years in the period 2009-2023 to ensure that cross-country comparability is not compromised.

For each country, Pearson correlation coefficients were calculated to examine the strength and direction of linear relationships between TFR and each socio-economic variable. The coefficients enabled the establishment of variables closest to being related to fertility trends in the period under observation.

The Pearson correlation coefficient was selected due to its simplicity, interpretability, and widespread use in social science research when analyzing the linear association between continuous variables. It enables a straightforward comparison of the strength and direction of relationships between fertility and various macroeconomic indicators across countries and over time. However, the use of this method comes with certain limitations. The Pearson coefficient only captures linear relationships and may fail to detect non-linear patterns that could be relevant in complex socio-economic contexts. Moreover, it does not account for potential lag effects, where socio-economic changes may influence fertility decisions with a delay. Additionally, correlation does not imply causation, meaning that significant coefficients do not necessarily indicate a direct or unidirectional relationship. These methodological constraints are important when interpreting the results, especially in cross-country comparative analyses involving multicausal phenomena such as fertility.

The temporal scale (2009-2023) was chosen to cover important economic and demographic happenings, including the consequences of the 2008 financial crisis and the COVID-19 pandemic, that are likely to have had a strong impact on reproductive behavior. Undoubtedly, demographic behavior may also have been influenced by the war in Ukraine, which began in 2022. The countries analyzed are in the immediate vicinity of the conflict's outbreak. The spatial scale consists of three Central European nations such as Poland, Czechia, and the Slovak Republic, that have varying demographic trends and public policy environments, offering an important comparative lens.

By combining bibliometric and empirical data analysis, the research methodology guarantees theoretical validity grounded in prevailing academic discourse as well as robust empirical measurement of macroeconomic determinants. The integrated approach enables the use of a sophisticated understanding of fertility patterns within a changing socio-economic context.

4. Results and Discussion

Between 2009 and 2023, Czechia, Poland, and the Slovak Republic exhibited clearly divergent trends in fertility rates (Figure 5). While Czechia showed a systematic and sustained increase in this indicator, fertility in Poland was markedly more volatile, and the effects of pro-

family policies proved to be short-lived. The Slovak Republic, in turn, experienced a moderate yet relatively stable increase in TFR. These differing trajectories serve as a starting point for analyzing the socio-economic factors that, as highlighted in the literature, may influence reproductive decisions.

During the analyzed period, Czechia recorded a consistent increase in fertility—from 1.51 in 2009 to 1.83 in 2021. This represents the highest level among the three compared countries. The literature suggests that such a trend may be driven by favorable institutional conditions, including access to childcare, low unemployment, economic stability, and a high level of trust in public institutions (Kocourková et al., 2023; Brabec, 2022; Matysiak et al., 2021). The Czech model of family policy, based on long-term support and substantial investment in education, appears to foster decisions to have children.

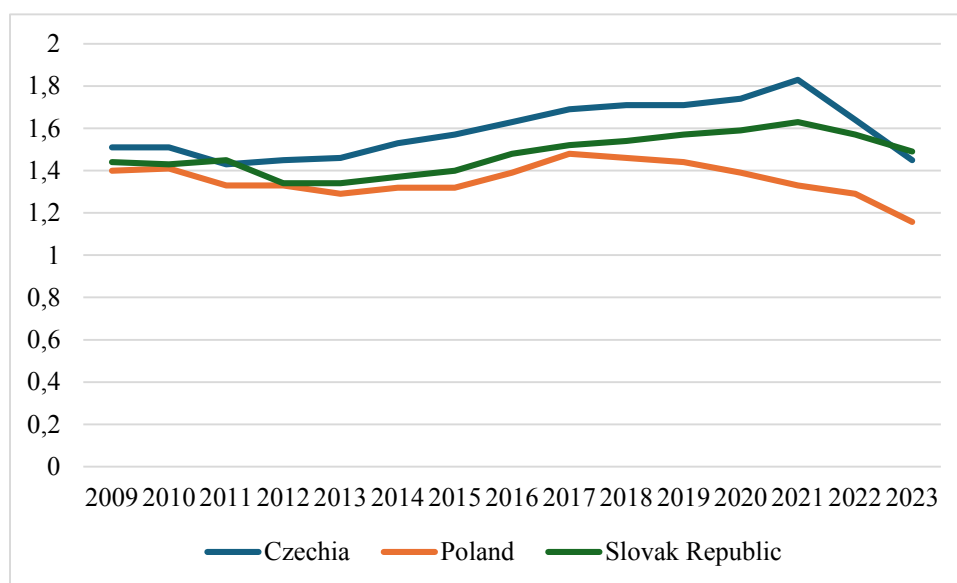


Figure 5. Changes in the Total Fertility Rate (TFR) in Czechia, Poland, and the Slovak Republic between 2009 and 2023.

Source: Authors' own research based on World Bank data.

In Poland, fertility levels were highly variable. Following a decline to 1.29 in 2013, the rate rose to 1.48 in 2017, only to decrease again to 1.33 by 2021 and to 1.16 by 2023. These fluctuations may indicate the absence of a coherent and long-term family policy strategy. The introduction of the 500+ program produced only a short-term effect, supporting the argument found in the literature that financial transfers alone are insufficient without institutional support and improvements in housing or employment conditions for families (Magda et al., 2020; Sikorska, 2021; Kaźmierczak-Kałużna, 2023).

In the Slovak Republic, a moderate yet relatively stable increase in fertility was observed—from 1.44 in 2009 to 1.63 in 2021. Although the rate of growth was slower than in Czechia, the country displayed greater consistency than Poland. The literature suggests that even with moderate financial outlays, employment stability, relatively good social infrastructure,

and predictable state policy can positively influence reproductive decisions (Hacker, 2009; Carson, 2012; Kimura, Yasui, 2023). The Slovak case aligns well with this interpretation.

The varied directions of change suggest that reproductive decisions are sensitive to a wide range of socio-economic factors, the strength and durability of which differ across countries. The increase in fertility in Czechia may point to the effectiveness of a long-term and comprehensive family policy, in contrast to the short-term impact of measures taken in Poland. Preliminary data analysis indicates that effective family support policy should rely not only on financial transfers but also on economic stability, access to childcare services, and investment in education.

The study examined the link between fertility rates (TFR) and the rate of gross domestic product (GDP) growth in three Central European countries: Poland, Czechia, and the Slovak Republic, covering the years 2009 to 2023 (Table 1).

Table 1.

Fertility Rates and GDP Growth in Poland, Czechia, and the Slovak Republic (2009-2023), with Pearson Correlation Coefficients

Year	Poland		Czechia		Slovak Republic	
	fertility rate, total (births per woman)	GDP growth (annual %)	fertility rate, total (births per woman)	GDP growth (annual %)	fertility rate, total (births per woman)	GDP growth (annual %)
2009	1,4	2,62	1,51	-4,80	1,44	-5,51
2010	1,41	3,17	1,51	2,71	1,43	6,79
2011	1,33	5,26	1,43	1,77	1,45	2,56
2012	1,33	1,51	1,45	-0,77	1,34	1,57
2013	1,29	0,68	1,46	-0,04	1,34	0,70
2014	1,32	3,92	1,53	2,25	1,37	2,71
2015	1,32	4,43	1,57	4,96	1,4	5,18
2016	1,39	3,03	1,63	2,58	1,48	1,95
2017	1,48	5,15	1,69	5,17	1,52	2,87
2018	1,46	6,25	1,71	2,83	1,54	4,06
2019	1,44	4,58	1,71	3,57	1,57	2,28
2020	1,39	-2,04	1,74	-5,30	1,59	-2,59
2021	1,33	6,93	1,83	4,03	1,63	5,73
2022	1,29	5,26	1,64	2,85	1,57	0,45
2023	1,158	0,14	1,45	-0,09	1,49	1,38
Pearson Correlation Coefficients	0,328		0,263		0,012	

Source: Authors' own research based on World Bank data.

In the case of Poland, the Pearson correlation coefficient was 0.328, indicating a weak positive relationship between TFR and GDP growth. However, this value is not statistically significant, which means that changes in the pace of economic growth did not have a clear impact on fertility levels during this period.

Similarly, in Czechia, the correlation coefficient was 0.263, which also did not reach statistical significance. Although Czechia experienced a systematic increase in fertility during the analyzed period, this trend cannot be directly linked to the pace of economic growth. It is more likely that other factors were responsible for the rise in TFR, such as stable family policies, investments in childcare, or a high level of job security.

The lowest correlation was observed in the Slovak Republic, where the coefficient reached only 0.012, indicating no meaningful relationship between GDP growth and TFR. This suggests that fertility levels in this country remained relatively independent of economic growth rates.

Economically, the absence of a statistically significant correlation between fertility rates and GDP growth across all three countries examined is a finding of particular relevance for comprehending the underlying dynamics of the phenomenon. These results suggest that fertility in Central Europe is not a straightforward function of the economic situation as measured by GDP growth. Given that, according to World Bank data, the population of Poland in 2023 was 36 387 353, that of Czechia was 10 864 004, and that of the Slovak Republic was 5 426 740, it is important to account for these demographic differences in the economic analysis. Since overall GDP growth does not reflect variations in population size, GDP per capita growth is considered a more precise indicator of economic well-being. Therefore, the authors decided to additionally examine and compare the relationship between GDP per capita growth and fertility rates in the three countries (Table 2).

The statistical analysis of data for Poland, Czechia, and the Slovak Republic from 2009 to 2023 allowed for an assessment of the relationship between fertility levels and the gross domestic product growth rate per capita. An effort was made to examine whether economic growth has a meaningful impact on reproductive decision-making in Central European countries. The calculated Pearson correlation coefficients were 0.24 for Poland, 0.34 for Czechia, and 0.03 for the Slovak Republic. Although these values indicate weak or very weak positive correlations, none of the results confirm a clear and statistically significant relationship. Particular attention should be paid to Czechia, the only country analyzed to show a systematic increase in fertility during the examined period. However, even in this case, it is not possible to clearly identify GDP per capita growth as the main driver of this trend. The results for the Slovak Republic clearly indicate a lack of connection between TFR and GDP per capita dynamics, suggesting that fertility levels in this country were virtually independent of economic conditions. A similar situation occurred in Poland, where, despite the short-term effects of family policies, fertility levels showed high variability and only a weak association with economic development.

Table 2.

Fertility Rate and GDP per Capita Growth in Poland, Czechia, and the Slovak Republic (2009-2023), with Pearson Correlation Coefficients

Year	Poland		Czechia		Slovak Republic	
	fertility rate, total (births per woman)	GDP per Capita Growth (annual %)	fertility rate, total (births per woman)	GDP per Capita Growth (annual %)	fertility rate, total (births per woman)	GDP per Capita Growth (annual %)
2009	1,4	2,55	1,51	-5,34	1,44	-5,63
2010	1,41	3,46	1,51	2,42	1,43	6,69
2011	1,33	5,20	1,43	1,56	1,45	2,43
2012	1,33	1,51	1,45	-0,91	1,34	1,40
2013	1,29	0,75	1,46	-0,07	1,34	0,60
2014	1,32	4,00	1,53	2,14	1,37	2,61
2015	1,32	4,50	1,57	4,75	1,4	5,08
2016	1,39	3,08	1,63	2,38	1,48	1,82
2017	1,48	5,14	1,69	4,89	1,52	2,72
2018	1,46	6,25	1,71	2,49	1,54	3,92
2019	1,44	4,61	1,71	3,16	1,57	2,14
2020	1,39	-1,86	1,74	-5,53	1,59	-2,67
2021	1,33	9,58	1,83	5,93	1,63	5,95
2022	1,29	5,71	1,64	1,24	1,57	0,74
2023	1,158	0,51	1,45	-1,85	1,49	1,47
Pearson Correlation Coefficients	0,242		0,345		0,035	

Source: Authors' own research based on World Bank data.

Overall, the rate of economic growth within the observed period did not prove to be a strong predictor of fertility levels in the countries analyzed. Decisions about having children are likely influenced more by institutional stability, social conditions, and cultural norms than by short-term changes in macroeconomic indicators.

Given that no significant relationship was found between reproductive decisions and GDP growth, it is important to consider other economic indicators that may better reflect the well-being of an average household and potentially influence fertility patterns. Investigating the association between the fertility rate and the unemployment rate could offer a more comprehensive understanding of the factors influencing reproductive behavior (Table 3). In Poland, the Pearson correlation coefficient between TFR and unemployment for the years 2009–2023 was -0.034, indicating no significant relationship. Despite a decline in the unemployment rate from 10.6% in 2013 to 2.8% in 2023, fertility levels did not show a clear upward trend. This may suggest that in Poland, reproductive decisions were not strongly linked to labor market conditions and were likely shaped by other factors.

In Czechia, a much stronger correlation coefficient of -0.76 was observed, indicating a clear negative relationship. As unemployment decreased, fertility levels increased. For example, unemployment fell from 6.7% in 2011 to 2.8% in 2021, while the TFR rose from 1.43 to 1.83 during the same period. These data suggest that a stable labor market may have been an important factor in encouraging family expansion in Czechia, further supported by effective family policies.

Table 3.

Relationship between fertility rate and unemployment rate in Poland, Czechia, and the Slovak Republic (2009-2023), including Pearson correlation coefficients

Year	Poland		Czechia		Slovak Republic	
	fertility rate, total (births per woman)	unemployment rate (percentage of the population in the labour force)	fertility rate, total (births per woman)	unemployment rate (percentage of the population in the labour force)	fertility rate, total (births per woman)	unemployment rate (percentage of the population in the labour force)
2009	1,4	8,50	1,51	6,70	1,44	12,00
2010	1,41	10,00	1,51	7,30	1,43	14,30
2011	1,33	10,00	1,43	6,70	1,45	13,50
2012	1,33	10,40	1,45	7,00	1,34	13,90
2013	1,29	10,60	1,46	7,00	1,34	14,10
2014	1,32	9,20	1,53	6,10	1,37	13,10
2015	1,32	7,70	1,57	5,10	1,4	11,50
2016	1,39	6,30	1,63	4,00	1,48	9,60
2017	1,48	5,00	1,69	2,90	1,52	8,10
2018	1,46	3,90	1,71	2,20	1,54	6,50
2019	1,44	3,30	1,71	2,00	1,57	5,70
2020	1,39	3,20	1,74	2,60	1,59	6,70
2021	1,33	3,40	1,83	2,80	1,63	6,80
2022	1,29	2,90	1,64	2,20	1,57	6,10
2023	1,158	2,80	1,45	2,60	1,49	5,80
Pearson Correlation Coefficients	-0,034		-0,760		-0,876	

Note. The unemployment rate is the number of unemployed persons as a percentage of the labour force based on the International Labour Office (ILO) definition. The labour force is the total number of people employed and unemployed. Unemployed persons comprise persons aged 15 to 74 who: - are without work during the reference week; - are available to start work within the next two weeks; - and have been actively seeking work in the past four weeks or had already found a job to start within the next three months.

Source: Authors' own research based on World Bank and Eurostat data.

The strongest correlation was recorded in the Slovak Republic, where the coefficient reached -0.876. This indicates a very strong inverse relationship between unemployment and fertility – the lower the unemployment rate, the higher the TFR. Between 2013 and 2023, unemployment fell from 14.1% to 5.8%, while fertility increased from 1.34 to 1.49. This may suggest that improved economic conditions and a greater sense of job security played a key role in reproductive decisions in that country.

Thus, the relationship between the unemployment rate and fertility level varies by country. In Poland, it was practically negligible, whereas in Czechia and the Slovak Republic, there was a strong, inverse correlation. These results confirm that the labor market, as an important socio-economic indicator, can play a significant role in shaping fertility, although its impact depends on local conditions, social policies, and public trust in the system.

Another important factor determining the stability of the economic environment is the inflation rate, which makes it essential to identify its relationship with the fertility rate (Table 4).

The statistical analysis of fertility rates and inflation in Poland, Czechia, and Slovakia from 2009 to 2023 enables an assessment of the strength and direction of the relationship between these variables in the context of the article's objective, which is to examine the relationship between fertility and selected socio-economic indicators. In Poland, the Pearson correlation coefficient was -0.534, indicating a moderate negative relationship between inflation and fertility. This means that during periods of higher inflation, especially in the years 2020-2021, a decline in fertility was observed, which may suggest that rising living costs and economic uncertainty negatively affected decisions to expand families. This result is consistent with academic literature that emphasizes the importance of economic stability in reproductive decision-making.

In the case of Czechia, the correlation coefficient was very weak, at 0.044, indicating no significant relationship between inflation and TFR. Despite a moderate increase in prices, fertility in Czechia grew steadily, suggesting that other factors, such as a stable and consistent family policy, high levels of social trust, and supportive institutional conditions, may have played a more important role in shaping reproductive decisions. In this case, inflation variability does not appear to have had a noticeable impact on fertility behavior.

Table 4.

Relationship Between Fertility Rate and Inflation in Poland, Czechia, and the Slovak Republic (2009-2023), Including Pearson Correlation Coefficients

Year	Poland		Czechia		Slovak Republic	
	fertility rate, total (births per woman)	inflation (annual %)	fertility rate, total (births per woman)	inflation (annual %)	fertility rate, total (births per woman)	inflation (annual %)
2009	1,4	3,80	1,51	1,02	1,44	1,62
2010	1,41	2,58	1,51	1,47	1,43	0,96
2011	1,33	4,24	1,43	1,92	1,45	3,92
2012	1,33	3,56	1,45	3,29	1,34	3,61
2013	1,29	0,99	1,46	1,44	1,34	1,40
2014	1,32	0,05	1,53	0,34	1,37	-0,08
2015	1,32	-0,87	1,57	0,31	1,4	-0,33
2016	1,39	-0,66	1,63	0,68	1,48	-0,52
2017	1,48	2,08	1,69	2,45	1,52	1,31
2018	1,46	1,81	1,71	2,15	1,54	2,51
2019	1,44	2,23	1,71	2,85	1,57	2,66
2020	1,39	3,37	1,74	3,16	1,59	1,94
2021	1,33	5,06	1,83	3,84	1,63	3,15
2022	1,29	14,43	1,64	15,10	1,57	12,77
2023	1,158	11,53	1,45	10,66	1,49	10,53
Pearson Correlation Coefficients	-0,534		0,044		0,331	

Note. Inflation, as measured by the consumer price index, reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.

Source: Authors' own research based on World Bank data.

In Slovakia, a positive correlation of 0.331 was found, indicating a weak but noticeable positive relationship between inflation and fertility. The increase in inflation in this country coincided with rising fertility, which may suggest that other factors such as increased public spending or social support may have offset the negative effects of rising prices. It is possible that in the context of improving social and economic security, inflation was not perceived as a barrier to having children.

Hence, the relationship between inflation and fertility across the three analyzed countries was varied. In Poland, inflation had a discouraging effect, in Czechia it had little to no impact, and in Slovakia, it may have coincided with an increase in fertility. These results confirm that the influence of inflation as a socio-economic indicator on reproductive decisions is not straightforward and depends on the specific economic, political, and institutional context of each country. Therefore, the findings support the article's assumption that economic indicators alone are not sufficient to explain fertility dynamics and must be interpreted within a broader social and policy framework.

The analysis of the relationship between fertility levels and government expenditure on education (as a percentage of GDP) in Poland, Czechia, and Slovakia between 2009 and 2021 provides interesting insights in the context of modern public policy (Table 5).

Table 5.

Relationship Between Fertility Rate and Government Expenditure on Education (% of GDP) in Poland, Czechia, and the Slovak Republic (2009-2021), Including Pearson Correlation Coefficients

Year	Poland		Czechia		Slovak Republic	
	fertility rate, total (births per woman)	government expenditure on education, total (% of GDP)	fertility rate, total (births per woman)	government expenditure on education, total (% of GDP)	fertility rate, total (births per woman)	government expenditure on education, total (% of GDP)
2009	1,4	4,99	1,51	4,15	1,44	4,01
2010	1,41	5,11	1,51	4,03	1,43	4,04
2011	1,33	4,86	1,43	4,24	1,45	3,90
2012	1,33	4,86	1,45	4,22	1,34	3,86
2013	1,29	5,02	1,46	4,05	1,34	4,07
2014	1,32	4,97	1,53	3,97	1,37	4,22
2015	1,32	4,82	1,57	5,75	1,4	4,58
2016	1,39	4,66	1,63	5,55	1,48	3,90
2017	1,48	4,57	1,69	3,81	1,52	3,93
2018	1,46	4,61	1,71	4,27	1,54	3,95
2019	1,44	4,68	1,71	4,54	1,57	4,27
2020	1,39	4,85	1,74	4,72	1,59	4,76
2021	1,33	4,67	1,83	4,80	1,63	4,80
Pearson Correlation Coefficients	-0,506		0,292		0,494	

Note. General government expenditure on education (current, capital, and transfers) is expressed as a percentage of GDP. It includes expenditures funded by transfers from international sources to the government.

Source: Authors' own research based on World Bank data.

In Poland, the Pearson correlation coefficient was -0.506, indicating a moderate negative relationship between public education expenditure and fertility. This means that despite relatively stable government education spending, fertility not only failed to increase but showed a downward trend. While this does not imply a direct causal relationship, it highlights a potential inverse association between these two variables. One possible interpretation is that greater public investment in education may be linked to broader socioeconomic changes, such as higher educational attainment (especially among women) and delayed family planning, both of which can contribute to lower fertility rates in Poland.

In the case of Czechia, a correlation of 0.292 was observed, indicating a weak but positive relationship between education spending and fertility levels. During the analyzed period, TFR showed a consistent upward trend despite moderate levels of education expenditure, which at times were even declining. This may suggest that in Czechia, the positive impact of education on fertility may have been indirect, for example, through building trust in institutions, better organization of childcare systems, or greater social awareness regarding the balance between professional and family life.

In Slovakia, the Pearson correlation coefficient was 0.494, indicating a moderate positive relationship between the analyzed variables. This implies that in this country, higher education spending coincided with an increase in fertility levels. It may suggest that greater investment in the education sector translated into improvements in institutional infrastructure and childcare conditions, which in turn encouraged decisions to have children.

Thus, the relationship between government spending on education and fertility levels varied across the analyzed countries. In Poland, a moderate negative correlation was observed, possibly indicating either an insufficient translation of educational expenditure into effective family support or a tendency among the more educated population to postpone family expansion in favor of career development. In contrast, Czechia and Slovakia exhibited positive correlations, which may reflect more effective use of educational resources within the context of family-oriented policies. These findings align with the article's objective by demonstrating that selected socio-economic indicators, such as education spending, can influence fertility levels, although not always directly, and that their effectiveness depends on the broader political and institutional context of each country.

Various forms of government social benefits, expressed through subsidies and other transfers, represent an important component of a country's social policy, which should also be reflected in the national fertility rate. Table 6 presents data on the TFR and subsidies and other transfers (as a percentage of total government expenditure) in Poland, Czechia, and the Slovak Republic for the period 2009-2022.

The analysis of the relationship between fertility rates and government social expenditures (expressed as a percentage of public expense) in Poland, Czechia, and Slovakia from 2009 to 2022 provides important insights in the context of the article's objective, which is to identify which socio-economic indicators are significantly associated with fertility levels. In the case of

Poland, the Pearson correlation coefficient was -0.276, indicating a weak negative relationship between the analyzed variables. This means that despite relatively stable and high levels of social spending (around 44-45%), no positive impact on fertility was observed, which, in fact, declined throughout most of the analyzed period. This may suggest that social policy in Poland was not sufficiently targeted at supporting families with children or did not adequately address their actual needs.

In Czechia, a positive correlation of 0.548 was recorded, indicating a moderate positive relationship between social spending and fertility. During the analyzed period, fertility clearly increased, while public expenditures on social purposes also gradually rose. This may indicate that the Czech social protection system was effectively linked with family support mechanisms, which translated into reproductive decisions within the population. Citizens' trust in the system and a coherent family policy may have further reinforced this effect.

Table 6.

Relationship Between Fertility Rate and Subsidies and other transfers (% of expense) in Poland, Czechia, and the Slovak Republic (2009-2022), Including Pearson Correlation Coefficients

Year	Poland		Czechia		Slovak Republic	
	fertility rate, total (births per woman)	subsidies and other transfers (% of expense)	fertility rate, total (births per woman)	subsidies and other transfers (% of expense)	fertility rate, total (births per woman)	subsidies and other transfers (% of expense)
2009	1,4	44,55	1,51	46,76	1,44	48,59
2010	1,41	44,38	1,51	46,85	1,43	50,99
2011	1,33	44,23	1,43	48,53	1,45	49,36
2012	1,33	44,50	1,45	48,55	1,34	50,09
2013	1,29	45,12	1,46	51,67	1,34	50,13
2014	1,32	45,63	1,53	50,94	1,37	49,64
2015	1,32	45,57	1,57	50,90	1,4	47,60
2016	1,39	44,66	1,63	51,13	1,48	48,79
2017	1,48	44,12	1,69	51,01	1,52	47,26
2018	1,46	44,49	1,71	50,26	1,54	45,74
2019	1,44	44,63	1,71	50,29	1,57	45,30
2020	1,39	47,15	1,74	51,34	1,59	44,37
2021	1,33	44,89	1,83	51,59	1,63	44,82
2022	1,29	44,90	1,64	50,52	1,57	46,45
Pearson Correlation Coefficients	-0,276		0,548		-0,884	

Note. Subsidies, grants, and other social benefits.

Source: Authors' own research based on World Bank data.

In Slovakia, by contrast, the correlation coefficient was -0.884, indicating a very strong negative relationship between social spending and fertility levels. The data suggest that despite a high level of social expenditures, fertility did not increase and instead showed a declining trend, especially in the first half of the analyzed period. This may imply that spending was not efficiently allocated to areas that directly affect family living conditions, such as childcare services, availability of nurseries, labor market flexibility, or direct child-rearing benefits.

Thus, the relationship between government social expenditures and fertility levels varied greatly by country. In Poland and Slovakia, the negative correlation may indicate the inefficacy of social policy in supporting reproductive decisions.

In contrast, in Czechia, the positive correlation suggests that a well-designed system of social spending can positively influence fertility. These findings support the article's premise that macroeconomic indicators alone are not sufficient to explain changes in fertility and that the quality of public policies and their adaptation to the local institutional and social context play a crucial role.

5. Summary

The bibliometric analysis conducted as part of this study clearly demonstrates a geographical imbalance in fertility-related research across Europe. While Western and Northern European countries dominate the academic discourse on fertility, Central European nations, particularly Poland, Czechia, and the Slovak Republic, remain largely underexplored. This is especially surprising given the pronounced demographic challenges these countries face, including some of the lowest fertility rates in the European Union.

Although Czechia appears more frequently in the academic literature compared to its regional neighbors, the overall scarcity of comparative, policy-oriented studies focused specifically on Central Europe limits the ability of scholars and policymakers to understand the region's unique socio-economic and institutional dynamics. Accordingly, this study contributes to filling a significant gap in the literature by providing an in-depth, evidence-based analysis of fertility trends in these three countries—an area of growing importance for demographic research and public policy alike.

A comprehensive review of the literature, along with an analysis of empirical data, underscores the critical importance of addressing the issue of low fertility in Central European countries. The findings of this article confirm that fertility in selected countries of Central Europe is shaped by a complex interplay of socio-economic factors rather than by any single economic indicator. Across Poland, Czechia, and Slovakia, no statistically significant correlation was found between GDP growth and fertility levels, suggesting that macroeconomic expansion alone does not translate into higher reproductive rates. The labor market, however, showed a much stronger association, particularly in Slovakia, where the inverse correlation between unemployment and fertility was the most pronounced. Similarly, Czechia also demonstrated a significant negative correlation between unemployment and TFR, highlighting the role of employment stability.

Inflation had a discouraging effect on fertility in Poland, but this relationship was weak or inconsistent in Czechia and Slovakia. Government expenditure on education showed the most favorable correlation with fertility in Slovakia, indicating the potential impact of institutional investments. In contrast, in Poland, educational spending correlated negatively with fertility, revealing possible inefficiencies in translating public investment into family support outcomes. This means that despite relatively stable education spending, fertility not only failed to increase but showed a downward trend. While this does not imply a direct causal relationship, it highlights a potential inverse association between these two variables. One possible interpretation is that greater investment in education may be linked to broader socioeconomic changes, such as higher educational attainment (especially among women) and delayed family planning, both of which can contribute to lower fertility rates in Poland. These findings underscore the importance of further investigation into the complex interactions between educational investment, social behavior, and demographic trends.

Regarding social spending, Czechia again showed a moderate positive correlation, while Slovakia revealed a strongly negative one, pointing to structural mismatches in how resources were allocated.

Overall, the most meaningful associations with fertility were observed in Czechia, where both social and labor market indicators aligned with rising fertility rates. This suggests that a consistent and coherent family policy embedded in a stable institutional environment is more influential in shaping reproductive behavior than purely economic growth metrics.

The analysis demonstrates that low fertility levels cannot be fully accounted for by economic factors alone. While economic conditions undoubtedly play a role, their influence varies significantly across countries and does not appear to be the primary determinant. The divergent patterns observed suggest that fertility outcomes result from a broader constellation of influences, including institutional settings, social trust, and cultural norms. These findings imply that economic incentives and constraints, though important, are insufficient on their own to shape reproductive behavior. Therefore, effective policy responses must consider the multifaceted nature of fertility determinants beyond purely economic dimensions.

An important practical implication of this study is that economic indicators exhibited divergent effects on fertility levels across different countries. This highlights the need for a more nuanced and in-depth examination of the economic determinants of fertility.

Another key implication for fiscal policy is the recognition that purely economic instruments are insufficient to stimulate higher fertility. This underscores the growing importance of modern public policy to anticipate potential demographic challenges and risks and to design proactive economic measures aimed at mitigating their long-term impact.

The analysis shows that family policies based solely on financial transfers have a limited and short-term effect on increasing fertility. The most effective measures combine financial support with access to childcare services, labour market flexibility, and affordable housing.

Country-specific differences were also observed—Czechia and Slovakia seem to achieve relatively better outcomes, potentially due to the more comprehensive nature of their interventions. These findings highlight the importance of integrated, long-term family policy strategies tailored to national socio-economic contexts.

Thus, the findings of this study have led the authors to identify several directions for further research:

1. Expanding the analysis through a PEST framework to examine the issue of low fertility in Central European countries, particularly Poland, which has the lowest fertility rate among the countries studied.
2. Investigating the risks associated with persistently low fertility in Central Europe and exploring strategies for mitigating these risks through appropriate economic mechanisms.

However, it is important to acknowledge that this study focused exclusively on selected macroeconomic indicators and employed only the Pearson correlation coefficient to assess statistical relationships. While this approach provides initial insights into potential associations, it does not capture non-linear dynamics, lag effects, or the influence of cultural, political, or institutional factors. Further research using multivariate models and broader socio-demographic data is needed to fully understand the complexity of fertility trends in Central Europe. These limitations should be taken into account when interpreting the results and formulating policy recommendations.

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