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Brief communication

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Short-term impact of the COVID-19 pandemic on age-specific fertility rates in Poland

Abstract

The article examines the short-term impact of the COVID-19 pandemic on monthly age-specific fertility rates in Poland using data for the period 1995–2022. The pandemic unfolded against the backdrop of a long-term decline in fertility and coincided with additional sources of social and economic instability – including the tightening of abortion law, rising inflation and the escalation of the war in Ukraine – all of which may have further shaped reproductive

decisions. The analysis employs monthly birth data by mother's age combined with interpolated female population counts, and applies the TRAMO-SEATS procedure and SARIMA models to estimate long-term trends and generate projections for the pandemic and immediate post-pandemic years. These projections are then compared with the observed values.
The findings indicate that the actual number of births in 2020–2022 fell markedly below the projections derived from pre-pandemic trends. The largest discrepancies occur among women aged 35–39 and 40–44, suggesting that the pandemic particularly intensified postponement in age groups facing narrower reproductive windows. Although fertility among women aged 30–39 had been rising gradually over the previous decades, these increases were insufficient to offset declines among younger cohorts. The forecasts for 2023–2024 also slightly overestimate births, pointing to a continuation of persistently low fertility.
The study highlights that COVID-19 affected fertility both directly – through lockdown measures, infection risks, and disruptions to medical services – and indirectly, by amplifying economic and psychological uncertainty. At the same time, the observed declines may signal a deeper demographic shift driven by the shrinking number of women of reproductive age and evolving attitudes toward childbearing among younger generations. The authors argue that further research is needed to address the issues of forecast stability and to disentangle the overlapping macro-level factors contributing to Poland's ongoing fertility decline.

Keywords: fertility, COVID-19 pandemics, time series analysis, fertility forecast, fertility trends, SARIMA, TRAMO-SEATS

Introduction

Since 2019, the number of births registered in Poland has declined sharply. This short-term trend was preceded by a long-term decline in fertility begun in 1989. After a short period of stabilisation in 2017–2019 at the level of 1.45, the total fertility rate (TFR) in Poland dropped to 1.39 in 2020, to 1.33 in 2021 and to 1.26 in 2022.[1] Data for 2023 show that 272,000 children were born in that year, which is approximately 33,000 less than in 2022.[2] This record-low number of births will presumably translate into the TFR in Poland being even lower in 2023 and 2024 than in 2022.

According to a recent projection of the resident population of Poland by the Statistics Poland, this downward trend will continue, with the number of children

[1] Demographic situation of Poland up to 2022. [Sytuacja demograficzna Polski do roku 2022], https://stat.gov.pl/obszary-tematyczne/ludnosc/ludnosc/sytuacja-demograficzna-polski-do-roku-2022,40,3.html (accessed: 31.01.2024)

[2] Socio-economic situation of the country. [Sytuacja społeczno-gospodarcza kraju w 2023 r.], https://stat.gov.pl/obszary-tematyczne/inne-opracowania/informacje-o-sytuacji-spoleczno-gospodarczej/sytuacja-spoleczno-gospodarcza-kraju-w-2023-r-,1,140.html (accessed 31 January 2024)

born annually staying well below 300,000 up to 2060.[3] These current and projected fertility rates result from long-term trends. However, recent events such as the COVID-19 pandemic and the war in Ukraine, combined with the country's internal political and economic situation, may additionally reduce the number of registered births in Poland.

The paper aims to assess the effect of the COVID-19 pandemic on the observed fertility rates in Poland using monthly time series data by age of the mother. We assume that the pandemic initiated a series of events that might ultimately lead to additional decreases in fertility rates going beyond the values resulting from the long-term declining trend observed in Poland. Although we use the onset of the pandemic in Poland to mark the beginning of these changes, we are aware that the abovementioned events, related to the political, economic and international situations, might also contribute to the declining number of births. Furthermore, the presented analyses do not claim to identify any causal relationship between fertility rates and the pandemic. Instead, we examine to what extent the experience of the pandemic altered the long-term trend in fertility rates by changing the environment and the context of individual decision-making processes related to childbearing.

The impact of short-term shocks such as changes in economic or epidemiologic conditions on reproductive outcomes on a population level is well documented and studied. There is, for example, research on the impact of the Spanish Flu on fertility in the years 1918–1920 (Boberg-Fazlic et al., 2021). It has also been shown that the total fertility rate in the US dropped during the Great Depression, from 2.5 in 1929 to 2.2 in 1939 (Comolli, 2017). The effects of more recent economic shocks in 2008 in Europe and US were studied by Sobotka or Matysiak (Sobotka et al., 2011; Matysiak et al., 2021). These studies showed that the uncertainty induced by economic or epidemiologic instability may have different effects on people's fertility depending on their age, educational attainment, type of residence and other factors. During most of these crises, the fertility of women with lower levels of education remained stable, whereas women with higher levels of education tended to postpone their reproductive decisions. The postponement effect was particularly strong among childless women in Europe, except for some Nordic countries (Jalovaara et al., 2019). These results highlight the importance of studying the effects of changes in social, economic and epidemiologic conditions on fertility outcomes, especially with respect to age. Therefore, in the presented analysis, we assess the impact of the COVID-19 pandemic on women's fertility by age group.

[3] Projection of residing population for the years 2023–2060. [Prognoza ludności rezydującej na lata 2023–2060], https://stat.gov.pl/obszary-tematyczne/ludnosc/prognoza-ludnosci/prognoza-ludnosci-rezydujacej-dla-polski-na-lata-2023-2060-poziom-powiaty,12,1.html (accessed: 6.01.2024)

The COVID-19 pandemic was a global crisis that influenced many demographic outcomes, including reproductive behaviour. During the pandemic and shortly after it, many scholars were already analysing its effects on reproductive outcomes (Qu 2021; Luppi, Arpino, Rosina 2022; Emery, Koops 2022; Aassve et al., 2020; Aassve et al., 2021; Pomar et al., 2022; Sobotka et al., 2023; Du et al., 2023). These studies mainly used time series analysis of monthly fertility rates to account for any irregularities in and deviations from the observed long-term trends. Most of these studies found that the pandemic coincided with a significant decrease in monthly fertility rates. The estimated effect of the pandemic on monthly fertility rates varied from very strong (−14%, as estimated by Pomar et al., 2022) to moderate (between –5% and –11%, as estimated by Aassve et al., 2021). Some studies showed that the pandemic had an ambiguous effect on fertility rates, with an initial decrease being followed by an increase (Sobotka et al., 2023; Du et. al., 2023).

The negative effects of the COVID-19 pandemic on fertility are mainly associated with increasing social and economic uncertainty, changes in work-life balance (due to forced remote work) and anticipated limitations in access to health care and assisted reproductive technologies (Aassve et al., 2020; Bujard, Andersson, 2024). While all of these factors may have led individuals to reduce their reproductive intentions and to further postpone their decisions concerning reproduction, they are of a rather hypothetical nature, since there are very few studies on individual fertility plans and motivations during the pandemic.

Only a few survey studies investigated the impact of the pandemic on fertility intentions, including those by Mynarska (2021) and Raybould (2023). These studies showed that a substantial share of surveyed individuals postponed or altered their fertility intentions because of the COVID-19 pandemic. As these authors pointed out, the main factors affecting postponement decisions were related to a lowered sense of financial security and inferior mental well-being during the pandemic. Moreover, in a qualitative study, the surveyed women expressed fear of giving birth alone in a hospital due to a stricter sanitary regime during the pandemic. Similar results were reported in an international comparative study carried out by Luppi (2020).

Finally, the delayed impact of the COVID-19 pandemic on the human reproductive system and reproductive health must be considered when discussing changes in observed fertility rates. Some studies found that COVID-19 infections might have severe long-term effects on both male and female reproductive health, which could lead to a lower number of children being born (Madaan et al., 2022; D'Ippolito et al., 2022).

The present study aims to contribute to the existing body of literature by analysing the effect of the COVID-19 pandemic on monthly age-specific fertility rates in Poland.

Based on the existing literature and analyses on this topic, we formulate the hypothesis that the pandemic led to a significant decrease in monthly fertility to a level far below the long-term trend. Moreover, we expect to observe that the effects of the pandemic on women's fertility outcomes differed across age groups. Thus, women in some age groups may have been more sensitive to the instability caused by pandemic, and therefore experienced more severe declines in fertility. While hypothesising about the relationship between the COVID-19 pandemic and the observed fertility rates, we are aware that in the case of Poland there are other factors that could affect individual decisions concerning childbirth, such as the enforcement of the law further restricting access to abortion (October 2020), the rising inflation rate (mid 2021) and the escalation of the military conflict in Ukraine (February 2022). These factors may have contributed to increasing levels of social and economic instability and uncertainty, which may, in turn, have led to further declines in the number of births to levels far below those resulting from the long-term fertility trends in Poland.

Data and methods

The analysis is based on monthly age-specific fertility rates covering the 1995–2022 period. We deliberately chose 1995 as the starting point of our time series because we wanted to exclude fertility changes resulting from the social and economic transformation of 1989. The TFR in Poland dropped from 2.33 in 1985 to 1.62 in 1995. The declining trend observed after 1995 was much more stable, even considering some temporal increases in the TFR. Thus, in our opinion, the proposed span of the time series is free of any distortions caused by the early stages of the social and economic transformation in Poland.

Monthly live births by age of the mother are calculated using data on registered births obtained from the Statistics Poland. The data on the female population by age were downloaded from the website of Statistics Poland. It must be noted that the data on live births registered in Poland include all live births delivered by mothers, regardless of their nationality or country of origin. Therefore, the data also include births to Ukrainian women who escaped to Poland after the escalation of the military conflict. For instance, in 2022, 5.5% of births in Poland were to mothers of non-Polish citizenship (16,711 children). Of these births, 82% were to women of the Ukrainian citizenship (13,738 children).

The most up-to-date analyses of the relationship between the pandemic and fertility were performed on age-aggregated indicators. Analyses based on aggregated fertility indicators might be misleading, mostly due to the large differences in the

reproductive decisions and intentions of women at different ages. Hence, our analysis is performed for births broken down by age group (15–19, 20–24, 25–29, 30–34, 35–39, 40–44 and 45–49), based on data retrieved from yearly databases of registered births for the 1995–2022 period. Over the analysed period, we notice substantial changes in the age structure of the women giving birth, in particular a decrease in the number of women giving birth in the youngest age categories. This population dynamics has a clear effect on the absolute (number of births) and the relative (rates) fertility measures. It should be noted that all period measures of fertility are sensitive to shifts in reproductive calendars. Therefore, the observed period measures of fertility are usually underestimated as a result of fertility postponement and the mean age at childbearing (Bongaarts, Feeney, 1998; Kohler, Ortega, 2022; Ortega, Kohler, 2002). These structural changes over the analysed period are responsible for a considerable share of the observed decrease in fertility among Polish women.

In our analyses, we use monthly data on live births and yearly data on the female population interpolated linearly to monthly values for all age groups of mothers. We compute partial fertility rates for age groups in a monthly format (converted to 30-day months to get rid of the calendar effects). Using monthly data on live births and monthly data on the female population of Poland, we calculate the fertility rates; i.e. for a given age, we calculate the ratio of the children born alive to women of that age during selected years.

In a time series analysis of monthly data on birth rates, it is important to keep in mind the lagged effect of external factors on observed values. The effect of the pandemic on mortality is immediate (causing death), whereas in the case of births, we can additionally assume that the pandemic (aside from potentially causing the death of a mother or a child) might influence individual reproductive decisions with results that manifest later. Thus, the causal relationship between the pandemic and the observed birth rates is much more subtle and ambiguous than the relationship between the pandemic and the mortality rates. Individual reproductive decisions were influenced not only by the spread of virus, but also by the reactions of the government and public institutions, with both affecting the individual sense of security. In addition, the rules during lockdowns restricted social contacts between younger people and kept married couples at home.

For the proper assessment of the pandemic effects on the observed monthly fertility rates, the cut-off point selection process is crucial. In the study by Sobotka (2023) – which is by far the most comprehensive study of the effects of the COVID-19 pandemic on fertility rates – researchers chose November–December 2020 as the cut-off point, based on assumption that since the onset of the pandemic was in early March 2020, the pandemic could begin affecting births in November 2020, with the

full effects occurring in December 2022 (assuming the average gestation length is close to nine months from ovulation to delivery). The first case of COVID-19 in Poland was confirmed by the Ministry of Health on 4 March 2020. Hence, in our analysis, we treat the years up to the end of 2019 as the period before the pandemic. Therefore, we first build the models based on data for 1995–2019 with projections for 2020 and 2021, and then build the models for 1995–2020 with projections for 2021 and 2022.

As the method of analyses, we apply the TRAMO-SEATS technique to each set of age-specific fertility rates. This method results in the decomposition of time series into a main trend (trend cycle), a seasonal component, and an irregular component, and allows for projection. We built projections of fertility rates for the 2020–2021 horizon based on data up to the end of 2019, and for the 2021–2022 horizon based on data up to the end of 2020. The next step is the computation of a projection of live births and a comparison of the projection to the actual data.

The TRAMO-SEATS method implemented in the DEMETRA software allows for a choice of SARIMA (Seasonal Autoregressive Integrated Moving Average) models based on several verification tools. We aim for optimal specifications, namely a smooth trend-cycle component, regular seasonality, and error series close to white noise. DEMETRA suggests a specification of the model, but in many cases we apply fine-tuning to improve its quality.

We apply standard notation: namely $SARIMA(p,i,q)(bp,bi,bq)_{12}$ denotes a model built for i-th difference of the series, bi-th seasonal difference, with autoregressive part of order p, moving average part of order q, and seasonal AR part of order bp, seasonal moving average of order bq. The general formula of Box-Jenkins type of model is:

$$A(L)\Delta y_t = \alpha_0 + B(L)\varepsilon_t$$

for the ARIMA model, and

$$\Psi(L_{12})A(L)\Delta_{12}\Delta y_t = \alpha_0 + \Theta(L_{12})B(L)\varepsilon_t$$

for the SARIMA model, where L, L_{12} denote lag operators $Ly_t = y_{t-1}, L_{12}y_t = y_{t-12}$, and Δ, Δ_{12} denote differences: $\Delta_{12}y_t = y_t - y_{t-12} = (1 - L_{12})y_t$. For our computations DEMETRA 1.0.3.229 is used, along with Gretl, for the introductory choice of model as well as for the projections. DEMETRA allows for outlier detection, decomposition of a series into a trend, and seasonal and irregular components; and then for diagnostics, including visual spectral analysis of residuals, tests for normality and independence and nonparametric tests for stable seasonality.

Results

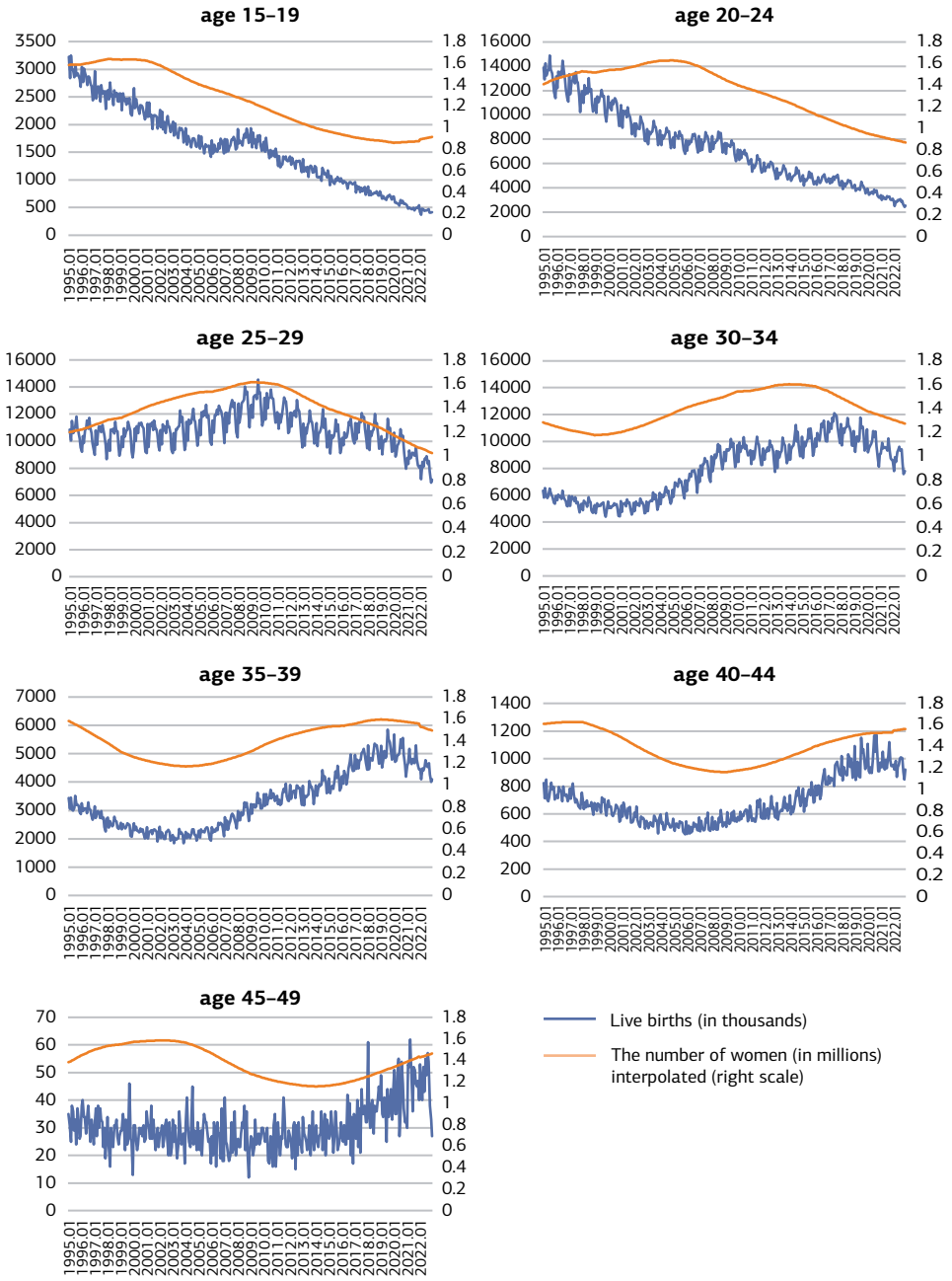
The presented age-specific analyses allow for the decomposition of the overall changes in the aggregated fertility measures into the contributions of selected age groups. Changes in fertility rates in contemporary societies are mostly based on changes in the quantum effect (fewer children born, especially for higher parities) and the tempo effect (postponement of the attributed main changes). Neither quantum nor tempo changes are evenly distributed across age groups of women. Some groups of women contribute more to the aggregated fertility measures because they make up a larger share of the overall population, or because of shifts in preferences regarding the age at first birth. Our descriptive analyses of the data indicate that such shifts occurred. As shown in Figure 1, there is a definitive shift over the analysed period towards older ages at birth and a systematic decline in the number of females. Both factors seem to contribute, from a structural point of view, to the decline in the observed fertility rates. There are fewer and fewer women over time, and with every consecutive year, a smaller fraction of these women give birth. Figure 1 shows that the dynamics of the number of women as well as of the number of children born differ substantially by age group. This indicates the correctness of our method, while also demonstrating why different models were selected for modelling individual series and calculating projections, as shown in Table 1.

Table 1. Optimal prognostic models for different age groups

	Model I (for projection I)	Model II (for projection II)
Age group 15–19	SARIMA$(0,1,1)(0,1,1)_{12}$	SARIMA$(0,1,1)(0,1,1)_{12}$
Age group 20–24	SARIMA$(0,1,2)(0,1,1)_{12}$	SARIMA$(2,1,1)(0,1,1)_{12}$
Age group 25–29	SARIMA$(1,1,1)(1,0,1)_{12}$	SARIMA$(1,1,1)(1,0,1)_{12}$
Age group 30–34	SARIMA$(1,1,1)(0,1,1)_{12}$	SARIMA$(1,1,1)(0,1,1)_{12}$
Age group 35–39	SARIMA$(0,1,1)(0,1,1)_{12}$	SARIMA$(0,1,1)(0,1,1)_{12}$
Age group 40–44	SARIMA$(0,1,1)(0,1,1)_{12}$	SARIMA$(0,1,1)(0,1,1)_{12}$
Age group 45–49	ARIMA(1,1,3)	ARIMA(2,1,1)

Source: Authors' own work.

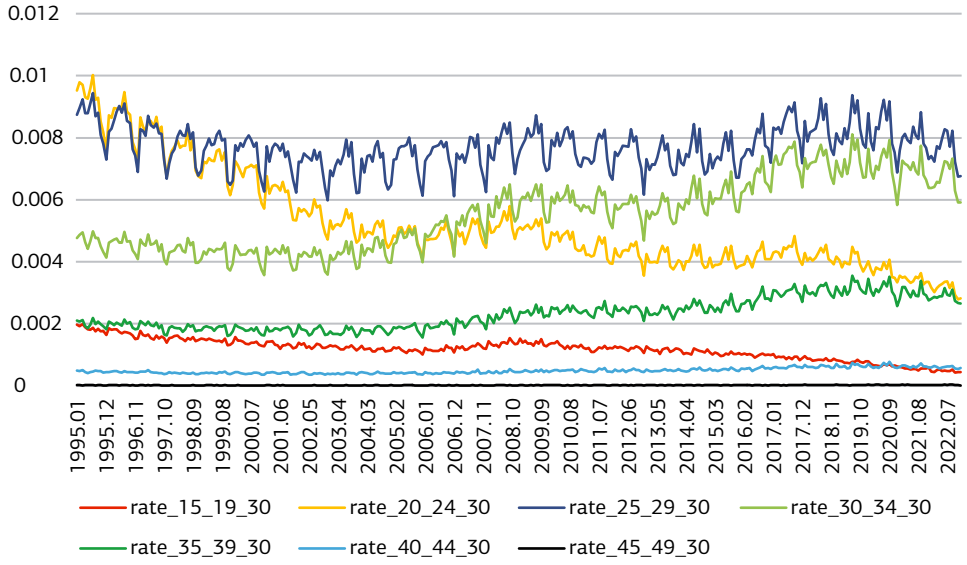
Figure 1. Monthly data on live births and the number of women by age in the 1995–2022 period



Source: Authors' own work.

Figure 2 shows the analysed series of the age-specific fertility rates per month in Poland from 1995 to 2022. The most spectacular reduction in the fertility rate in the entire study period (by almost two-thirds) concerns the group of women aged 20–24. The increase in the fertility rates of women aged 30–34 and 35–39 that was unfolding over a quarter of a century does not sufficiently compensate for this change, especially given that a gradual decline in the fertility rate in all age groups has been observed since 2017.

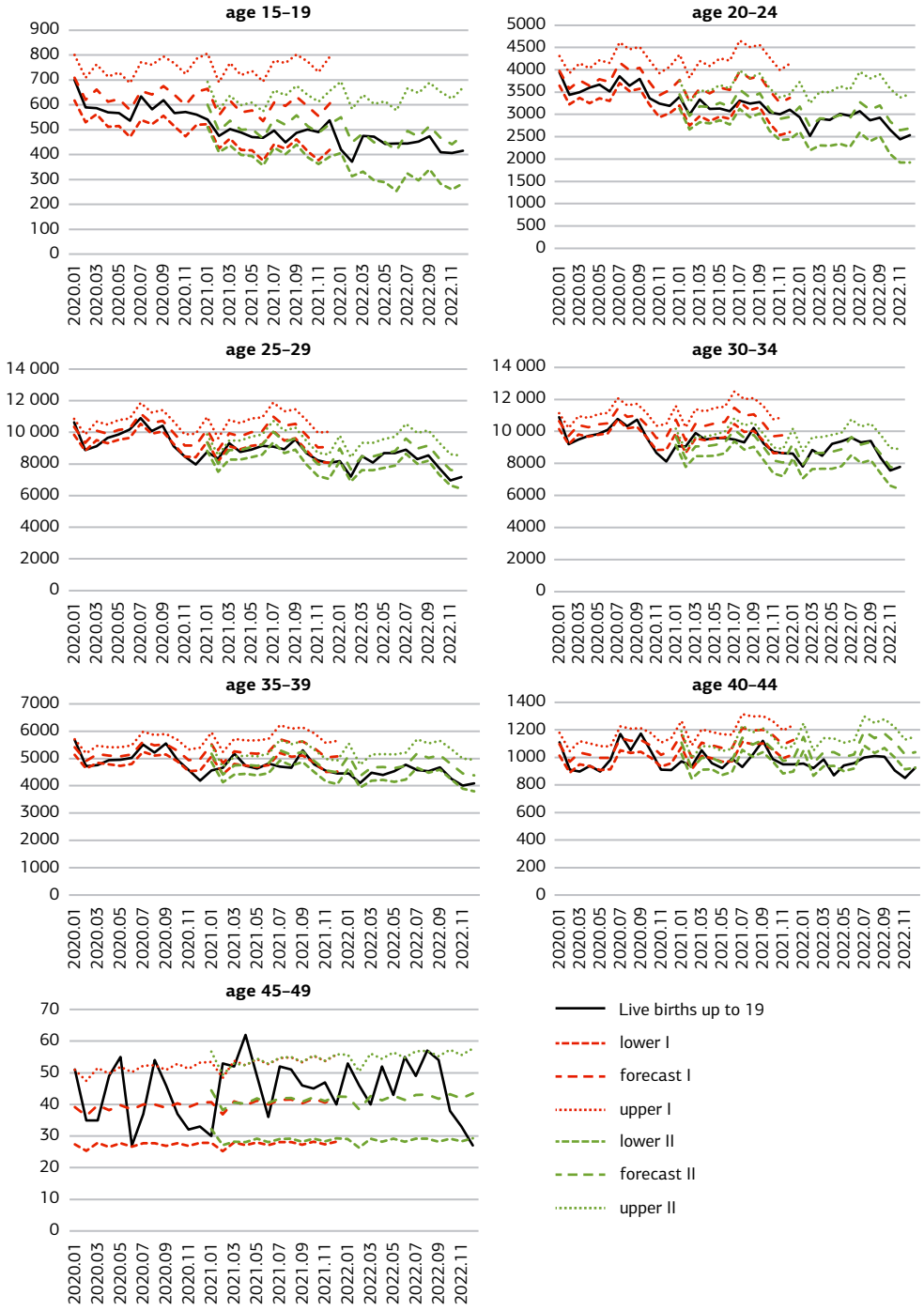
Figure 2. Age-specific fertility rates aligned to 30-day months



Source: Authors' own work.

Figure 3 shows the projection of live-born children for model I and model II, including data up to the end of 2019 and 2020, respectively, along with the upper and lower 95% confidence intervals. It is clear that projection II is more accurate than projection I. The latter projection, which is based on the data for the period up to the end of 2019 (model I), systematically overshoots the actual birth numbers in all age groups apart from the oldest one. For the youngest women (aged 15–19), the largest discrepancies between the projected and the actual numbers of babies born can be observed at the end of 2020 (about nine months after the first lockdown), the middle of 2021 and the turn of 2022.

Figure 3. Projection I and projection II compared to live births



Source: Authors' own work.

The most important results are for the 20–24, 25–29, 30–34 and 35–39 age groups as they contribute up to 94–95% of the total number of births. Within these four groups, projection II produced by model II is the most accurate for women aged 30–34 and the least accurate for women aged 35–39. For the 20–24, 25–29 and 35–39 age groups, the number of births in the second half of 2022 is below the projected value.

The reduction in the age-specific fertility rates, which may be attributed to the pandemic, is the most pronounced in the 35–39 and 40–44 age groups, in which the actual number of births is close to the lower end of the confidence interval for the projection and is often even outside this range. The number of babies born to women in the oldest group varies randomly, but the overall number hovers at around 40, which makes it possible to ignore problems with the accuracy of the predictions for this group. Another issue is the declining number of women in the most important age groups (20-39), which, combined with negative trends in fertility rates, means that an increase in the number of births cannot be expected in the coming years.

To sum up, our estimates based on projection I indicate that the total number of babies born in 2020 and 2021 is significantly higher than the actual values in 2020 and 2021 (19,300 more babies in 2020 and 40,600 more babies in 2021). Projection II for 2021 and 2022, which is based on a longer span of data that incorporate the data from 2020, is much closer to reality, but is also too optimistic (800 more babies in 2021 and 12,900 more babies in 2022), as shown in Table 2.

Table 2. The differences between the number of babies born and the projections of the number of births

	Number of babies born	Projection 1	Difference 1	In %	Projection 2	Difference 2	In %
2020	355 260	374 602	–19 342	–5.4%			
2021	331 469	372 089	–40 620	–12.3%	332 269	–800	–0.2%
2022	305 064				317 996	–12 932	–4.2%

Source: Authors' own work.

The decline in fertility rates since 2019 in Poland, which was further accelerated by the pandemic, the unstable economic and social situation and the war in Ukraine, appears to be a sign of a more persistent fertility crisis. The projections based on the samples ending in 2020 predict a reduced number of births (compared to projection I) not nly in 2021 but also in 2022 in all but the last age group, and the real values correspond to these projections. Based on the analysis, we conclude that the observed trends point to a seemingly permanent tendency for live births to decrease in the future. These findings are supported by the latest data published by Statistics

Poland, which shows that the number of births registered in 2023 in Poland dropped by around 33,000 to 272,000, which is the lowest value recorded after 1945.

We apply a similar method to obtain projections of the numbers of babies born to mothers in the different age groups in each month of 2023 and 2024 based on the data up to the end of 2022. First, the SARIMA specification is chosen on the basis of the Arimax package in Gretl. Next, the appropriate forecast for the 24 months of the years 2023 and 2024 is calculated based on the TRAMO-SEATS method, which is also applied in the Gretl package. These calculations are made with the use of fertility coefficients for 30-day months. To compute the expected numbers of babies born, we need the expected numbers of mothers in particular age groups. As these data are not currently available, we use a linear extrapolation of the previous series for the 15–19, 40–44, and 45 and over age groups, and for the more important age groups from 20 to 39, we apply the approximation based on the number of women five years younger from the earlier years, multiplied by the appropriate fraction corresponding to the change in the number of women over time observed in the analysed series.

Table 3. Projection of the number of babies born for 2023 and 2024

Live births	15–19	20–24	25–29	30–34	35–39	40–44	45+	TOTAL
2019	8242	47 792	121 881	123 784	61 004	11 747	457	374 907
2020	7080	42 754	115 366	117 498	60 082	11 989	491	355 260
2021	5906	38 054	105 800	112 339	57 027	11 780	563	331 469
2022	5228	33 721	97 018	104 356	52 874	11 320	547	305 064
2023	**4269**	**30 307**	**91 179**	**94 258**	**50 297**	**11 476**	**515**	**282 302**
2024	**3402**	**27 391**	**86 662**	**89 168**	**44 605**	**11 786**	**496**	**263 508**

Source: Authors' own work.

The resulting estimates of 282,302 babies born in 2023 (less than 4% above the true value of 272,000 recently announced by Statistics Poland) and 263,508 babies born in 2024 are preliminary projections, influenced by the additional error of the approximation mentioned above. These values fit into a wider perspective of the recent fertility decline in Poland which started around the onset of the COVID-19 pandemic. The presented projections calculated with the use of long-term time series are still above the actual number of children born, which may be a sign of a more profound change in fertility in the coming years. That change can be attributed not only to individual attitudes towards childbearing, but also to structural effects related to the number of potential mothers aged 20–24 and 25–30 reaching historic lows and to the steady decrease in the number of women aged 30–39 in the coming years (Figure 1).

Conclusions

The actual fertility data and decisions of families are influenced not only by the COVID-19 pandemic, but also by other aforementioned factors. Among them are socio-political issues such as abortion law discussions; economic factors such as social transfers to families with children (500+), inflation and increased real estate prices; and the geopolitical situation related to the escalation of the war in Ukraine. While the impact of the COVID-19 pandemic on the fertility behaviour reflected in the data cannot be isolated from the influence of such factors, we believe that the pandemic had both a strong direct influence through, for example, lockdown measures and illness among women and children as well as an indirect influence via increased levels of uncertainty and instability.

The results confirm our assumption that there is a significant discrepancy between actual fertility and projections based on monthly time series data. Moreover, as shown in Table 3, actual fertility is well below the projected values, which might indicate that we are witnessing another wave of fertility decline in Poland. As was already mentioned, these changes cannot be solely attributed to the COVID-19 pandemic; other factors should also be considered such as the impact of geopolitical instability, rising inflation and poor housing conditions, as well as structural effects related to the diminishing number of females of reproductive age.

We must be aware, however, that the observed discrepancies between the actual and the projected fertility levels may result from a methodological problem related to time series analysis of monthly fertility data: that is, recursive prognosis stability. As was mentioned in the earlier parts of the paper, previous studies showed a great deal of instability in projections depending on the selected cut-off point. We speculate that this could also be a problem with the Polish data. The choice of the cut-off point may affect how close the projection is to the actual trend. We assume that the choice of a slightly more distant point improves the chances that the projection will align with the observed trend. We aim to address this issue in our future analyses of recursive stability performed on the present data.

Finally, our interpretation of the fertility decline associated with the COVID-19 pandemic may be problematic given that fertility changes of a more fundamental nature appear to be taking place in Poland. The decrease in the number of births observed in Poland since 2019 that led to the number of births falling below 300,000 in 2023 can be a sign of a persistent wave of low fertility due to generational changes in Polish society. Therefore, the deviation from the predicted trend based on data for the 1995–2022 period may also be attributed to structural changes at the societal

level. The history of low fertility rates since 1989 results in a decreasing share of young women in the population today, which has contributed to the sharp decrease in the number of births. The observed changes may also be of a qualitative nature. Those born around 2000 who are now entering adulthood may have a completely different approach to family formation and parenthood, which can result in stronger quantum and tempo effects in the years to come. Thus, the difficulties in assessing the impact of external factors on fertility rates might be due to the overlap of macro events such as the pandemic and, presumably, a new wave of fertility decline in Poland caused by quantitative and qualitative changes in the younger generations.

The COVID-19 pandemic significantly influenced fertility choices and reproductive behaviour by increasing social and economic uncertainty, disrupting access to healthcare, and altering work-life balance. Lockdowns, fear of infection and hospital restrictions made many couples postpone childbearing, particularly highly educated and childless women, amplifying the tempo effect of delayed parenthood. The pandemic psychological burden – decline in mental well-being, concern about financial security and fear of giving birth under restrictive sanitary regimes – further discouraged fertility intentions. In Poland, these factors coincided with already declining fertility rates, resulting in a sharper-than-expected drop in births in 2020–2022, especially among women aged 35–39, whose biological window for reproduction is narrower. While some studies observed a temporary rebound in births after the initial decline, evidence suggests that for many, reproductive plans were not simply delayed but reconsidered entirely, potentially leading to a more persistent reduction in fertility in the coming years

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