Fertility factors in Czechia according to the results of the 2011 census

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ABSTRACT

In the last quarter century, women's reproductive behaviour underwent a marked change in Czechia. The 2011 census showed a fall in cohort fertility below two children per woman by the end of her reproductive span. Factors behind changes in fertility, particularly from a cohort perspective, have not been sufficiently analyzed. The aim of this article is to determine the main factors influencing cohort fertility in Czechia. The main objective is to test the impact of the most frequently discussed factors of fertility at the individual level. The analysis is based on anonymised individual-level data from the 2011 Czech Population and Housing Census. We used the method of causal modelling to monitor the impact of various factors on cohort fertility. It was confirmed, that the key factor behind fertility levels was the marital status (married women are more likely to become mothers than single women). Other important factors included woman's income (a higher income raises the chance of remaining childless or having only one child) and achieved educational level (the level of childlessness increases as the level of education rises). Future fertility rates in Czechia will depend mainly on the extent to which university educated women will be capable to reconcile work and family life in order to fulfil their reproductive ambitions. By analysing the differences in cohort fertility among various population groups and identifying the factors that may affect fertility levels across these subpopulations, it is possible to gain a better understanding of the mechanisms behind changes of reproductive behaviour.

KEYWORDS

cohort fertility; fertility factors; Czechia; population census; logistic regression

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1. Introduction

The marked changes in reproductive behaviour seen among women in Czechia over the last twenty-five years have been attributed to economic transformation and value changes associated with the second demographic transition (e.g. Kučera and Fialová 1996; Fialová and Kučera 1997; Rychtaříková 2000; Rabušic 2001; Sobotka, Zeman and Kantorová 2003; Sobotka et al. 2008). In the early 1990s Czechia was witness to a dramatic fall in total fertility as a result of fertility postponement (Sobotka 2003, 2004a, 2004b) and diversifying reproductive behaviour (Kantorová 2004; Sobotka 2004a). The previous reproductive model was no longer compatible with the new conditions, and it was rapidly abandoned by cohorts of young women (born towards the end of the 1960s, see Sobotka et al. 2008; Šprocha 2014). Czechia (and former GDR, Hungary and Slovenia) was one of the former Eastern Bloc countries in which the response to the changing conditions brought about by the end of communism was quite fast (Sobotka 2003, 2004a, 2011). A relatively large amount of attention has been devoted to analysing the changes in reproductive behaviour in Czechia (e.g. Rychtaříková 2000, 2010; Sobotka, Zeman and Kantorová 2003; Sobotka et al. 2008), while less attention has been paid to the factors behind fertility, probably owing to difficulties in accessing the data and more complicated methodologies used to analyse them.

Since the knowledge of conditionalities behind the reproductive intentions of women and couples plays a key role for decision-making processes (e.g. for setting family policies), the main aim of this article is to test the impact of selected main factors (marital status, income and education) influencing cohort fertility in Czechia in connection with the following three basic hypotheses:

H1) A married woman is more likely than a single woman to become a mother at least once, and she is also more likely to give birth to more than two children.

H2) As the woman's income rises so too does the chance of her remaining childless or of having only one child.

H3) As education levels increase, the childless rate rises and the chance of having more than two children decreases.

2. Theoretical framework

There are discussed many types of factors of fertility in the literature. The extent to which they exert an influence depends on the population, the social and economic situation, historical traditions and the internal structure of the country's population, for example, economic activity, the position of women on the labour market, education, and so on (for Czechia see e.g. Klasen and Launov 2006; Kostelecký and Vobecká 2009; Šídlo 2008).

The last global financial crisis (2008–), which led among other things to a deterioration in the situation for young people on the labour market (European Commission 2013), has reignited discussion on fertility factors (particularly structural ones) (e.g. Sobotka et al. 2011; Goldstein et al. 2013) and has been accompanied by studies investigating the effects of insecurity on the labour market and employment (e.g. Pailhé and Solaz 2012; Matysiak and Vignoli 2013). Important characteristics include level of active *participation on the formal labour market* and its inherent character (full-time, part-time employment, and so forth). Given differences in traditional gender conceptions, these factors are also analysed from a gender perspective. The specific character of the country also plays a role, particularly in relation to the nature of the labour market, social and family policies, dichotomous perceptions on the status of men and women in society and on the labour market, and so on. Over time these shape a country's long-term historical and political development (Lundström and Andersson 2012). Economic activity and the labour market are closely connected to *income levels*, which are another important factor in explaining the variables behind fertility. Economic theory holds that higher incomes lead to an increasing concern for the quality of children's lives as against the quantity of children (Becker 1960). Alongside gendered aspects of the labour market and family environment, income levels may lead to differences in fertility levels. Higher incomes have two different effects. They increase the demand for children and hence may positively influence fertility (the income effect). But they can also increase the cost of time spent with children and so may negatively impact on fertility (the opportunity cost of having a child; Cette, Dromel and Méda 2007; Pailhé and Solaz 2012). The opposite effect may be seen in those on low incomes – demand falls (income is spent on essential items) and reproduction is postponed (income effect). On the other hand the cost of time spent with children falls (cost effect), which may have a positive impact on fertility. Here *state family and social policies* are important. The United Kingdom is a typical example of a country with a historically large difference in fertility levels in relation to income, which is then exacerbated by family (and social) policies targeted at low-income families (Sigle-Rushton 2009). In traditional breadwinner countries, the man is usually responsible for bringing in the majority of the family's income and so his position on the labour market will have a greater impact on fertility than that of the woman. The income effect will have a greater impact than the cost effect, and male employment is therefore positively associated with fertility (Pailhé and Solaz 2012). By contrast in societies where the man is seen as the breadwinner, female employment has a demonstrably negative effect on fertility levels

(for example, Italy; see Matysiak and Vignoli 2013). In these countries the absence of such policies is considered to be one of the reasons for lower fertility levels (Neels and De Wachter 2010). However, some studies of former Eastern Bloc countries (e.g. Matysiak and Vignoli 2013), which also experience problems owing to harmonisation of childcare and work, have not clearly identified *unemployment* as a negative factor in fertility. Czechia already had a high level of female employment under socialism (Kantorová 2004) in addition to intricate links between the labour market and family sphere (Ettlerová and Šťastná 2006); however, it has been confirmed that female employment has a negative impact on fertility levels and on the postponement of childbearing (Klasen and Launov 2006). Women in full-time work on open-ended contracts are less likely to have dependent children than women in part-time work (Kurtinová 2015).

In northern countries with high levels of gender equality, a woman's *income* correlates positively to fertility level, while her partner's income has less impact (Neyer 2009).The negative effect of insecurity on the labour market is associated with delayed reproduction in Sweden, as confirmed in research by Lundström and Andersson (2012).The situation in Belgium is similar, where unemployed women have a lower chance of entering into motherhood than working women. The difference is particularly evident in university educated women who tend to wait for better positions on the labour market (Neels and De Wachter 2010). According to research by Pailhé and Solaz (2012) the situation differs to some extent in France, where insecurity on the labour market does not have such a great effect on female fertility. However, there is still a tendency for women to postpone first order births because of insecure employment or short-term employment contracts. It is thought that generous family state benefits and high rates of unemployment benefit are behind the reduced impact of labour market insecurity on the timing of first order births and cohort fertility in France. Other research has also shown that the link between female unemployment and the timing and intensity of fertility is ambiguous. It has been demonstrated that in the former GDR, unemployment among women born after the fall of the Berlin Wall correlates positively to first order births, but male unemployment has no significant effect (Özcan, Mayer, Luedicke 2010). Data from the 2005 German "Gender and Generation Study" indicate that labour market insecurity among men living in the former GDR has a negative influence on childbearing intentions, but this relationship was not found among women (Berninger, Weib, Wagner 2011).In Italy couples where the woman does not work have a greater chance of having at least one child than those in which the woman is employed. Hence the traditional male breadwinner social model increases the chance of the woman becoming a mother (Santarelli 2011). A study by Kalwij (2010) attempted to obtain a more comprehensive view of the relationship between female employment and fertility in its investigation of 16 former Eastern Bloc countries. However, it did not succeed in finding any more substantial links either.

Position on the labour market and income level are closely linked to *educational attainment achieved*. In postmodern societies this is one of the main differentiating factors influencing reproductive behaviour. It links a series of factors that has direct and indirect impact on reproduction. They are length of study, differences in social and cultural capital, value orientations, and so forth. The direct impact education has on fertility and especially timing relates to *length of study*. Studying is generally seen as incompatible with establishing a family (Baizán, Aassve and Billari 2003; Blossfeld and Huinink 1991; Kravdal 1994). This has also been confirmed by some studies in Czechia (Kantorová 2004; Šťastná 2009). Extended education is seen to delay economic independence and thereby entry into adulthood (e.g. Kohler, Billari and Ortega 2002). This direct impact is then augmented by socioeconomic situation, values, preferences and post-study opportunities, which exert an influence on entry into motherhood because more highly educated women often try to gain stable employment, financial security or good housing etc. before establishing a family (Sobotka et al. 2008). Becker's (1960) classical economic theory holds that there is a link between higher education and higher income levels, and the associated higher opportunity costs of non-participation in the labour market. Hence the relationship between educational level and fertility rate is negative. It has a more significant impact in societies where the female/male roles are strongly differentiated and in areas where harmonising work and family roles is difficult (Liefbroer and Corijn 1999; Rychtaříková 2004). The economic theory of fertility posits that women with higher levels of education postpone fertility and childbearing (Brolcháin and Beaujouan 2012) because the opportunity costs are higher for women at the beginning of their career. The negative relationship between education level and fertility rate has been confirmed in Europe and Czechia by a number of studies (e.g. Kalwij 2010; Klasen and Launov 2006, Rychtaříková 2004). However, it does not hold everywhere because in Belgium, for instance, the income effect has a greater impact, and among the generations of women born after 1945 a positive relationship has been found between education level and cohort fertility (Neel a De Wachter 2010). Similarly a higher level of education is linked to a greater number of children among men (e.g. Pailhé and Solaz 2012; Lappegård and Rønsen 2013) because the lost opportunity costs are not as high for them (Bartus et al. 2013). However, this relationship cannot be considered to be universal either as a study in the Netherlands and Flanders in Belgium by Liefbroer and Corijn (1999) has shown.

In the majority of cases the effect of *marital status* on fertility rate has been interpreted as unambiguous. People living as married couples have a higher chance of giving birth to a larger number of children than those in unmarried couples (e. g. Pailhé and Solaz 2012, Neels and De Wachter 2010; Hoem, Jalovaara and Mureşan2013). The results of cohort fertility studies conducted in Czechia have also confirmed this over the long term (e.g. Chromková-Manea and Rabušic 2013).

3. Data and methodology

Anonymised individual-level data from the 2011 Population and Housing Census can be used to link information on the number of live births born to a woman with other characteristics. Causal modelling, specifically binary and multinomial logistic regression, was used to determine which factors affect cohort fertility levels.

Binary logistic regression was used for first model, and the dependent variable was a live birth – either the mother had thus far not given birth to a child or had given birth to at least one. The multinomial logistic regression used in second model made it possible to expand the dependent variable to include additional categories (0, 1, 2, 3 and 4 or more children). The reference category used in this model was two children. The data set consisted of women aged 45–49 and the independent variables were women's marital status (ref. married at least once), level of income (ref. high income) and educational attainment (ref. tertiary education).

The choice of independent variables was made to ensure the characteristics were relatively stable over time. Marital status was therefore aggregated into two categories – single, and married at least once (including married, divorced and widowed). Educational attainment can be considered a predominantly stable characteristic from age group 25–29 and up. Four basic education groups entered into the models: lower secondary or lower, secondary, upper secondary, tertiary.

The main categories of income level were aggregated into four categories: 'undetermined', low, middle and high income formed out of the ten main categories of employment on the basis of estimated median gross monthly income (see tab. 1). Category 'undetermined' consisted of economically inactive and unemployed seeking for their first job. Among economically inactive women are not working pensioners (including disabled pensioners), persons at home or other dependent persons and others with own source of livelihood. So this category is very heterogeneous and their income level as well as reproduction behaviour is hard to estimate.

The outcome of the binary logistic regression is the odds ratio (in table Exp (B)) of having at least one child versus having none for independent variable category in relation to the reference category, assuming that the values of the other independent variables do not change. The multinomial logistic regression shows the odds ratio of having a specific number of live births versus the reference number of children (two). The independent variables were entered into both types of logistical regression (using the enter method) and the interaction among the independent variables was not included in the model.

Tab. 1 Main classes of occupations by category of income and median gross monthly salary in 2011.

Main classes of occupations (CZ-ISCO-08)	Category by income	Median gross monthly salary (in CZK)
Armed Forces	higher income	24,123
Managers	higher income	39,966
Professionals	higher income	28,928
Technicians and associate professionals	higher income	25,486
Clerical support workers	middle income	20,554
Service and sales workers	low income	14,401
Skilled agricultural, forestry and fishery workers	low income	16,936
Crafts and related trades workers	middle income	20,335
Workers Plant and machine operators, and assemblers	middle income	20,130
Elementary occupations	low income	13,346

Data source: Statistická ročenka České republiky 2013.

The data set from the population census could have been taken as the basic set, however some women from the model were excluded on the grounds that they did not answered to some of the questions from which the indicator used in the model was derived. The proportion of women excluded from the model containing all the female age categories was 11.9%. In the five-year age categories analysed the proportion was between 11.4% and 16.5%, and declined as age increased.

Because of the number of women excluded from the model, the reliability and explanatory potential of the model was tested using several methods. The chi-square statistic and its significance level (Sig. of chi-square model) can be used to determine whether the independent variables significantly contribute to the model. This occurs when the null hypothesis that the regression coefficients take the value zero is refuted. Next the model is tested to calculate the proportion of variability explained by the dependent variable using independent variables. In binary logistic regression pseudo Nagelkerke R^2 is used, which corrects the Cox and Snell pseudo R^2 to the maximum value of one (Řeháková 2000). The final method used is the classification table and it evaluates the quality of the model. It involves classifying the binary dependent variable

into a four-field classification table according to the number of observed and predicted values. A high proportion of correctly classified variables on the main diagonal confirm the fit of the model.

In addition to evaluating the quality of the model, we also evaluated whether the categories of independent variables were significant for explaining the model. For this purpose the Wald test was used. If the null hypothesis, that the regression coefficient is null, is refuted (at 1% or 5% significance level), then the independent variables significantly contribute to explaining the dependent variable.

4. Changes in cohort fertility and a differentiated analysis of cohort fertility

Significant changes in fertility timing associated with postponed motherhood can be seen when looking at the female population structure in younger age according to number of children and therefore also in cohort fertility. A sharp fall is evident in the lower age category. While in 1991 a mother aged 20–24 had on average 0.71 children, ten years later this had fallen to 0.30 children per woman in this age group and in 2011 it was only 0.16 children. The differences were less marked among the older age groups because these had subsequently caught up on their postponed reproduction.

Given the very low fertility rate in the 40 and over age group, the level of cohort fertility can be considered to be almost completed. In 2001 the mean number of children per woman aged 40–44 was still more than two children (2.05), but by the last census, conducted in 2011, cohort fertility had fallen substantially below this level (to 1.87 children) (Figure 1).

Different generations of women lived out their reproduction spans in different eras, and these were

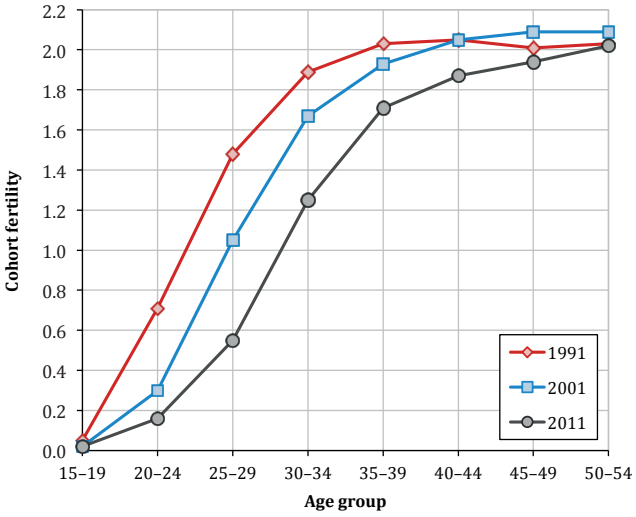

Fig. 1 Cohort fertility among women in 1991, 2001 and 2011.
Data source: Population and Housing Censuses 1991, 2001 and 2011.

subjected to a range of factors that affect completed fertility. These include economic, value, cultural and political determinants (Kurkin 2010). Completed fertility is a relatively stable indicator and so its values did not change dramatically.

Completed fertility among the generations born during the Second World War was around 2.05 children (Figure 2). The exception was the higher rate seen among the generations born in 1939 and 1940, most likely a result of the pro-population measures promised in 1963 and 1964, but that never in fact materialised.

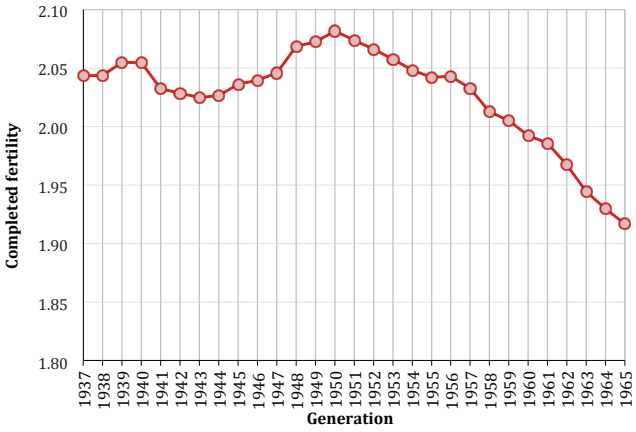

Fig. 2 Completed fertility by female generation in 2011.
Note: Mean number of children per woman who had an identified number of children for the female generations with completed reproduction in the Population and Housing Census 2011.
Data source: Population and Housing Census 2011.

Completed fertility among the generations of women born between 1945 and 1950 increased by 0.05 children per woman. This increase was a result of pro-population measures introduced in the 1970s, for example advantageous loans for newlyweds, better access to housing for families with children, higher child benefit (mainly for second and third order children), extended maternity leave and the introduction of parental benefits (Frejka 1980). The generations born from the 1950s and on experienced a decline in completed fertility as many of the pro-population measures ceased to be of value, and access to housing was still poor. The generations of women born in 1960 and later had fewer than two children on average.

The results of the 2011 Census confirm that in Czechia the two-child family model that was typical of the socialist era continues to dominate (Rychtaříková 2004). More than half of all women aged 35–39 to 70–74 had two children. Among the older age categories the two-child family model was more frequent, but because of the larger share of women with three or more children, the proportion falls to just under half – between 40 and 49%.

It is possible to calculate the parity progression ratios from the data generated from the census for women with completed reproduction. The results

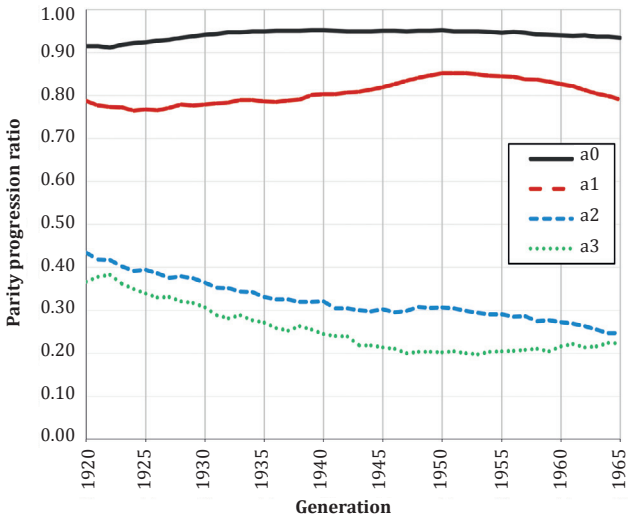

Fig. 3 Parity progression ratios by female generation in 2011.
Data source: Population and Housing Census 2011, authors' calculations.

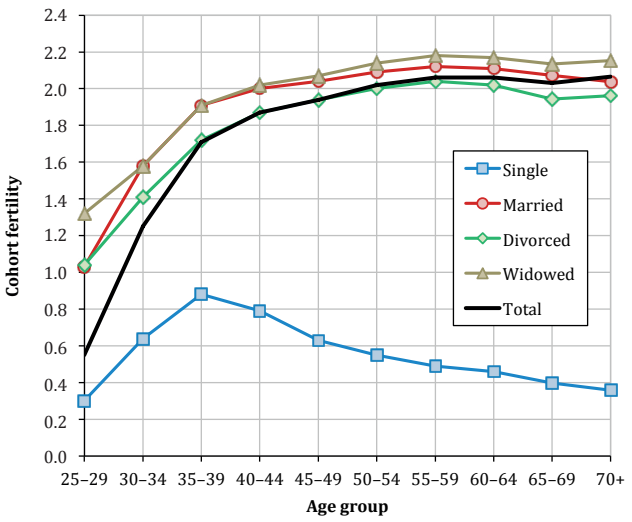

Fig. 4 Female cohort fertility by marital status and age group in 2011.
Data source: Population and Housing Census 2011.

indicate that childlessness among women born in Czechia between 1920–1985 was not common as for other countries from former West bloc (Rowland 1998). The probability of at least one child (a0) being born to women from the generations conceived between1920 and 1965 is always more than 0.90 (Figure 3), and around 0.95 among those born between 1932 and 1956.

The proportion of childless women has not risen substantially in the younger generations. The probability of having at least two children (a1) was always higher than 0.75, while the probability of having a third and fourth child (a2 and a3 respectively) fell substantially until the generation of women born in 1945, when it stabilised, and in the 1955 and subsequent generations the probability of having a third child fell, while the probability of having a fourth child grew slightly.

4.1 Cohort fertility by marital status

In Czech society entering into wedlock was traditionally linked to reproduction, and this is confirmed by the higher cohort fertility of at least one child among younger married woman (approximately under 40). It i s generally the case that married women achieved greater fertility and that this is particularly true of older widowed women. Divorce rates are highest among Czech women aged 30–39, and failed marriages may significantly affect women's reproduction plans, by shortening the timespan within which women are at greater risk of becoming pregnant, thus reducing completed fertility levels. Hence, fertility rates among divorced women are slightly lower in the post-reproductive age group (Figure 4).

Single women quite clearly have the lowest level of fertility. Interestingly, though, fertility levels among women aged 35–39 are substantially higher than among the older cohorts nearing or at the end of their reproductive lives. This is indirect evidence of the shift away from marriage and reproductions being strongly bound together, as a greater proportion of children are being born outside wedlock (almost 50% in 2015). Reproduction among single women is gradually becoming a feature of the increasingly diverse reproduction strategies and is no longer a marginal phenomenon.

4.2 Cohort fertility by educational attainment and main classes of occupations

The growing proportion of women with a upper secondary (with leaving certificate) and tertiary degree means that cohort fertility may tend to reflect the different intensity and character of reproductive behaviour of these sub-populations based on education attainment. Between 1991 and 2011, the number of women aged 25–49 with tertiary education rose from 208.1 thousand to 502.4 thousand (or from 6.0% to 13.1%).

The results of the 2011 Census show that female cohort fertility falls in almost all age groups as education levels rise (Figure 5). In the youngest group of women whose reproductive span ended between the ages of 45 to 49, cohort fertility among university educated women was 1.76 children per woman, while among women with lower secondary education or lower it was 25% higher at 2.22 children. Women with secondary without certificate were the only other group in this age category to have more than two children per woman. In the older age groups, the differences in cohort fertility between the most and least educated were more entrenched. Fertility in women aged 70 and over with lower secondary education or lower was one and a half times higher than among women with higher education. Attaining a higher education (particularly to degree level) was a privilege that distinguished groups of women through specific characteristics including lower levels of fertility.

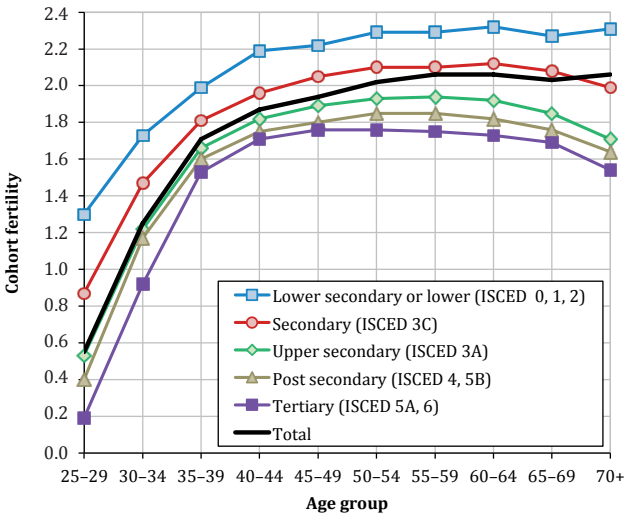

Fig. 5 Cohort fertility by educational attainment in 2011.
Note: Categories are based on ISCED-97.
Data source: Population and Housing Census 2011.

The differences in cohort fertility among women with incomplete reproduction are greater between the educated groups because they often manifest themselves in differences in the timing of childbearing. For instance in the 25–29 age group, cohort fertility among women with lower secondary education or lower was 1.30, while for the same age group of women with upper secondary level it was 0.53 and among female with tertiary education it was 0.19 children per woman.

The differences in female cohort fertility according to main classes of occupations were less marked than by levels of education. The lowest fertility levels in the youngest age group to have completed reproduction (45–49 years) were achieved by managers, professionals (e.g. lawyers, teachers, scientists, doctors, managers) and technicians and associate professionals (up to 1.85 children per woman). These are the first three main classes of occupations. By contrast elementary occupations (no. 9) and skilled agricultural workers (no. 6, Table 1) had rates high above the basic reproductive level (2.10 children per woman).

Women employed in the first three of the main classes of occupations had the lowest level of fertility even among the oldest age group, the 50+ category. By contrast those employed in categories 9 (elementary occupations) and 6 (*skilled agricultural workers*) had the highest fertility levels. The differences between the groups of women with lower and higher fertility levels increased in the older age groups. For example, in the 45–49 age group the highest level of fertility was 24% higher than the lowest, while among women aged 70 and over it was 45% higher.

Marked differences in cohort fertility by main classes of occupations were identified in the youngest age groups owing to differences in the timing of births. For instance, in the 25–29 age group cohort fertility among elementary occupations reached 0.71 children per woman, while among executives and managers it was 0.20 children.

Tab. 2 Cohort fertility by main classes of occupations in 2011.

Age group	1	2	3	4	5	6	7	8	9	88	99	Total
15–19	0.05	0.02	0.02	0.01	0.01	0.06	0.03	0.03	0.04	0.02	0.08	0.02
20–24	0.06	0.05	0.06	0.05	0.10	0.13	0.13	0.13	0.17	0.19	0.42	0.16
25–29	0.20	0.21	0.25	0.27	0.43	0.60	0.55	0.55	0.71	1.12	0.86	0.55
30–34	0.75	0.89	0.97	0.99	1.15	1.38	1.28	1.29	1.44	1.70	1.37	1.25
35–39	1.41	1.56	1.58	1.59	1.66	1.90	1.74	1.74	1.83	2.00	1.78	1.71
40–44	1.70	1.77	1.77	1.79	1.87	2.10	1.92	1.95	2.01	2.05	2.01	1.87
45–49	1.82	1.84	1.85	1.88	1.99	2.26	2.05	2.08	2.12	1.94	2.09	1.94
50–54	1.88	1.87	1.91	1.95	2.06	2.40	2.14	2.16	2.21	2.01	2.14	2.02
55–59	1.87	1.83	1.87	1.87	2.00	2.28	2.01	2.02	2.11	2.24	2.03	2.06
60–64	1.76	1.76	1.79	1.85	2.02	2.49	2.02	2.02	2.23	2.09	2.07	2.06
65–69	1.77	1.73	1.77	1.83	1.98	2.50	1.96	2.08	2.15	2.04	1.98	2.03
70+	1.85	1.61	1.71	1.84	1.92	2.34	1.99	1.89	2.08	2.07	1.93	2.06
Not identified	1.15	1.40	1.35	1.47	1.35	2.14	1.67	1.47	1.75	1.24	1.60	1.33
Total	1.41	1.34	1.40	1.28	1.47	1.93	1.64	1.66	1.90	1.69	1.56	1.58
No. of women in thousands	96	444	479	187	421	21	101	163	118	2 309	254	4 602

Note: Main classes of occupations (CZ-ISCO-08): 1 – Managers; 2 – Professionals; 3 – Technicians and associate professionals; 4 – Clerical support workers; 5 – Service and sales workers; 6 – Skilled agricultural, forestry and fishery workers; 7 – Craft and related trades workers; 8 – Plant and machine operators, and assemblers; 9 – Elementary occupations; 88 – Economically inactive and those seeking first work; 99 – Not identified. Armed forces occupations are not listed because the total number of service women aged 15 and over was around 2,000.
Data source: Population and Housing Census 2011.

4.3 Factors of cohort fertility

The significance level of the chi square in first model was zero, so the independent variables significantly contributed to explaining the dependent variable. Model 1 contributed to explaining variability at level 0.352. The proportion of dependent variable values correctly attributed in the classification table was more than 95%. According to the Wald test the categories of almost all the independent variables were significant at 1% significance level; only mothers on low and middle incomes did not contribute substantially to the model (see tab. 3).

Single women aged 45–49 had a 0.020 times lower chance of having at least one live birth than women married at least once (see tab. 3). The odds ratio of having at least one child is substantially higher for women on higher incomes than women whose main classes of income were 'undetermined'. On the other side, according to the Wald test category mothers on low income was no significant and category middle income was at 5% significance level. In this point of view, the income effect on completed fertility of women at the end of the reproductive span seems to be relatively small.

In model 1 women with secondary education had the highest odds ratio of having a child (1.814) compared to women with tertiary education. Women with an upper secondary school had slightly less chance (1.428), followed by women with the lowest education level.

Tab. 3 Binary logistic regression, number of live births, model 1.

Independent variable	Binary dependent variable at least one child vs. none Exp (B)
Marital status	
Single	0.020**
Married at least once	1
Income level	
Undetermined	0.500**
Low income	0.964
Middle income	0.934*
High income	1
Educational attainment	
Lower secondary or lower	1.322**
Secondary	1.814**
Upper secondary	1.428**
Tertiary education	1
Constant	26.806**
Tests	
Sig. Chi square of model	0.000
R^2 (Nagelkerke)	0.352
Classification table (in %)	95.3

Note:* at 5% significance level, ** at 1% significance level.
Date source: Population and Housing Census 2011, author's calculations using SPSS 16.0.

As in model 1, the independent variables in the multinomial logistic regression model significantly contributed to the model (significance level was zero). The proportion of explained variability was almost 0.2, which is lower than in model 1. In model 2 the proportion of correctly attributed dependent variables in the classification model was also lower (60.1%). The Wald test showed that some independent variables (upper secondary, middle income) did not contribute significantly in the model (to 1% of significance level) (see tab. 4).

The odds ratio of a single woman being childless or having one child as opposed to two children was substantially higher than among women married at least once (see tab. 4). The chance of having three rather than two children was higher among women married at least once, while the odds ratio of having four or more children versus reference two children was higher among single women.

Tab. 4 Multinomial logistic regression, number of live births, model 2.

Independent variables	Nominal dependent variable – number of children (ref. = 2 children)			
	0 vs. 2	1 vs. 2	3 vs. 2	4+ vs. 2
Marital status				
Single	137.929**	10.350**	0.822**	1.678**
Married at least once	1	1	1	1
Income level				
Undetermined	2.590**	1.461**	1.674**	3.888**
Low income	1.096**	1.042**	1.332**	1.674**
Middle income	1.074*	0.931**	1.273**	1.344**
High income	1	1	1	1
Educational attainment				
Lower secondary or lower	0.862**	0.759**	2.216**	4.488**
Secondary	0.496**	0.645**	1.353**	1.346**
Upper secondary	0.656**	0.833**	1.062**	0.990
Tertiary education	1	1	1	1
Tests				
Sig. chi square of model	0.000			
R^2 (Nagelkerke)	0.199			
Classification table (in %)	60.1			

Note: * to 5% of significance level, ** to 1% of significance level.
Data source: Population and Housing Census 2011, authors' calculations using SPSS 16.0.

Women whose main classes of occupations were 'undetermined' had the highest odds ratio of having three, four or more children as opposed to two than women in the other occupations categories. This was followed by women on low and middle incomes for whom the odds ratio was slightly lower, and this tended to be lowest among women on higher incomes. The

odds ratio of remaining childless as opposed to having the reference two children was higher among women whose main classes of occupations was 'undetermined'. In all cases the chance of having three or four or more children versus two fell among women with a higher level of education.

The chance of being childless or having one child as opposed to the reference two rose through the education levels starting from secondary school education to higher education. Women with lower secondary school education or lower were again the exception because they were more likely to be childless or have only one child compared to women with secondary or upper secondary education (see tab. 3).

5. Discussion

The study confirmed that marital status is a key factor in fertility in Czechia. In both models the variable was significant at the 5% significance level and women who had married at least once had a substantially greater chance of having a child than not. The chance of having a higher number of children (3 or 4+) as opposed to the reference two children was higher in case of three children and lower for four or more children. The effect of marital status of woman on fertility depends on the country context and on the prevalence of non-marital cohabitation (Kuhnt and Trappe 2013). While being married has only a modest positive effect on fertility in France (Toulemon and Testa 2005), the impact is sizeable in the Netherlands (Balbo and Mills 2011). Hypothesis H1 can therefore be confirmed.

Woman's socioeconomic situation was not found to be very important determinant of fertility at the end of the reproductive age. The chance of a woman having a child as opposed to not having a child falls as income increases, as hypothesis H2 states was not the case among the 45–49 age group. On contrary, the odds ratio of remaining childless as opposed to having the reference two children in multinomial logistic regression was higher among women whose main classes of occupations was 'undetermined' This is in line with findings of Spéder and Kapitány (2009) that the likelihood to have a child in Hungary declines sharply when women or her partner is unemployed. Findings of other studies also confirm that among childless women those with a higher income are more likely to give birth whereas the unemployed are prevented from realizing their childbearing intentions (Berrington 2004). It was shown that as the woman's income level increased she had less chance of having a greater number of children than the reference two in Czechia. Hypothesis H2 can therefore be considered to be only partially confirmed.

The effect of education depends on other variables in the model. If no income variables are included, then it can mediate "income effect" (Spéder 2010). Accordingly, mechanisms discussed on the effect of income variable work similarly for the education effect (Quesnel-Vallée and Morgan 2003). The odds ratio of a woman giving birth to a child falls as the highest level of education increases among women, beginning with those with secondary school education but no leaving certificate and rising to those with tertiary education. The group of women with the lowest level of education (lower secondary or lower) was third highest. The chance of having a greater number of children (3 or 4 and more) as opposed to two children falls in relation to increasing level of education. Similarly to the previous hypothesis, H3 can be confirmed if we overlook the exceptional case of woman with the lowest level of education that were at both extremes – they tend to be childless more frequently than other women and also have the highest number of children. Both models confirmed the statistically significant effect of the educational attainment on the number of live births. The research findings regarding education have been ambiguous and seem to point to the relevance of country context (Kuhnt and Trappe 2013). It appears that women with higher educational levels are more likely to realize their fertility intention in France (Toulemon and Testa 2005) which suggest the importance of family policies to support work-life balance. France has a long history of policies that encourage fertility, including extensive preschool daycare facilities to favour the work-life balance (Régnier-Loilier and Vignoli 2011). On contrary, in United Kingdom educational differences in cohort fertility are significant and suggest the strong educational gradient in fertility among British women (Berrington et al. 2015). Completed fertility is smaller for higher educated women because a higher proportion of women with tertiary education remain childless or have fewer children than low-educated women. As family policies in United Kingdom are concentrated on low-income families higher educated women are not supported in work-life balance by family policies like in France.

6. Conclusion

Fall in cohort fertility among the generation of women with completed reproduction spans to under two children per woman, signalling the importance of understanding fertility differences in Czechia. Analysing differences in cohort fertility values among different population groups and identifying factors that may influence fertility levels in these sub-populations enables us to better understand the mechanisms behind reproductive behaviour. These findings can then be used to modify policies aimed at reducing, where possible, any subsequent falls beyond this figure among future generations (Šprocha 2014).

Given changes in fertility levels and the analysis above, one can postulate that the future fertility rate in Czechia will strongly depend on how women with

higher education, assuming they increase as a proportion of the population, are able to harmonise work and family life so they can fulfil their reproductive ambitions.

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