
SOME REMARKS ON THE FERTILITY TRANSITION IN SLOVAKIA IN THE EARLY 20TH CENTURY

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ABSTRACT

The demographic transition in Slovakia from the point of view of fertility began in the early 20th century. In connection with these changes in fertility in Slovakia in the first half of the 20th century there was a significant and historically unique transformation of the intensity and the character of age-specific fertility rates. The main aim of this paper is to analyse the changes in fertility of the Slovak population in the first half of the 20th century in connection with the onset and spread of the demographic transition. Special attention is paid to the level of voluntary fertility restriction and its impact on the intensity and nature of the process of fertility.

Keywords: fertility, demographic transition, 1st half of the 20th century, Slovakia *Demografie*, 2017, 59: 287–302

INTRODUCTION

The demographic transition is a historically unique qualitative and quantitative transformation of the nature of a population's reproductive behaviour that is marked by significant changes in the processes of mortality and fertility and in the population age structure as a whole (Pavlík *et al.*, 1986). While demographic reproduction prior to the transition is largely determined biologically, once the transition is completed, socio-economic factors are the primary determinants of reproductive behaviour (Pavlík, 1977). The theoretical concept of natural fertility dictates that the reproductive behaviour of populations before the onset of the demographic transition would not be influenced by the number of children (see Henry, 1953, 1961, 1964). A married couple would therefore act (from a reproductive point of view) the same way no matter how many children they already have (Henry, 1961). The changes to reproductive behaviour that take place

during the process of the demographic transition do not affect all countries and their populations at the same time, but generally affect various populations and subpopulations differently in terms of both timing and dynamics. Slovakia, according to several indicators, falls within the area of countries in Europe where this process has been delayed. Several studies (Fialová, 1987; Pavlík *et al.*, 1990) have shown that marital fertility on the territory of the Slovak Republic began to decline after 1900 without any prior significant changes in the age at marriage. The end of the demographic transition came during the 1960s (Vereš, 1986). From this it is obvious that fertility in Slovakia in the first half of the 20th century underwent a significant and very important transition.

The fertility transition in Slovakia during the 19th and the first half of the 20th century has received some attention in research (see, e.g., Vereš, 1983, 1986; Pavlík *et al.*, 1990), but many questions remain unanswered.

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At the same time, neither the methods nor the data provided by the Hungarian and later Czechoslovak demographic statistics were used in these analyses. At present, Slovak historical demography is focusing its attention mainly on local analyses (e.g. *Furmaník*, 2017; *Golian*, 2016a,b and 2017), and synthesising works at the national level are rather an exception (e.g. *Šprocha – Tišliar*, 2014; 2016).

The primary aim of this paper is to analyse the changes in the fertility of the Slovak population in the first half of the 20th century. For this purpose we use both classic analytical tools such as Coale's indices (*Coale*, 1973, *Coale – Treadway*, 1986) and the Coale-Trussell fertility model (*Coale – Trussell*, 1974 and 1978), and we also examine cohort changes in the intensity and structure of women by parity. In addition, we use the crude birth rate, the total fertility rate, and mean age at birth and first birth in an effort to determine how the fertility of women in Slovakia changed in the first half of the 20th century.

DATA AND METHODS

There are several problems that arise when one tries to analyse the nature, intensity and development of fertility in pre-WWI Slovakia. The biggest problem is the lack of data required to reconstruct some of the more fine-grained indicators: the data available up to 1900 are essentially limited to the crude birth rate and only the 1880, 1890 and 1900 censuses can be used to construct the Coale indices. Starting in 1900, more data become available with which to calculate the age-specific fertility rate. Data on the number of live births for the period 1900–1912 were published in broad age groups (up to age 17, ages 17–19, 20–24, 25–29, 30–39, 40–49). The number of women of reproductive age was estimated for each year by linear interpolation from the 1900 and 1910 census results. After World War I, more detailed data become available on the age of mothers at the time of birth of a live-born child (up to age 17, ages 17–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49). The number of women of reproductive age was published by the Czech Statistical Office (1987) for the period 1920–1937. From 1925 on, absolute birth figures are combined not only with the age at birth, but also with true birth order. For second- and higher-order births, the published

data also include the length of time since the previous birth. From 1938 until 1944, the crude birth rate is once again the only type of data available; the State Statistical Office in the Slovak Republic in 1939–1945 did collect birth data, but those data were never processed or published in detail, except for the crude birth rate. Moreover, the original documents were probably irretrievably lost during the Slovak National Uprising in 1944 when the headquarters of the State Statistical Office were moved from Bratislava to Central Slovakia (the epicentre of the uprising) and many of its employees then joined the insurgents. After the reunification of Czechoslovakia, beginning in 1946, fine-grained data again became available for calculating cross-sectional indicators of fertility.

The other problem involves that arises in this type of analysis relates to geographical and administrative divisions. Up until 1918, Slovakia was a part of the Austro-Hungarian Empire as a vaguely defined region without clear borders. However, statistical and census data are only available for individual administrative divisions (provinces), a number of which lie on the territory of present-day Slovakia but also of neighbouring countries (i.e. present-day Hungary, Ukraine, Poland, and Austria). We therefore decided to only use data for those provinces where the majority of the population lived on the territory of what is now the Slovak Republic. These included 17 provinces. This issue (of practical significance to historical demography) was ultimately only resolved with the formation of the Czechoslovak Republic in 1918 and the conclusion of the Treaty of Trianon in 1920. This treaty defined the borders of Slovakia as they remain (with very minor modifications) to this day, save for one period – in the years 1938–1945. The First Vienna Award of 2 November 1938 resulted in the transfer of large parts of Southern Slovakia to Hungary and the annexation of a number of small enclaves in Northern Slovakia by Poland. In total, over 10,600 km² inhabited by some 860,000 people were transferred to Hungary and Poland and only returned after WWII was over.

Turning now to the issue of methodology, we chose to use Coale's indices in our analysis, which are commonly employed to analyse various stages in the population process and the dynamics of its transformation in the course of the demographic transition. Coale's indices are based on indirect standardisation, where

a population assumed not to be engaging in fertility control is used as the standard; the population typically used for this is the Hutterite religious community of North Dakota, noted for its strict rejection of any type of fertility control. For the purposes of our analysis, we used available census data from the years 1880, 1890, 1900, 1910, 1921, 1930, 1950, and 1961 to calculate the three basic indices for the population of Slovakia: I_f – the index of overall fertility; I_g – the index of marital fertility; and I_m – the index of proportion married.

We also made an attempt to calculate the degree of fertility control using the Coale-Trussell fertility model (Coale – Trussell, 1974 and 1978). The model defines fertility control as a married couple's conscious decision to avoid having more children based on the number of children they already have. This, in turn, assumes that such a decision will be reflected in the age-specific birth rates for married women in these populations as opposed to women in populations that do not practice deliberate fertility control. Consequently, in populations with fertility control, the frequential fertility curve should decrease faster in proportion to age than in populations with natural fertility. The model then produces an estimate of the rate of deliberate fertility control (lower 'm').

According to Coale and Trussell (1978), the model hypothesised that, in any population, the ratio of marital fertility $f_{(x)}$ to natural fertility $F_{(x)}$ at a specified age (x) is given by:

$$f_{(x)} / F_{(x)} = M \exp(m \cdot v_{(x)}).$$

Parameter M is a scale factor and measures the fertility level of the observed population and parameter m indicates the degree of control of marital fertility. $V(x)$ is the typical age-specific deviation of controlled fertility from natural fertility and was derived from 43 fertility schedules reported in the United Nation's Demographic Yearbook 1965. $F(x)$ was estimated by taking age-specific averages of 10 natural fertility schedules.

Taking the logarithms of both sides of the previous equation, we can write:

$$\ln \frac{f_{(x)}}{F_{(x)}} = \ln(M) + mv_{(x)}$$

As such, the Coale-Trussell fertility model is fundamentally based on the comparison of two series of age-specific fertility rates – that of the studied population and that of populations with a natural fertility rate as estimated by the authors using real data from populations that do not engage in fertility control. In these calculations, the extremes (age groups <20 and 45>) are usually left out due to the small event size and – in the youngest age groups only – the high prevalence of premarital conception. In general, the higher 'm' is, the higher the degree of fertility control. Negative values and positive values up to 0.3 indicate (see Coale – Trussell, 1974, 1978) no or weak fertility control. Values upwards of 0.5 speak of a clear intent to limit family size (Coale – Trussell, 1974, 1978).

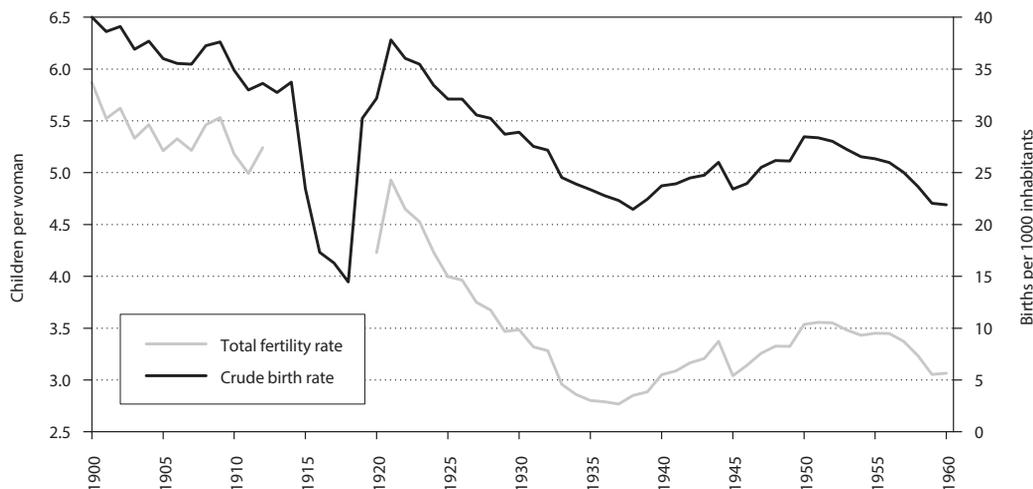
The 1930 census was the first to ask women about the number of children they had given birth to and the censuses of 1950 and 1961 followed suit. We used the data obtained in all three censuses to conduct a detailed cohort analysis of fertility changes focusing on the development of completed fertility and intergenerational changes in the structure of the female population by number of children (parity) and cohort parity progression ratios.

THE FERTILITY TRANSITION: FIRST SIGNS

In Slovakia, the crude birth rate remained above 40‰ for all of the 19th century. The total fertility rate in 1900 reached about 6 children per woman. The first decade of the 20th century, however, brought the first signs of a gradual decline. This trend continued after World War I and the post-war recuperation phase until the 1938. Slovakia finally attained a 30‰ crude birth rate in the late 1920s, which Chesnais (1992) considers the beginning of the modern paradigm of controlled fertility. The total fertility rate dropped to under 4 children per woman and below 3 after a sharp decline in 1932–1933.

During World War II, Slovakia experienced significant population growth, which was greatly aided by new pro-natality and pro-family measures implemented by the authorities of the newly independent Slovakia in imitation of similar steps taken by the Third

Figure 1 The total fertility rate and the crude birth rate in Slovakia 1900–1960



Source: Népmozgalma 1900–1912; Pohyb obyvateľstva (Population Dynamics) 1919–1937; Štatistické zprávy (Statistical Reports) 1942–1943; Pohyb obyvateľstva na Slovensku (Population Dynamics in Slovakia) 1945–1948, 1949–1960; Věkové složení obyvateľstva v letech (Age Structure of the Population in the Years) 1920–1937 a 1945–1979; authors' calculations.

Reich³). The cohort effect also played a significant role, as the populous cohorts of women born after World War I reached reproductive age.

After World War II there was a temporary increase in fertility, which halted in 1953, after which birth rates in Slovakia began to steadily decline. The first half of the 1960s then saw the country pass the 20‰ line, which (so Chesnais, 1992) implies general control of fertility and marks the start of the post-transitional phase. At the same time, the total fertility rate decreased to 3 children per woman.

As a society implements fertility control, it is not only the intensity of the process that changes, but also the character of age-specific fertility rates. With some degree of overgeneralisation, we can describe those changes as attempts to prevent the conception of (unwanted) higher-order children. As we showed above, Slovakia's population did not during the period in question adopt the practice of postponing marriage

and both men and women typically entered marriage at a young age and with a high intensity (i.e. what is known as the non-European model of nuptiality still prevailed). This observation is also confirmed by mean age at first birth, which was approximately 24 years of age throughout the 1920s and 1930s. On the other hand, the same period saw the median age of fertility drop from 29 to 27 and the interdecile range of fertility gradually decrease from 18.5 to 17.4 years, while the lower decile remained virtually the same. This means that about half of all fertility was concentrated at an increasingly younger age and 80% of the total fertility rate was realised in a shorter age span.

Having reached the compensation maximum after the Great War, fertility began to decline in all age groups except the youngest one. Shortly before the breakup of Czechoslovakia, it was at 50–75% of the 1920s levels for those age groups and at 70% of the level for the group aged 30 and under.

3) In Slovakia, such measures reflected both the totalitarian nature of the ruling regime and the conservative Christian nature of society and included a total ban on abortions, even in situations where the mother's life was at risk, as well as a strict ban on the sale and distribution of any type of birth control. In terms of social policy, the regime was intent on returning women to their proper place in the home (Tišliar, 2013; 2015).

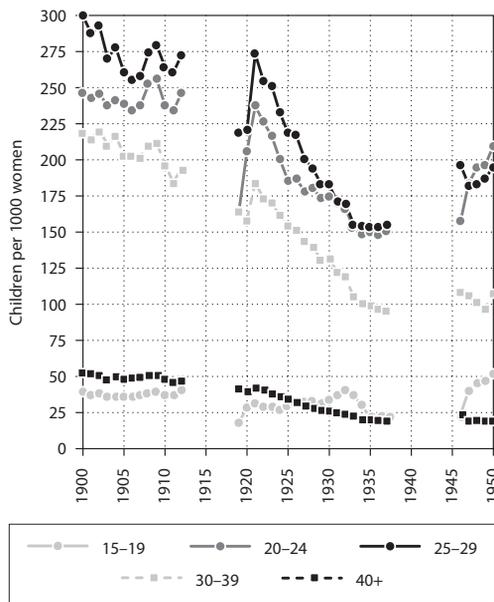
As a consequence of this development, the contribution of individual age groups to the total fertility rate began to shift. First, the share of women aged 35 and over began to decline. The contribution of the 25–29 and 30–34 age groups remained relatively stable; however, that of the 20–24 age group increased, and starting in 1925 so did the contribution of the age group 15–19. Considering the development of fertility rates, we can assume that the primary contribution of the economic downturn of the 1930s was the decrease in higher-order births and the increase in marriage postponement to over the age of 20. The latter is evidenced not only by a decrease in fertility in women under the age of 20, but also the stabilisation of fertility in the 20–29 age group and a slight increase in the average age at first birth (from 23.7 to 24.0), which is first observed in 1933.

Between 1925 and 1950 first-order fertility remained largely stable, ranging between 0.8 and 1.1 children per woman, but fifth- and higher-order fertility declined

sharply (by more than 0.7). A similar downward trend can be observed in the total fertility rates of fourth-order births and to some extent third-order births as well, but some caution is warranted when interpreting these data given the changing structure of the female population by parity. We will address the issue of changes in birth intensity by order when considering the cohort perspective.

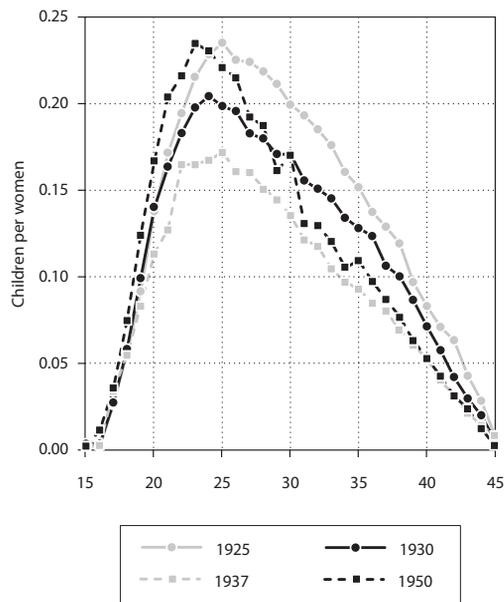
A very important tool of historical demographic studies is the analysis of birth intervals (e.g. *Fialová et al.*, 2015). One of the first signs, albeit an indirect one, of the onset of fertility control in the population of Slovakia can be found in the trend of birth intervals. The years between 1925 and 1937 saw a sharp increase in the number of years between all higher-order births (specifically, we looked at the number of years between the second and the fifth child). The most significant change was observed in the length of time between the second and the third child, but the interbirth period between the third and fourth child also saw a sizeable increase (see Figure 4).

Figure 2 Fertility levels by age, 1900–1950



Source: Népmozgalma 1900–1912; Pohyb obyvateľstva (Population Dynamics) 1919–1937; Štatistické zprávy (Statistical Reports) 1942–1943; Pohyb obyvateľstva na Slovensku (Population Dynamics in Slovakia) 1945–1948, 1949 and 1950; Vekové složení obyvateľstva v letech (Age Structure of the Population in the Years ...) 1920–1937 a 1945–1979; authors' calculations.

Figure 3 Fertility levels by age in selected years



Source: Pohyb obyvateľstva (Population Dynamics) 1925, 1930, 1937; Pohyb obyvateľstva na Slovensku (Population Dynamics in Slovakia) 1950; Vekové složení obyvateľstva v letech (Age Structure of the Population in the Years ...) 1920–1937 a 1945–1979; authors' calculations.

According to *van de Walle* (1974), a decline in marital fertility caused by deliberate fertility control is unambiguously observed if Coale's index of marital fertility (*Ig*) drops below 0.5. With *Ig* ~ 0.6, it can only be assumed that the population as a whole has begun to implement some sort of regulation of family size.

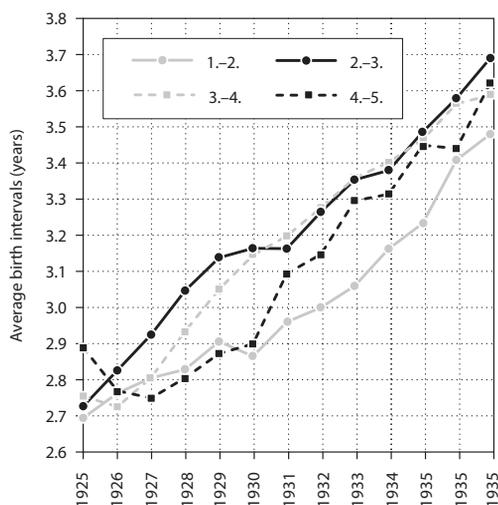
In Slovakia, the marital fertility index (calculated from Hungarian census data 1880–1910) first decreased below 0.6 in 1910 and remained at the same level in 1921 when the first official Czechoslovak census took place. This, however, needs to be viewed in the light of the post-war compensation phase, which culminated in Slovakia in 1921 and which skewed the figures. It would appear that it was in the 1920s when fertility control was finally adopted by society as a whole; this is evident from the *Ig* dropping below 0.5 by the end of the decade (cf. Figure 5). Fertility transition in Slovakia can be considered completed by the end of the 1950s. As census data show, in 1961, the marital fertility index finally dropped below 0.35; this value is generally considered

(e.g. *Pavlík et al.*, 1986) to definitively mark the end of the fertility transition.

According to census data, the index of overall fertility remained relatively stable at 0.4. It fell below that level by the early 1920s to then stabilise in 1930 at 30% of Hutterite fertility, and the early 1960s then saw a further decline to 0.24.

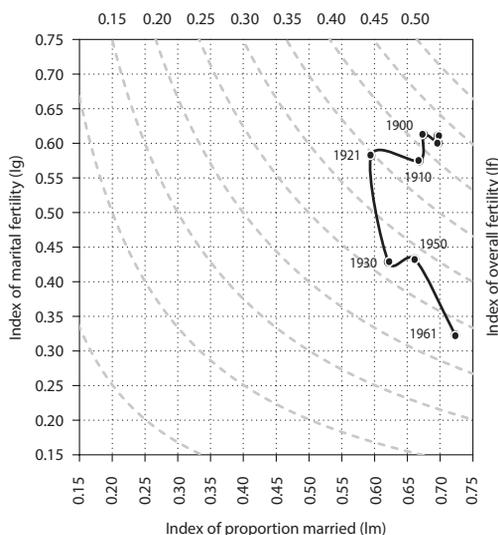
The high *Im* values (see Figure 5) confirm the crucial role of a woman's marital status for the fertility levels in pre-WWII Slovakia when in all census years for which data is available – save for 1921 – the *Im* exceeded 0.6, a figure above the 0.55 threshold which, according to *Hajnal* (1965), distinguishes populations with European marriage patterns from populations with non-European marriage patterns. Slovakia thus ranked among the latter and, as is typical for such a population, most women in Slovakia married at least once and often at a young age (see *Šprocha*, 2016). These women then began to take part in the reproductive process while in the first half of their reproductive age, which was then reflected in the nature

Figure 4 Average birth intervals in marriage, 1925–1937



Source: Pohyb obyvateľstva (Population Dynamics) 1925–1927, 1928–1930, 1934–1937; authors' calculations.

Figure 5 Trajectories of *Im*, *Ig* and *If* for Slovakia 1880–1961



Source: Authors' calculations

of reproduction: in European-type populations the bulk of fertility was realised in the second half of a woman's reproductive years (i.e. at the age of 30 and above), in Slovakia fertility was concentrated – and increasingly so – in the first half of a woman's reproductive years. This is due not only to the different nature of nuptiality (especially its timing), but also to gradual fertility control, in this case efforts to prevent higher-order conception, which – logically – would take place once a woman has reached the age of 30.

In order to quantify the degree to which fertility control was practiced, we opted to employ the Coale-Trussell fertility model (Coale – Trussell, 1974; 1978). The model assumes that efforts by a married couple to avoid (further) conceptions will be reflected in the development of age-specific marital fertility rates: in a population which practices fertility control, these rates are expected to decrease faster with age than they would in a population which does not practice fertility control, i.e. where a couple's reproductive behaviour does not take into account the number of children they already have. This rate of decrease is expressed by m . The higher the value of m , the more widely fertility control is practiced within a population and, conversely, values lower than 0.3 and negative values of m are typical for populations with very low or no fertility control at all. Consequently, Coale and Trussell established $m > 0.5$ as a threshold that marks populations where one can with some degree of certainty speak of commonly practiced deliberate fertility control (Coale – Trussell, 1978).

The results of our calculations for the years 1900–1961 are shown in Table 1 and they confirm some of

our findings above: the first decade of the 20th century shows very little evidence of fertility control, with $m > 0.3$ only in the 35–39 age group. The overall rate of fertility control began to rise just before the Great War, but even the early 1920s do not yet see fertility control being widely practiced, save perhaps in the 30–34 age group, where, for the first time in history, m rises above the 0.5 threshold. In 1930, however, the 25–29 age group crossed that threshold as well and even older age groups (35–44) came quite close. This, along with the rising overall values of m , which in 1930 nearly reached 0.5, is clear evidence of the gradual society-wide implementation of fertility control. The years after World War II then finally see m breaking the 0.5 threshold across all age groups, in most cases by a large margin, and by the late 1950s, m finally rises above 1.0 in all age groups, indicating that the process of fertility transition had been completed.

In terms of the dynamics of m , the first signs of fertility control appear in the early 1900s and it is at first primarily older women who are practicing in it. The interbellum period then sees fertility control spreading to younger age groups and the process of fertility transition begins to affect the entire reproductive age range. In terms of cohorts – on which more below – it is plain to see that in addition to older cohorts (women born in the 1880s and 1890s), women born in the early 1900s began to limit the number of children they had. This confirms the generally accepted irreversible nature of deliberate fertility control and its inter-generational spread.

Table 1 Degree of fertility control according to Coale and Trussell's 'm' based on census data for Slovakia, 1900–1961

Population	'm'	'm' in age groups			
		25–29	30–34	35–39	40–44
'Slovak provinces' 1900	0.26	0.27	0.16	0.33	0.25
'Slovak provinces' 1910	0.31	0.38	0.19	0.45	0.26
Slovakia 1921	0.38	0.23	0.53	0.37	0.37
Slovakia 1930	0.49	0.66	0.60	0.49	0.46
Slovakia 1950	0.85	0.98	0.84	0.92	0.82
Slovakia 1961	1.24	1.50	1.36	1.30	1.18
Hutterites 1921–1930	-0.08	-0.05	0.02	-0.09	-0.10

Source: Authors' calculations.

THE FERTILITY TRANSITION: A COHORT PERSPECTIVE

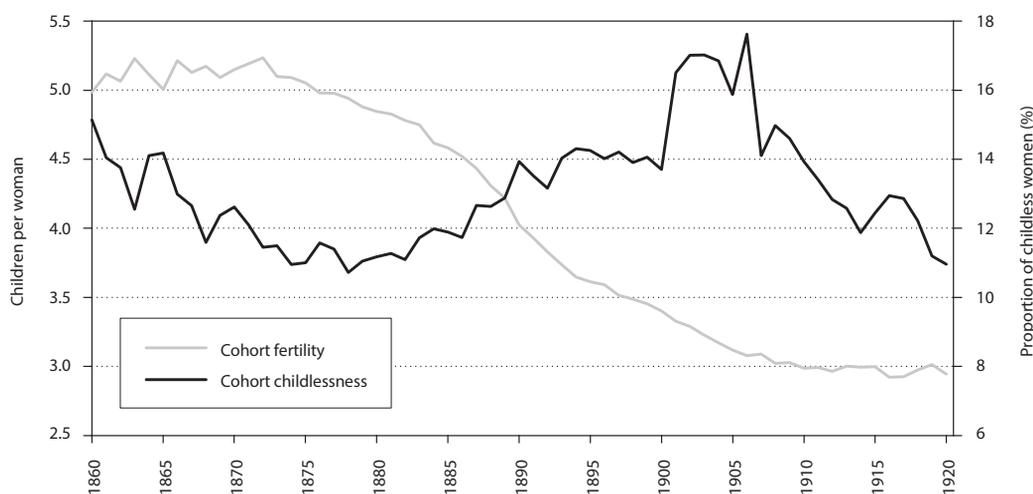
In every country that has undergone the fertility transition, it is possible to identify forerunners, i.e. population groups and areas that were the first to undergo the changes, and from which the changes spread not only through space but also through various societal strata as the new paradigm of reproductive behaviour was adopted by more and more couples (see *Livi-Bacci, 1986*). Cohort analysis is a tool with which it is possible to track the dynamics of the fertility transition from its onset to its conclusion by showing the intergenerational nature of the process. Slovakia is a particularly noteworthy example here: thanks to the unique census of 1930 and the subsequent censuses which collected data on how many children a woman had, we are able to track the entirety of the intergenerational fertility transition, starting with the cohorts of women born in the second half of the 19th century. In this section, we will be using the data from the censuses conducted in 1930, 1950, and 1970 to analyse changes to the completed fertility of women born between 1860 and 1920. At the same time, the reader should also be aware that in the case of the oldest cohorts, the data may be partly influenced

by the large sample size of women, as they were the population that had been in the 1930 population census for over 60 years.

The completed fertility rate of women born in the years 1860–1875 regularly reached levels of 5 and above, but beginning with the cohorts born in the second half of the 1870s, completed fertility rate started to decline. Initially, the yearly decrease was small, and so the first drop by 0.5 children was achieved within ten birth cohorts, when, on average, women born in the first half of the 1880s had 4.5 children. In younger birth cohorts, the decline was much faster, with the fastest rate recorded among women born between 1885 and 1895, when at the end of that period, cohort fertility dropped by 1 child to 3.5 children. The decline then continued in younger cohorts, but at a slower pace: for women born in 1905, the average number of children was 3, but for cohorts born in 1908 through 1920, it dropped to approximately 2.85–2.96. This leads us to the conclusion that the crucial decline of the completed fertility rate in Slovakia took place in the cohorts between 1880 and 1905.

These changes, however, are a reflection of the dramatic shifts in the cohort parity progression ratios. Up to the cohorts from the late 1870s, women with 5

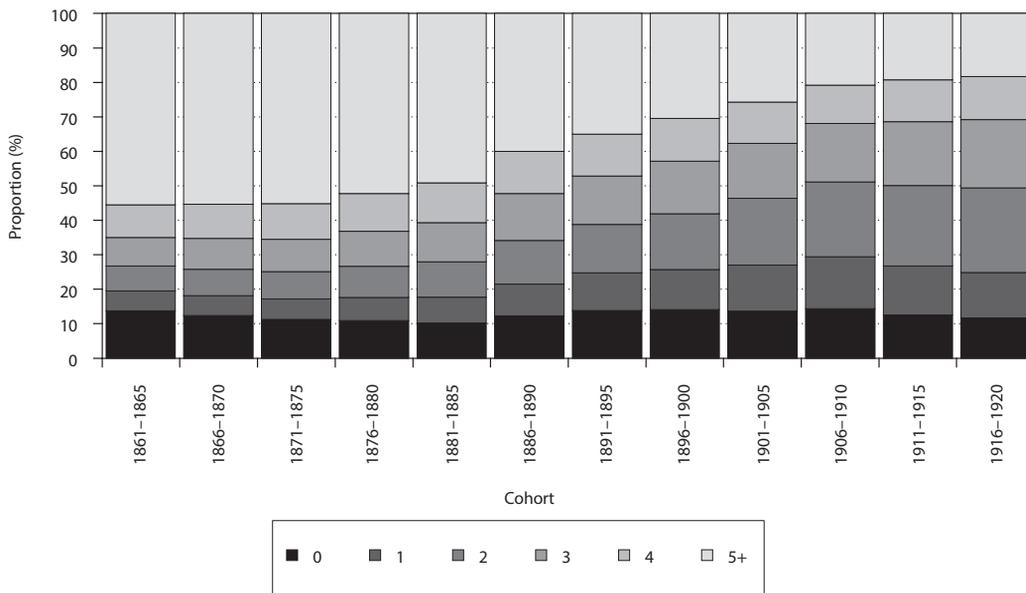
Figure 6 The completed fertility rate and cohort childlessness



Note: Data for the 1860–1880 cohorts are from the 1930 population census, for the 1881–1900 cohorts from the 1950 census, and for the 1901–1920 cohorts from the 1970 census.

Source: Sčítaní lidu (Population Census) 1930, 1950 and 1970; authors' calculations.

Figure 7 Women by number of children



Source: Sčítani ľidu (Population Census) 1930, 1950 and 1970; authors' calculations.

or more children constituted over one-half of the female population. Beginning with the cohort born in 1885, their share began to decline and in the cohorts born by the end of the 19th century, it dropped to one-third. This intercohort decline is a reflection of increasing attempts at fertility control for higher-order children, which is, in turn, one of the major signs that the fertility transition is in progress, and so the share of women with 5 or more children continued to decrease until it stabilised at one-fifth in the 1911–1920 cohorts.

At the same time, the share of women with two or three children rose: while in the oldest cohorts, that group constituted a mere 15% of the entire female population, for cohorts born in the first decade of the 20th century their share rose to 40%, with a growing intercohort trend. In contrast, the share of childless women and women with only one child remained stable for much of the period in question at 6–10% for the former group and 10% for the latter. Those figures increased slightly at the turn of the 19th and 20th century, as both these groups were the ones most severely affected by the adverse conditions of the Great War and its aftermath and by the economic crisis

of the 1930s. As noted by Rowland (1998, 2007) and Sobotka (2006, 2017) in several Western and Northern European countries, the childlessness of women born in the early 20th century was significantly above the 20% threshold. Slovakia continued to belong to those European populations with a low share of childless women and having a single child remained only a marginal reproductive strategy.

In populations that do not practice fertility control, the probabilities of family size increase were relatively high even for higher-order children, as married couple does not take any steps to prevent further conception and the total number of their children is thus not dependent on the number of children they already have (Henry, 1961; 1964). In such populations, the slow decline in the probability of family size increase with age is not evidence of fertility control, but rather the result of biological limitations, i.e. the increasing difficulty of conception and live birth at a higher age. Consequently, the parity progression ratios remain high even with higher-order children. In Slovakia, this can be observed in cohorts of women born in the 1860s through the early 1870s where

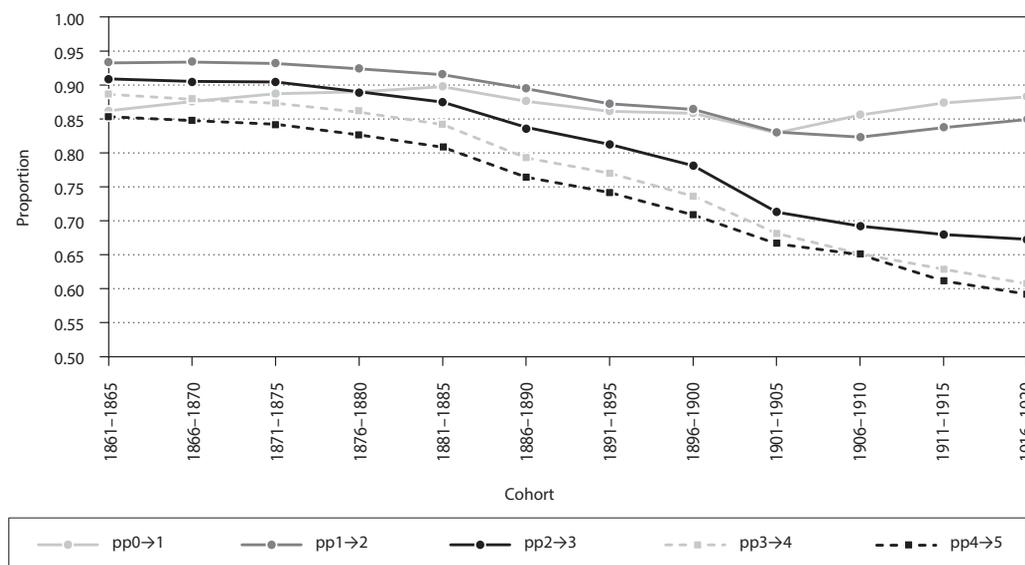
the difference in the probability of giving birth to a second child and the probability of giving birth to a fifth child was a mere 8–9 p.p. The level of probability was thus relatively stable intergenerationally and also quite high (at 80%) regardless of parity. However, starting with cohorts born in the second half of the 1870s, but especially in cohorts born in the 1880s, we begin to notice a consistent intergenerational decline in the probability of third- and higher-order births. Understandably, the first to decline was the probability of a fifth child (and beyond), but soon the same was true of the fourth child. In cohorts born in the final years of the 19th century, the difference in probability of giving birth to a second child and the probability of giving birth to a fifth child nearly doubled to 16 p.p. and for cohorts born between 1916 and 1920 it increased to as much as 26 p.p. A sharp increase can be seen in the difference between the probabilities of a second and a fourth child (20 p.p. for cohorts born between 1916 and 1920) and a second and a third child (16 p.p.).

Considering the data above, one would be justified in concluding that in Slovakia the process of the

fertility transition began with the group of women born in the second half of the 1870s, but took full effect in the cohorts born in the 1880s and continued to deepen with the following cohorts. This clearly shows the intergenerational irreversibility of the process in the population of Slovakia as well.

And for final proof of this irreversibility, we consider the paradox of the higher probability of second-order births compared to first births. For populations with natural fertility, it has been found that the chance that a woman will give birth to a second child is higher than that for a first child. In populations with planned reproduction, however, the opposite is true, which is explained by the conditional nature of this probability in populations practicing fertility control and by the biological nature of reproduction in populations with natural fertility. In every population, there are a number of women who cannot have children. However, this group only has a statistical effect on first-order births since, logically, only women who have already given birth to one child can be spoken of as being likely to give birth to a second one. In Slovakia, this paradox

Figure 8 Parity progression ratios for women in Slovakia



Note: pp0→1 probability of a childless woman giving birth to her first child; pp1→2 probability of a woman with a 1 child giving birth to second child etc.
Source: Sčítaní lidu (Population Census) 1930, 1950 and 1970; authors' calculations.

was first recorded in women born in the first decade of the 20th century.

In populations with deliberate fertility control, these probability levels are affected not only by biological factors, but also by attempts to prevent further conceptions. This is demonstrated particularly by attempts to prevent further pregnancies once the couple has a set number of children. This, in turn, is manifested by a sharp decline in the probabilities of family size increase. In Slovakia, this can be clearly observed in the cohorts of women born in and after the 1880s.

CONCLUSION

Our detailed analysis confirmed that the beginnings of the fertility transition in Slovakia can be dated to the first decade of the 20th century, but society-wide deliberate fertility control only took hold in the 1920s. The process of the fertility transition was then completed by the 1950s.

Coale's indices and the Coale-Trussell fertility model supplemented by an analysis of cohort parity progression ratios confirmed that the main feature was the onset and spread of voluntary fertility restriction, which reflected the completed fertility rate and the structure of women by parity. A comparison of the fertility of single cohorts showed the gradual spread of permanent changes in fertility.

According to our findings, in Slovakia the process of the fertility transition began with the group of women born in the second half of the 1870s, but took full effect in the cohorts born in the 1880s and continued to deepen with the following cohorts. The completed fertility rate decreased from more than 5 children per woman to below 3 children per woman. Similarly, we could see an intercohort decrease in the parity progression ratios for third- and higher-order child, while the probability of a first and second birth changed only a little. These shifts resulted in a significant reduction in the proportion of women with five or more children and, on the other side, an increase in the proportion of women with two or three children.

Up until the cohorts from the late 1870s, women with 5 or more children made up over one-half of the female population. Beginning with the cohorts born in 1885, their share began to decline and in the cohorts born by the end of the 19th century it had dropped

to one-third and stabilised at one-fifth in the 1911–1920 cohorts. At the same time, the share of women with two or three children rose (from 15% to 40%). With the exception of women born at the end of the 19th and the beginning of the 20th century, which suffered from the adverse effects of World War I and the economic crisis of the 1930s, childlessness and one-child families remained marginal reproductive models.

The level of parity progression ratios in older cohorts was relatively stable and also quite high regardless of parity. The transition of probabilities began with the group of women born in the second half of the 1870s, but took full effect in the cohorts born in the 1880s and continued to deepen with the following cohorts. The result was a drop in the probability of the birth of higher-order children, while the chances of the birth of a first and a second child remained high. Their intergenerational decline in women born in the late 19th and the early 20th century was the result of unfavourable reproductive conditions during the World War I and the economic crisis of the early 1930s.

Our analysis showed that changes also occurred in cross-sectional indicators. The total fertility rate went down from almost 6 children to below 3 children per woman. The character of age-specific fertility rates also changed. Above all, the age-specific fertility rates were reduced except among younger ages. When examining this development, it becomes apparent that the main reason for the decline in fertility can be traced to the overall decline of higher-order fertility. While first- and second-order fertility was stable or slightly decreased, third and successive births becoming much rarer than ever before. Birth intervals also increased in length. The median age fell and the interdecil range grew shorter.

According to our findings, the fertility transition in Slovakia (in terms of major changes) did not differ significantly in its main features from other European countries. The main feature was the decline in the higher-order fertility rate and the increase in the proportion of women with two or three children. Compared to Western and Northern Europe, there was generally less childlessness and a lower proportion of women with only one child. These reproductive models were not characteristic for Slovakia even after the end of the demographic transition.

On the other hand, the relatively low value of the index of marital fertility (in the last two decades

of the 19th century) before the start of the demographic transition was quite surprising. Compared with available data for selected European countries (with the exception of France) this level was one of the lowest in Europe (see, for example, Coale – Watkins, 1986). It is interesting that the European Fertility Project as well as Andorka (1971), Andorka – Balasz-Kovács (1986) and Demeny (1968) identified these specificities also in other Hungarian counties. The low levels of the marital fertility index in the southern regions of Slovakia were also highlighted by Vereš (1983, 1986). On the other hand, our research as well as the results of Coale's European Fertility Project confirmed that the irreversible beginning of the decline in marital fertility began only

in the first and the second decade of the 20th century and was more pronounced in the inter-war period. This made Slovakia unevenly behind Northern and Western Europe.

In addition to the direct effect of limiting higher-order children, it is important to mention the indirect effect of extensive foreign emigration. The absence of young men as well as spouses in families, the imbalance in the marriage market, could be an important factor in the increase in childlessness and growing birth intervals, thereby accelerating the decline in fertility and family size. At the same time, we may believe that emigration has also contributed to the more rapid spread of innovation and the diffusion of new forms of reproductive behaviour.

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Appendix

Appendix 1 Historical provinces in Slovakia, 1900



Note: Black provinces were not included in the analysis.

Appendix 2 Selected fertility indicators of women in Slovakia

Year	Crude birth rate	Total fertility rate	Cohort	Cohort fertility	Cohort childlessness
1900	40.5	5.91	1860	5.01	15.2
1905	36.4	5.24	1865	5.03	14.2
1910	35.3	5.21	1870	5.18	12.6
1920	32.6	4.25	1875	5.07	10.9
1925	32.5	4.01	1880	4.86	11.1
1930	29.2	3.49	1885	4.59	11.8
1935	23.6	2.80	1890	4.00	13.9
1940	24.0	3.06	1895	3.58	14.3
1945	23.7	3.04	1900	3.35	13.7
1950	28.8	3.55	1905	3.06	16.0
1955	26.6	3.46	1910	2.92	13.9
1960	22.1	3.07	1915	2.93	12.4

Source: Népmozgalma 1900–1912; Pohyb obyvateľstva (Population Dynamics) 1919–1937; Štatistické zprávy (Statistical Reports) 1942–1943; Pohyb obyvateľstva na Slovensku (Population Dynamics in Slovakia) 1945–1948, 1949–1960; Věkové složení obyvatelstva v letech (Age Structure of the Population in the Years ...) 1920–1937 a 1945–1979; Sčítaní lidu (Population Census) 1930, 1950 and 1970; authors' calculations.

Appendix 3 Structure of women in Slovakia according to the number of children

Cohort	Proportion of women with the number of children (%)					
	0	1	2	3	4	5
1861–1865	13.7	5.8	7.3	8.3	9.5	55.5
1866–1870	12.4	5.8	7.7	8.9	9.9	55.4
1871–1875	11.2	6.0	7.9	9.4	10.3	55.2
1876–1880	10.9	6.7	9.0	10.2	10.9	52.2
1881–1885	10.2	7.6	10.2	11.3	11.6	49.1
1886–1890	12.3	9.2	12.7	13.6	12.3	40.0
1891–1895	13.8	11.0	14.0	14.0	12.1	35.0
1896–1900	14.1	11.6	16.2	15.3	12.4	30.4
1901–1905	13.7	13.3	19.4	15.9	12.0	25.7
1906–1910	14.3	15.1	21.7	17.0	11.1	20.8
1911–1915	12.6	14.2	23.4	18.5	12.2	19.2
1916–1920	13.2	14.2	23.2	18.2	11.8	19.4

Source: Sčítaní ľidu (Population Census) 1930, 1950 and 1970; authors' calculations.