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Seeding the gender revolution: Women's education and cohort fertility among the baby boom generations

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In Europe and the United States, women's educational attainment started to increase around the middle of the twentieth century. The expected implication was fertility decline and postponement, whereas in fact the opposite occurred. We analyse trends in the quantum of cohort fertility among the baby boom generations in 15 countries and how these relate to women's education. Over the 1901–45 cohorts, the proportion of parents with exactly two children rose steadily and homogeneity in family sizes increased. Progression to a third child and beyond declined in all the countries, continuing the ongoing trends of the fertility transition. In countries with a baby boom, and especially among women with post-primary education, this was compensated for by decreasing childlessness and increasing progression to a second child. These changes, linked to earlier stages of the fertility transition, laid the foundations for later fertility patterns associated with the gender revolution.

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Introduction

The changing relationship between women's education and fertility is one of the key ingredients in the ongoing transformation of gender roles and family life, which has been termed 'revolutionary' by a number of scholars (Goldin 2006; Esping-Andersen 2009; Esping-Andersen and Billari 2015); Goldscheider et al. (2015) even call this 'the gender revolution'. During most of the twentieth century, the lowest fertility was seen among women with the highest levels of education. This negative educational gradient in women's fertility was associated with the Western 'male breadwinner–female homemaker' family model. As, culturally, women were not supposed to combine their family roles with a professional career, women holding higher academic qualifications were rare, and typically had low marriage and fertility rates (Goldin 1990; Goldscheider et al. 2015).

In the heyday of the male breadwinner model, there was an important revival of fertility in many Western countries: in the middle of the twentieth century, a baby boom interrupted the decades-long decline of fertility dating back to the nineteenth century (Macunovich 2002). Neither demographers nor other social scientists were able to foresee this (Van Bavel 2010; Van Bavel and Reher 2013). One of the reasons for it being totally unexpected was that it occurred at a time when girls' participation in education was expanding. In Europe and North America, the process of educational expansion beyond primary level accelerated in the period following the Second World War, with growing proportions of not just men but also women completing secondary and higher levels of education (Boli et al. 1985; Aldcroft 1998; Schofer and Meyer 2005). Given the negative educational gradient in fertility, the expected impacts of the rising participation

of girls in education were fertility postponement and further fertility decline. What happened, in fact, was a revival of fertility in countries as diverse as Spain (Reher and Requena 2015), Sweden (Sandström 2014), and Belgium (Van Bavel 2014).

This paper addresses the apparent paradox of a negative relationship between women's education and fertility on the one hand, while on the other hand fertility was increasing at a time when the educational attainment of women was growing. We investigate trends in the quantum of cohort fertility underlying the baby boom in 14 European countries and the United States (US). The baby boom was primarily a phenomenon typical of Western countries, but to enhance the comparative perspective our paper also includes some former socialist states of Central and Eastern Europe (CEE). This will help us to gain insight into the conditions explaining the presence or absence of a baby boom and, more particularly, into the role played by women's education in different contexts. We analyse how components contributing to completed fertility (entry into motherhood, and progression to lower- and higher-order parities) differ by women's educational attainment across countries and cohorts.

The results show fertility revival in all educational groups in countries experiencing a baby boom, largely offsetting the compositional effects implied by women's increased educational attainment. In these countries, the proportion of women with more than two children was on the rise, but we demonstrate that this can be explained without assuming any increase in intended or ideal family size. We show, on the one hand, that trends display common features of the transition to modern fertility (including increased homogeneity of family formation patterns across educational groups and the consolidation of the two-child family), but on the other hand, that there were also more specific features that generated a baby boom in only a subset of countries. A baby boom is only observed in countries where the increasing tendency to have one or two children was strong enough to compensate for the decreasing propensity to have higher-order births. We conclude by linking these findings back to the ongoing discussion about changing gender roles and family behaviour.

The baby boom, fertility, and women's education

So far, there is no widely accepted overall explanation for the baby boom, but some factors are well known (Macunovich 2002; Van Bavel and

Reher 2013). The most important is that the baby boom, as a period phenomenon, was fuelled by a shift towards earlier marriage and family formation. This change was in line with a secular trend that emerged in the nineteenth century in a growing number of countries (Hajnal 1965; Watkins 1986; Alter 1991). Nuptiality had already increased gradually between the second half of the nineteenth century and the 1930s in many European countries west of the Hajnal line (Hajnal 1953, 1965; Watkins 1986), notably in countries with advanced demographic transitions (Coale and Treadway 1986). The Great Depression slowed down marriage rates in many countries for a number of years, but the subsequent marriage boom (Hajnal 1953) represented the acceleration of an ongoing trend, weakening the old Malthusian marriage pattern in Europe. Even if there is no conclusive, generally accepted explanation for the marriage boom and the shift towards earlier childbearing, explanations based on increasing opportunities for the cohorts coming of age after the Great Depression (e.g., Easterlin 1987) are plausible.

This shift in tempo explains a large part of the baby boom (Van Bavel and Reher 2013): for the US, Ryder (1980) estimated that 58 per cent of the increase in period fertility underlying the baby boom could be attributed to changes in the timing of childbearing to younger ages. However, we consider the rising quantum of fertility the most puzzling part of the story, because it runs against the tide of the secular fertility transition, which involved the spread of family size limitation. For instance, declining childlessness was a major ingredient of the baby boom (Sandström 2014; Van Bavel 2014; Reher and Requena 2015), while the proportion of women with no children had increased during earlier stages of the fertility transition (Morgan 1991; Rowland 2007).

The revival of fertility occurred in a period when women's education was on the rise, although the spread of mass education features prominently in explanations of fertility *decline* (Caldwell 1982; Axinn and Barber 2001; James et al. 2012). With regard to the mechanisms that might explain how more education would lead to lower fertility, some theories focus on the schooling of parents as a determinant of fertility preferences and behaviour. Other theories focus on the role of children's schooling rather than that of parents (Axinn and Barber 2001). In this paper, we connect the perspectives of parents and children to give clues to the changing linkage between education and fertility during the baby boom; that is, the perspectives of older

generations (investing in the education of their offspring) and younger generations (coming of age as better educated than previous generations).

In the context of the increasing importance of education in the social structure of modernizing societies, one of the major strategies parents pursued to invest in the quality and prospects for their offspring was sending them to school and doing so for longer periods of time (Caldwell 1982; Axinn 1993; Axinn and Barber 2001; Reher 2011). In the nineteenth century, many parents did this even before governments started to enforce primary education by law, and many parents encouraged their children to continue schooling beyond the compulsory age (Soysal and Strang 1989). Sending children to school clearly entails economic costs for parents (Caldwell 1982), so schooling is associated with increased parental investment in a smaller number of children, with a preference for 'child quality' rather than 'child quantity' (Michael 1975; Hanushek 1992).

Accordingly, in the nineteenth and early twentieth centuries, parents started to limit their family sizes and invested more in the education of their offspring. What happened next in these younger, better educated generations? The expansion of mass education beyond the primary level sped up sharply after 1940, and this was equally the case for women and men (Meyer et al. 1992). Based on this, fertility was expected to decline via at least four mechanisms: (1) longer school enrolment leads to later ages at union formation and childbearing, due to role incompatibility; (2) an increased level of education reduces the gains from marriage and therefore leads to lower marriage rates among more highly educated women; (3) with regard to childbearing, more highly educated women face greater opportunity costs, since it will reduce their activities in the labour market; and (4) better educated women are more effective at using contraception than women with less education (Rossi 1984; Blossfeld and Huinink 1991; Lappegård and Rønsen 2005; Kravdal and Rindfuss 2008). However, despite these pervasive negative effects of education on fertility, a revival rather than a decline in the fertility rate was observed among these younger, better educated cohorts, not just in the timing, but also in the quantum dimension (Van Bavel and Reher 2013).

How can we make sense of this unexpected combination of increasing women's education and fertility? In the following subsections, we investigate three aspects of the quantum distribution: the declining proportion of childless women, the spread of the two-child family, and parity progression beyond two children. In a nutshell, our argument is as follows:

economic and cultural factors converged to establish and consolidate the two-child norm for people across the whole educational distribution, childlessness declined, and the proportion of women having at least two children increased. The latter implies a greater number of families with three or more children, even if parity progression beyond the second child remained stable.

Family formation on the rise among educated women

At the turn of the nineteenth and twentieth centuries, many women in Western countries never started a family. As far as the evidence shows, childlessness peaked in the 1880–1910 birth cohorts (Morgan 1991; Rowland 2007). Childlessness was particularly widespread among the most educated women, perhaps because they wanted to capitalize on their degree in the labour market. They often refrained from starting a family or postponed it. Postponement could entail experiences and circumstances that made it less likely that they would ever marry or have any children (Morgan 1991). In this subsection we discuss some general developments explaining the rise in family formation at the time of the baby boom, and then establish the link between educational level and family formation. By 'family formation', we refer to the process of starting a family, including union formation and having children.

- After the Great Depression and the Second World War, the economic and social circumstances in Europe and North America, as well as general advances in wealth and health resulting from post-war prosperity, were very favourable for starting a family. The economy boomed: jobs were in abundance, men's wages rose, the demand for an educated workforce grew, and vertical social mobility rocketed (Coontz 2005). The economic conditions helped make the late nineteenth century's bourgeois family ideal a reality for a growing number of men in terms of earning enough to allow their wives to stay at home and care for a limited number of children. This led to the heyday of the male breadwinner–female homemaker family (Cherlin 1983; May 1988; Creighton 1999; Murphy 2002), although many working-class men did not earn enough to be able to support a stay-at-home wife (Pott-Buter 1993; Janssens 1997). This family model, with its glorification of the

mother and housewife, was strongly associated with the baby boom in the West (Bean 1983). On the eastern side of the Iron Curtain, gender role specialization in household tasks and childrearing also prevailed but because men's wages were usually not high enough to support a family and the rapidly industrialized economies desperately needed new workers (Berend 2005), women were expected or even compelled to participate in the labour market (Stloukal 1999; Fidelis 2010).

- In parallel, the expanding service and light industry sectors in the West, which were considered suitable for women (Cherlin 1983; Goldin 1990; Pott-Buter 1993), also needed workers and employees. Labour force participation became a conventional part of the life course for most women, although they were perceived only as secondary earners and were expected to leave the labour market when starting a family. At the same time, the newly emerging possibilities for working part-time and the development of household appliances enabled women to combine family life with participation in the labour market: once their children reached school age, they could go back to work. Taking into account that they tended to have their children (typically not more than three) in their 20s and to cluster births closely together, they could re-enter the labour market as employees while still relatively young. Accordingly, investment in both work and (smaller) families became increasingly compatible for younger generations of better educated women (Morgan 1991; Bonvalet et al. 2014).

Summing up, these arguments imply the following mechanisms that linked the early stages of the fertility transition with the baby boom. First, the diffusion of family size limitation in the earlier generations was linked with increased educational attainment in the next generation (i.e., a transition from child quantity to child quality). Next, once family size limitation had become a structural part of family life, educated women could start a family, stop childbearing early, and still realize their earning potential and personal ambitions in the labour market. Conversely, a larger proportion of women with a predisposition to start a family would now pursue post-primary education, and the group would become less and less select in terms of family ambitions (Van Bavel 2014). As a result, the proportion of educated women who

started a family would increase, and the expansion of education would not lead to decreasing fertility in the overall population. To the extent that the inclination to start a family grew at a greater pace than educational enrolment and attainment, fertility could even increase.

Recent evidence about the baby boom is consistent with this interpretation. Using decomposition techniques, Reher and Requena (2015) showed that despite educational expansion and the negative educational gradient in family size for women, completed fertility still increased, because women of all educational levels exhibited rising fertility rates. The positive effect of increasing fertility rates outweighed the negative effect of changing population composition by education in all eleven countries these researchers analysed, including European and non-European ones. Van Bavel (2014) reported a strongly declining educational gradient in completed fertility in the cohorts producing the baby boom in Belgium, with increasing marriage rates and declining childlessness explaining the larger part of the convergence in fertility between women of different educational levels. Sandström (2014) found that fertility differentials by educational level were much reduced among Swedish women and that this produced the baby boom peak of the 1960s. He argued that the convergence in childbearing behaviour between better educated and less educated women was crucial for the 1960s boom in Sweden, as the proportions of women with secondary and post-secondary education increased substantially in the cohorts born after the mid-1930s.

These pieces of evidence refer to the northern and western parts of Europe, which by the end of the Second World War were well advanced in their fertility transitions. Large family sizes were still seen in most countries lying on the eastern side of the Hajnal line and in southern Europe (Frejka 2008). Nevertheless, a recent study of Spanish women born during the first half of the twentieth century showed that the negative association between education and fertility there also resulted mainly from differential rates of family formation. After selecting married women with at least one child, the educational gradient in fertility disappeared (Requena and Salazar 2014).

Given our theoretical arguments and these earlier findings, we expect to find that the association between women's education and family formation changed in important ways during the baby boom; namely that an increasing proportion of women with advanced education started a family and had at least one child.

The consolidation of the two-child norm

Although a large part of the baby boom took place in times of economic prosperity and optimism, stimulating early family formation, these factors can at most only partially explain it. Further, the revival of fertility had already started in the mid-1930s (Van Bavel and Reher 2013). It seems plausible that the boom also involved a pronatalist cultural tide that played a role of its own, perhaps related to the fear of population decline (Teitelbaum and Winter 1985; Van Bavel 2010). For the US, there is survey evidence that the revival of fertility during the baby boom was fuelled by increases in the normative pressure to have two children (Blake and Das Gupta 1975). In his review of the explanations for the baby boom, Bean (1983) also concluded that the acknowledged cultural emphasis on the family, home, and motherhood must be assigned some independent causal role. Nevertheless, it remains hard to quantify and prove this empirically.

What has been documented, however, is the increasing homogeneity in family sizes observed during the period: the baby boom involved more people having at least two children and fewer people having more than four children (Bean 1983; Requena and Salazar 2014; Sandström 2014; Van Bavel 2014; Reher and Requena 2015). Bean (1983) interpreted this increasing homogeneity as signalling the emergence and consolidation of a two-child norm: part of the baby boom resulted from ever larger proportions of the population being able to 'comply' with the norm that it is best to have at least two children. The two-child norm has proved to be pervasive and persistent (Sobotka and Beaujouan 2014).

This normative interpretation follows the categorization of the parity distribution proposed by Ryder (1980): (1) the proportion remaining childless (as opposed to those with at least one child); (2) the proportion having the 'normative' number of children (namely two); and (3) the proportion having 'optional' children (i.e., more than the normative number, meaning three or more). The justification for this categorization is that social norms 'pressed people into a preference for marriage over non-marriage, parenthood over non-parenthood, and at least two children rather than an only child [...] Beyond the second child, the progression is primarily a matter of individual preference' (Ryder 1980, p. 33). To explain variation in progression at low parities, 'one should look within the realm of normative pressure in relation to the socio-economic context' (Ryder 1980, p. 34). By

contrast, to explain variation in parity progression past the second child, one should look 'within the realm of discretionary reproduction', although unwanted or unplanned pregnancies may also contribute at these higher parities (Ryder 1980, p. 34). Testa et al. (2014) recently showed that the distinction between 'normative' and 'discretionary' (or 'optional') parity progression remains relevant for childbearing decisions, even today.

The question remains to what extent increasing homogeneity around the two-child family holds across and within countries, when comparing women by level of educational attainment. A recent study by Reher and Requena (2015), using the coefficient of variation to measure heterogeneity but looking at all women irrespective of education, did indeed report increasing homogeneity in the number of children ever born in a range of European and non-European countries (including the US). In the current paper, we investigate whether increasing homogeneity also holds between educational groups (i.e., did differences between educational groups become smaller?), within educational groups (i.e., did the variance in fertility measures decrease within each level of education?), and among all women within countries, irrespective of education.

Third births and beyond

In the US, the baby boom involved an increase in births of both normative and discretionary orders: not only did a growing proportion of the population have at least two children, but a growing proportion also had more than two (Ryder 1980). The latter is particularly notable, since it represents an unexpected departure from the secular, downward trend driven by the diffusion of family size limitation. Survey evidence suggests that part of the increase in the proportion of third, fourth, and higher-order births did not result from an increase in intended higher-order births, but instead from an increase in unintended births (Ryder 1978; see also discussions in Bean and Swicegood 1979; Bean 1983). Furthermore, Emeka (2006) has shown that the generations that produced the baby boom, themselves born around the Great Depression era, were the only twentieth-century cohorts in the US whose actual fertility was higher than their ideal fertility. The study also showed a continued decline of ideal fertility from the 1880s until the 1940s cohorts, from an ideal family size of just over three children to about two-and-a-half. According to Emeka's study, the decline in ideal fertility

continued monotonically over the cohorts that produced the baby boom, although this contradicts an earlier study by Blake (1966).

We argue that the proportion of women having three or more children could rise as a result of two different scenarios. First, it may be that a larger proportion of women who already have two children move on to have additional discretionary children. This scenario would imply that parity progression ratios (PPRs) to third and higher-order children are on the rise. The second scenario is that parity progression to third and higher-order children remains stable or even reduces, but that more women have at least two children and, as a result, more women are at risk of having three children or more. To see to what extent each scenario applies, depending on the country and level of education, we compare parity distributions and PPRs. Time series showing simple parity distributions will tell us whether an increasing incidence of higher-order births contributed to the baby boom. Comparing these with time series of progression ratios will inform us about the applicable scenario.

The second scenario could explain why more third and higher-order births occurred, without the need to assume either increasing family size ideals or a weakening effectiveness of fertility control. The first scenario would instead imply higher family size ideals, less effective birth control, or both. One possible reason to expect this first scenario follows from the fact that the baby boom involved a shift towards earlier family formation. This shift implies that women were exposed to the risk of (unintended as well as intended) pregnancy for a longer part of their fertile lives, with the additional exposure concentrated at ‘prime-time’ ages, when couples are younger, more sexually active, and in their peak years of fecundity (Ryder 1978).

A recent study of Spanish women born in the first half of the twentieth century has indicated that contraceptive use was more widespread and more sophisticated among women with a higher level of education than among the less educated (Reher et al. 2014). If more highly educated women are indeed more successful in limiting their fertility, then we would expect higher-order birth rates to be less likely to increase among better educated women and more likely to increase among the less educated. An additional reason for expecting such an association between education and higher-order births follows from timing–quantum interactions, since the more highly educated tend to start a family later. A later age at first birth is associated with a shorter ‘at risk’ period for proceeding to higher-order births.

Lastly, we expect that there will be a connection between lower-order (normative) and higher-order (discretionary) parity progressions, notably among more highly educated women. The previous subsections presented the argument that as family size limitation and the two-child family were gaining a stronger foothold, better educated women became more inclined to start a family rather than stay unmarried and childless. This implies a negative correlation between childlessness and family size limitation; or in terms of PPRs, a negative correlation between the progression to the first child on the one hand and progression from the second child to higher-order children on the other. As more highly educated women were better able to stop at two children, they would feel less of a need to remain childless in order to realize their non-family career ambitions: they could reach the normative family size without having any discretionary children.

Data and measurements

We use data about women’s educational attainment and their final number of children from the US and 14 European countries: Austria, Belgium, Croatia, the Czech Republic, Estonia, France, Germany (but only the former East Germany), Greece, Hungary, Poland, Slovakia, Spain, Sweden, and Switzerland. These represent a broad range of countries from the Western world in terms of historical and cultural background, as well as demographic conditions. Some countries were already well advanced in the demographic transition and had experienced below-replacement fertility rates during the interwar years (Van Bavel 2010), and some countries experienced a clear baby boom whereas others did not. Hence, comparing these countries will allow us to shed more light on how education relates to fertility trends under different conditions. A drawback of including this number of countries is that we are comparing very different educational systems. To minimize any resulting problems of comparative classification, we use broad categories, distinguishing between only three levels of education, as discussed in the ‘Educational attainment’ subsection and in greater detail in the supplementary material (section B).

Retrospective census data

Our analyses rely on data that either cover the complete population of women or are based on very large

samples, such that sampling error can to a large extent be ignored and tests of statistical significance are superfluous. Table 1 gives country-specific information about the data and sources.

With regard to the censuses and their timing, two potential limitations need to be considered. First, the census year should not be too soon after the baby boom period, in order for the fertility of the cohorts under study to be treated as (almost) completed. If the age of 40 is taken as the upper limit for childbearing, censuses taken around 1980 allow examination of birth cohorts up to 1940 and later censuses will cover later birth cohorts. Second, if a census is from a relatively recent period, selective old-age mortality and gaps in people's memories become potential sources of bias for older birth cohorts (Van Bavel 2014). We discuss these sources of bias and other data-related issues in the supplementary material (section A). The conclusion there is that selective survival and under-reporting of births may produce slight underestimates of fertility, especially for the older cohorts, to the extent that they are correlated with family size. This could result in somewhat exaggerated estimates of the magnitude of fertility recovery during the baby boom, although the trends in cohort completed fertility based on vital statistics are very similar to the ones we use based on retrospective census data (see next subsection). In some cases, we use more than one census, in order to optimize cohort coverage. For the Czech Republic and Austria, the most recent birth cohorts used in the analysis are taken from later censuses (the birth

cohorts of 1900–40 are from the 1980 or 1981 Census and cohorts of women born after 1940 come from the 1991 Census).

Cohort fertility

Our main objective is to examine the change in the quantum of fertility that is related to educational attainment. Although the baby boom is generally understood as a period phenomenon, the aim is to observe the fertility outcomes of the birth cohorts who produced the baby boom, namely the people born during the first four decades of the twentieth century. Considering, for example, that from a period perspective the baby boom peaked between 1955 and 1965, the cohorts who mainly contributed to this were born between 1920 and 1940. Women born before 1915 belong to generations that largely completed their childbearing before the baby boom, while women born after 1940 experienced their peak childbearing years after 1965.

We calculated completed fertility rates for five-year birth cohorts and compared these with corresponding official rates based on vital statistics (available from the online database of developed countries available from L'Institut national d'études démographiques (INED): <http://www.ined.fr/>) as an external consistency check. The results of the comparison are presented in Figure 1. As can be seen, the two time series match closely in all countries. The general pattern

Table 1 Data and sources for women's fertility and educational attainment in 15 countries

Country	Code	Source ^a	Year(s)	Birth cohorts covered	N women (thousands)
Austria	AT	CFE database	1981, 1991	1901–45	1,942
Belgium	BE	Hisstat.be	1981	1901–45	2,049
Croatia	HR	CFE database	2001	1917–45	644
Czech Republic	CZ	CFE database	1980, 1991	1901–45	2,410
East Germany	DD	IPUMS	1981	1901–45	1,178
Estonia	EE	Census, 25 per cent sample	1979	1901–45	67
France	FR	CFE database	1982	1917–42	135
Greece	GR	IPUMS	1991	1901–45	196
Hungary	HU	CFE database	1990	1901–45	108
Poland	PL	CFE database	2002	1921–45	68
Slovakia	SK	CFE database	1991	1901–45	838
Spain	ES	IPUMS	1991	1906–45	367
Sweden	SE	Linnaeus database, census, and register data	1970+	1916–45	1,301
Switzerland	CH	CFE database	2000	1901–45	896
US	US	IPUMS	1990	1901–45	2,138

^aCFE database is the Cohort Fertility and Education database (CFE 2017, <http://www.cfe-database.org/>); Hisstat.be is the database that contains the Belgian census data; IPUMS is the Integrated Public Use Microdata Series (Minnesota Population Center 2017, <https://international.ipums.org/>); Estonian data were provided by the Estonian Institute for Population Studies.

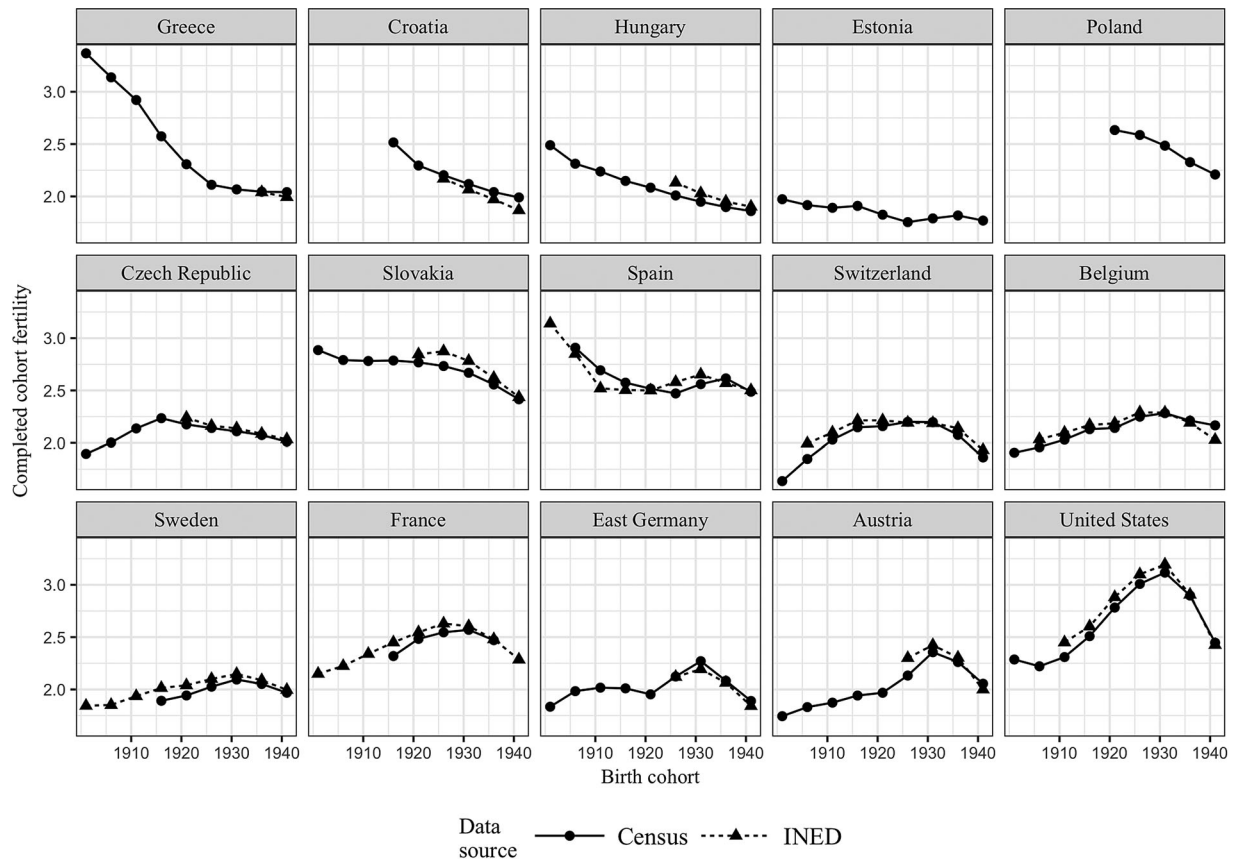


Figure 1 Completed cohort fertility for 15 countries: a comparison of estimates from our retrospective (census) data with vital statistics data from the INED database

Note: Years on x-axis indicate the starting year of birth for each five-year cohort interval (1900–04 to 1940–44). Countries are ordered by the percentage change in completed fertility observed for all women (irrespective of education), as reported in Table 2. *Source:* Authors' calculations from data listed in Table 1.

that emerges confirms earlier observations (Van Bavel and Reher 2013): there was a revival of cohort fertility only in countries where the fertility transition was well underway and that had reached low cohort fertility levels (typically around two children per woman) in generations born after the turn of the twentieth century (like Sweden, the Czech Republic, Belgium, and the US, for example). By contrast, Estonia is the one country where there was a downward trend despite fertility already having declined towards about two children per woman. Frejka et al. (2004) have attributed this absence of a baby boom to the violent reorganization of society and large-scale repression that took place in the Baltic states in the 1940s and 1950s. Recent microdata analysis lends support to this explanation (Puur and Klesment 2014). In Croatia, Greece, Hungary, Poland, and Slovakia, fertility was still relatively high in the earliest cohorts and subsequently declined. In Spain, it was very high for cohorts born in 1900–10 and declined substantially for

subsequent cohorts, but then rose slightly in the most recent cohorts.

Educational attainment

Comparing educational attainment across countries is not straightforward, given the cultural and institutional diversity in educational systems (Schneider 2010). For example, specialized intermediate studies such as nursing are classified as secondary in some countries, but as non-tertiary, post-secondary in others (UNESCO 2003). To minimize problems of equivalence, we chose to group attainment levels into three very broad groups based on the International Standard Classification of Education ('ISCED 1997', UNESCO 2003): low (ISCED 0–2), medium (ISCED 3–4), and high (ISCED 5–6). The supplementary material (section B) details our approach. For convenient reference, the terms low, medium, and high education are used interchangeably with primary, secondary, and tertiary education in this paper.

Figure 2 shows the evolution of the proportions of women with low, medium, and high education by country and birth cohort. In all countries, the proportion of women with education beyond the primary level rose. However, the extent to which this happened varied strongly by country. In Greece, Belgium, and particularly Spain, the changes were minor. By contrast, in the US, there were already more women with medium than low education from the 1915–19 cohort onwards. Several other countries also made this crossover, but later. Typically, the proportion of women with at most primary qualification went down, most notably for the baby boom cohorts (born in the 1920s and 1930s and coming of age in the 1940s and 1950s) and those born later.

Although the proportion of highly educated women increased in all countries, the proportion remained very limited in most, with the corresponding line looking almost flat in many. The largest increases in the proportion of highly educated women are visible in the US and Estonia. The decline in the proportion of women with low education was driven initially by

the proportion that completed secondary education. Therefore, when we talk about the expansion of girls' education, it was for the most part limited to secondary education in the generations studied here. Nevertheless, the shift from primary only to secondary-level education has proven to be a crucial one for reproductive behaviour (Cohen 2008).

In the 'Results' section, we relate women's educational attainment to their completed fertility as measured at the time of a census, although actual childbearing often occurred much earlier. Since the available data do not allow us to determine the exact timing of leaving education in relation to actual childbearing, it is important to note that the causal relationship between education and fertility may run in both directions. The educational path chosen by a woman can have an impact on her childbearing behaviour, but in some cases early childbearing also influences future educational attainment. As a result, the associations presented should not be interpreted as estimates of the causal effect of education on fertility. This is discussed in greater detail in the supplementary material (section A).

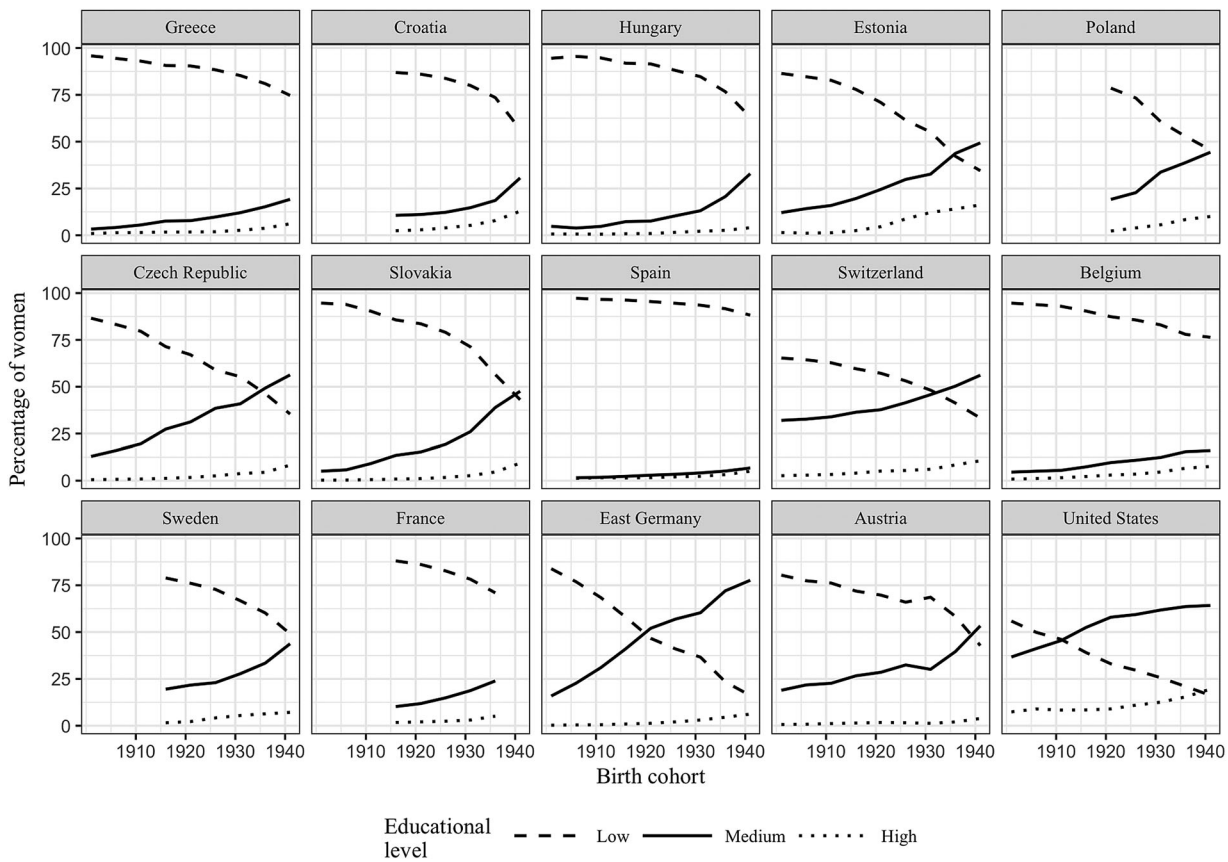


Figure 2 Percentage distributions of women by level of education, by birth cohort in 15 countries

Note: Years on x-axis indicate the starting year of birth for each five-year cohort interval (1900–04 to 1940–44). Countries are ordered by the percentage change in completed fertility observed for all women (irrespective of education), as reported in Table 2. Source: As for Figure 1.

Results

This section first paints the general picture of completed cohort fertility by educational level and verifies to what extent the hypothesis of increasing homogeneity in family size applies. Subsequently, we focus on the role played by declining childlessness and increasing family formation across educational groups. Lastly, we investigate our questions regarding higher-order births.

Cohort fertility by level of education

Figure 3 presents cohort completed fertility by country and level of education. Countries with a baby boom typically show an increase in cohort fertility across all educational groups. An exception is France, where the fertility of the highly educated shows a decline, at least for the early 1920s cohorts. However, the fertility of the very small group of highly educated women in the 1915–19 cohort seems suspiciously high, so we are sceptical

about whether this figure depicts a realistic picture of what actually happened. In countries where overall completed cohort fertility did not rise (Croatia, Estonia, Greece, Hungary, Poland, Slovakia, and Spain), this is because the fertility of women with low education did not increase. Nevertheless, in these countries fertility levels still rose among women with medium or high education. In summary, the fertility of secondary- and tertiary-educated women increased almost everywhere, but whether or not there was a revival of overall cohort fertility largely depended on the behaviour of the (still very large) group of women with low education. In a number of countries, there seems to be a clear convergence in completed fertility between educational levels (Belgium, Croatia, Estonia, Greece, Hungary, and Spain). In other countries, the trends for different levels of education run more in parallel.

To shed more light on the issue of increasing homogeneity with respect to completed cohort fertility, Figure 4 plots the coefficients of variation (i.e., the ratio of standard deviation to the mean) for

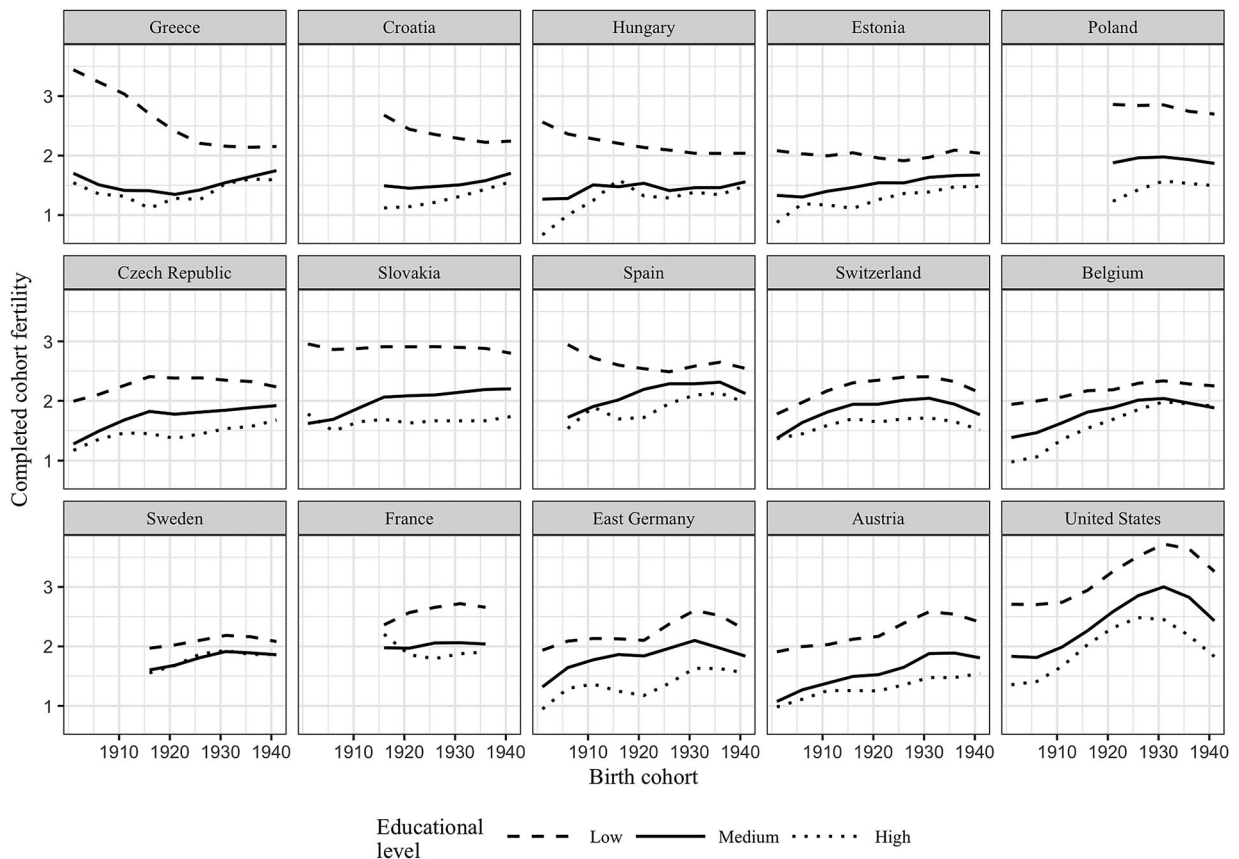


Figure 3 Completed cohort fertility by birth cohort and level of education in 15 countries

Note: Years on x-axis indicate the starting year of birth for each five-year cohort interval (1900–04 to 1940–44). Countries are ordered by the percentage change in completed fertility observed for all women (irrespective of education), as reported in Table 2.
Source: As for Figure 1.

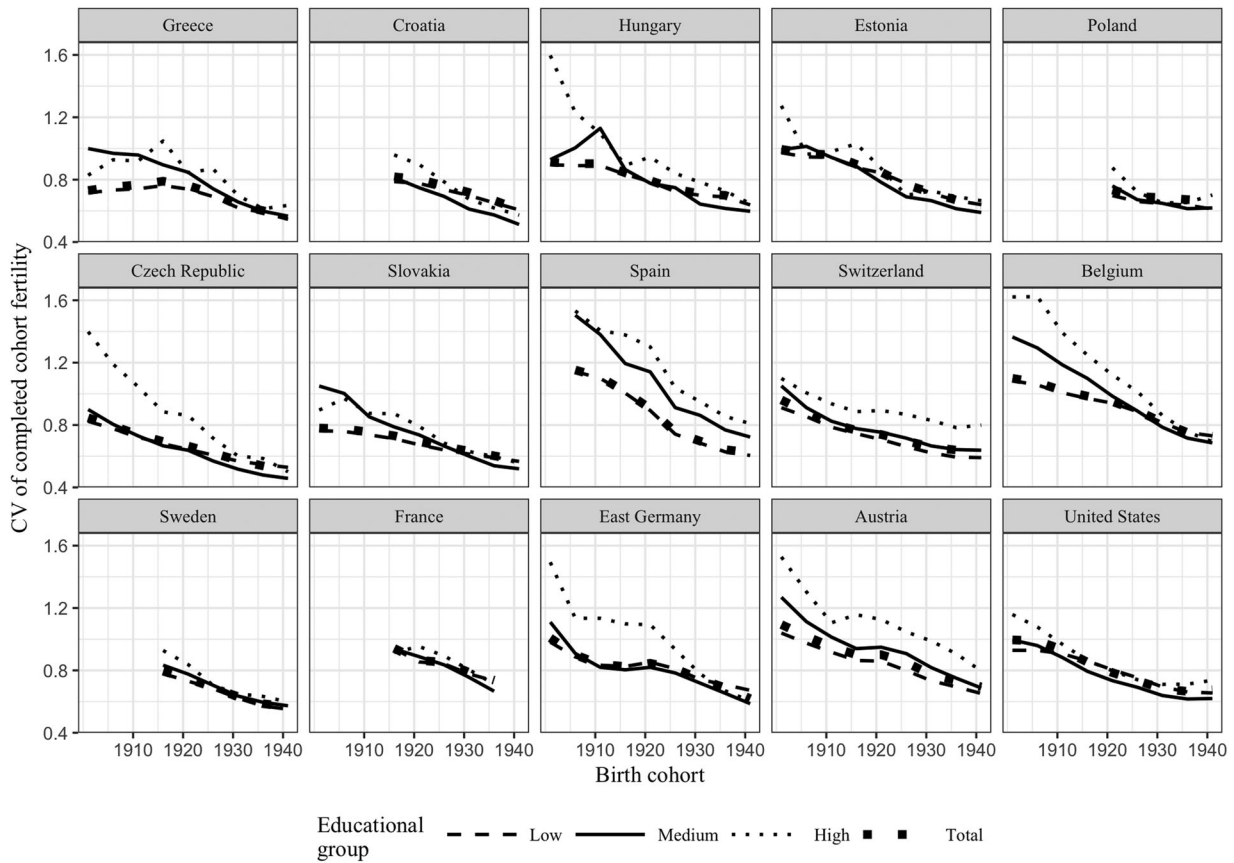


Figure 4 Coefficient of variation (CV) of completed cohort fertility: all women (bold squares) and separately by level of education, by birth cohort in 15 countries

Note: Years on *x*-axis indicate the starting year of birth for each five-year cohort interval (1900–04 to 1940–44). Countries are ordered by the percentage change in completed fertility observed for all women (irrespective of education), as reported in Table 2.

Source: As for Figure 1.

completed fertility for the total population of women (bold squares) as well as separately by level of education. Overall, all countries move in the direction of a more homogeneous distribution of final number of offspring, among all levels of women's education. The increasing homogeneity holds not only within countries, but also within educational groups. In many countries (Austria, Belgium, the Czech Republic, and East Germany), the highly educated are more heterogeneous than the other two groups, but this dissimilarity decreases over time. Only in Switzerland does there seem to be a different trend, namely that the variation decreases less within the highly educated group than within the other groups.

Figure 5 shows the extent to which educational groups became more similar to each other over the cohorts, by plotting the relative differences in completed fertility between attainment levels by cohort. More specifically, it charts the completed fertility of women with low and high education, respectively,

relative to that of their counterparts with medium education. The general picture is one of increasing convergence between attainment levels, but there is a stronger convergence between women with low and medium education than between those with high and medium education. There are also examples of stability over time in the 'low vs. medium' gradient (such as Switzerland (CH)). When comparing highly educated women with the medium educated, the differences are smaller and more stable. For instance, in Sweden (SE) completed fertility is almost the same in the two educational groups. All in all, Figure 5 suggests that the greatest difference is between women with at most primary education on the one hand, and those with secondary or tertiary education on the other.

Family formation

We expected the baby boom to be partly attributable to increasing proportions of women with education

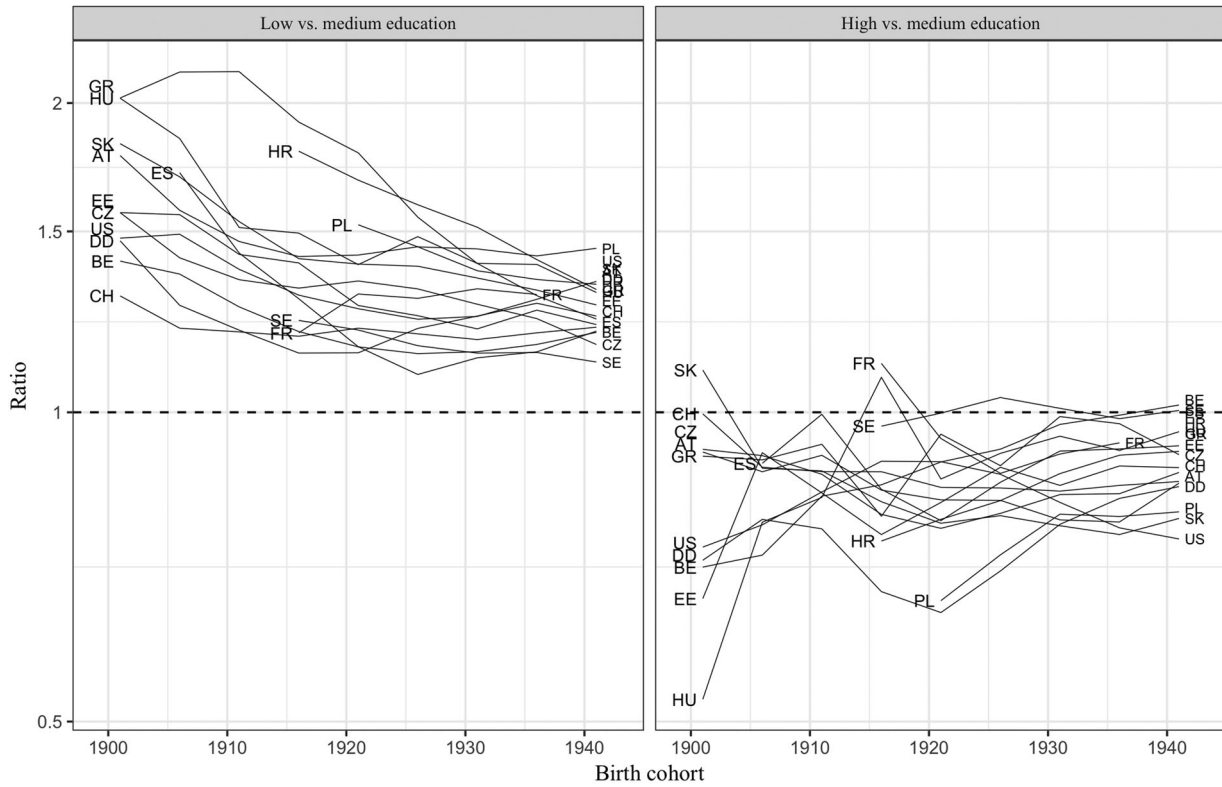


Figure 5 Relative fertility ratios for low vs. medium and high vs. medium education, by birth cohort in 15 countries

Note: The y-axis is in log scale for symmetry around ratio of unity. Years on x-axis indicate the starting year of birth for each five-year cohort interval (1900–04 to 1940–44).

Source: As for Figure 1.

beyond primary level having ever started a family. Such is indeed shown to be the case. Figure 6 shows that childlessness declined for all three educational levels in all countries (except in Greece for the 1900–20 cohorts); not only in countries with a baby boom, but also in those without a clear boom (including Estonia, Hungary, and Spain). Nevertheless, childlessness generally declined among women with medium or high education. As a result, there was a downward and convergent trend, even though the least educated continued to be the least likely to remain childless.

To what extent can the growth of the proportion of the population having at least one child, particularly among more educated women, explain both the revival of completed cohort fertility and the diminishing differences in fertility between educational levels? To answer this question, we calculated completed fertility only for women who had at least one child (Figure 7). It turns out that both the educational gradient and the increase in overall cohort fertility are much reduced when looking only at women with at least one child. In some countries, the educational gradient in completed fertility

almost disappears in this group: in Belgium and Sweden, the lines for different educational groups are very close to each other. The lines in these countries also look almost flat, indicating no increase in completed family size among those who had at least one child.

To obtain a more precise picture, Table 2 presents the percentage change in completed fertility between the 1916–20 and the 1931–35 cohorts by country and level of education. The first cohort was chosen because it is the earliest one available for all countries, and the second because it experienced family formation largely before the advent of modern hormonal contraceptives. The table allows comparison of change for all women (left-hand side of the table) with change for those who had at least one child (right-hand side of the table). Most of the numbers on the right-hand side of the table are negative, indicating that in most countries there was a decline in the average number of children born between the two selected cohorts among those who gave birth to at least one child. Thus, for most countries the revival of completed cohort fertility, observed particularly among

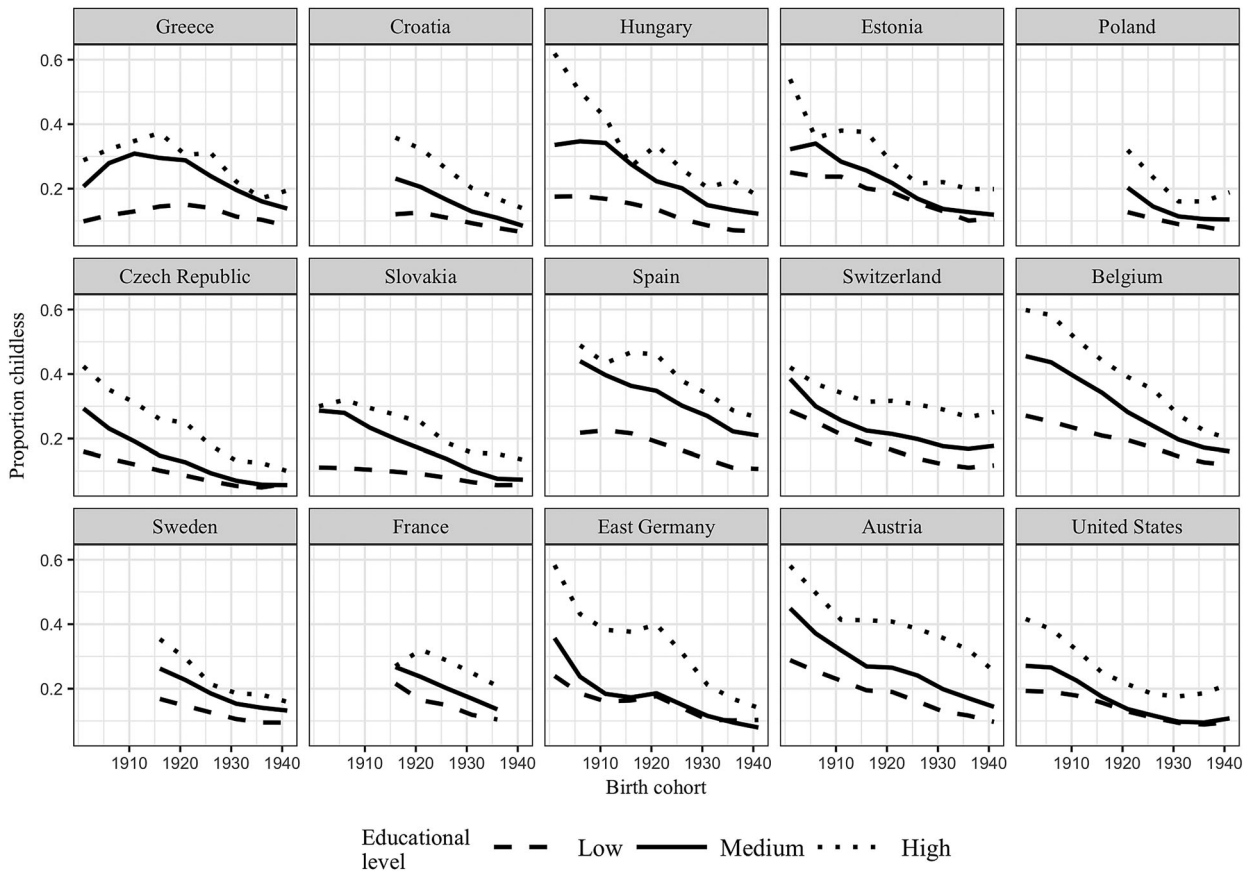


Figure 6 Proportion of women childless by birth cohort and level of education in 15 countries
Note: Years on x-axis indicate the starting year of birth for each five-year cohort interval (1900–04 to 1940–44). Countries are ordered by the percentage change in completed fertility observed for all women (irrespective of education), as reported in [Table 2](#).
Source: As for [Figure 1](#).

Table 2 Percentage change in completed cohort fertility between the 1916–20 and 1931–35 cohorts, by educational attainment, in 15 countries

Country	All women				Women with at least one child			
	Educational attainment				Educational attainment			
	Low	Medium	High	Total	Low	Medium	High	Total
Austria	21.7	25.6	17.5	21.3	12.5	14.6	7.5	12.1
Belgium	7.6	12.6	28.9	7.2	-0.4	-7.7	-1.0	-1.3
Croatia	-14.8	1.1	17.5	-15.8	-17.4	-10.8	-5.5	-19.0
Czech Republic	-2.5	1.1	5.7	-5.6	-7.4	-7.3	-9.9	-10.9
East Germany	22.4	12.7	31.0	12.9	14.3	5.4	3.7	5.9
Estonia	-3.7	11.6	24.6	-6.3	-11.5	-3.8	-0.3	-14.2
France	15.1	4.3	-14.9	10.8	2.5	-8.0	-17.2	-0.6
Greece	-20.1	9.7	37.2	-19.7	-22.9	-3.8	10.5	-22.8
Hungary	-7.6	-1.1	-13.3	-9.3	-14.4	-15.9	-20.4	-16.0
Poland	-0.3	5.2	27.8	-5.7	-4.4	-5.3	3.5	-10.3
Slovakia	-0.4	4.0	-1.5	-4.2	-3.9	-7.4	-15.2	-7.9
Spain	-0.6	13.4	23.6	-0.5	-9.9	-1.1	-0.5	-9.6
Sweden	10.9	19.3	24.2	10.7	3.1	4.0	-1.4	2.4
Switzerland	4.4	5.2	0.7	2.3	-3.4	-1.0	-2.6	-3.6
US	26.4	32.6	20.9	24.2	17.7	21.3	10.1	14.8

Note: For Poland, the base cohort is 1921–25.
Source: Authors' calculations from data listed in [Table 1](#).

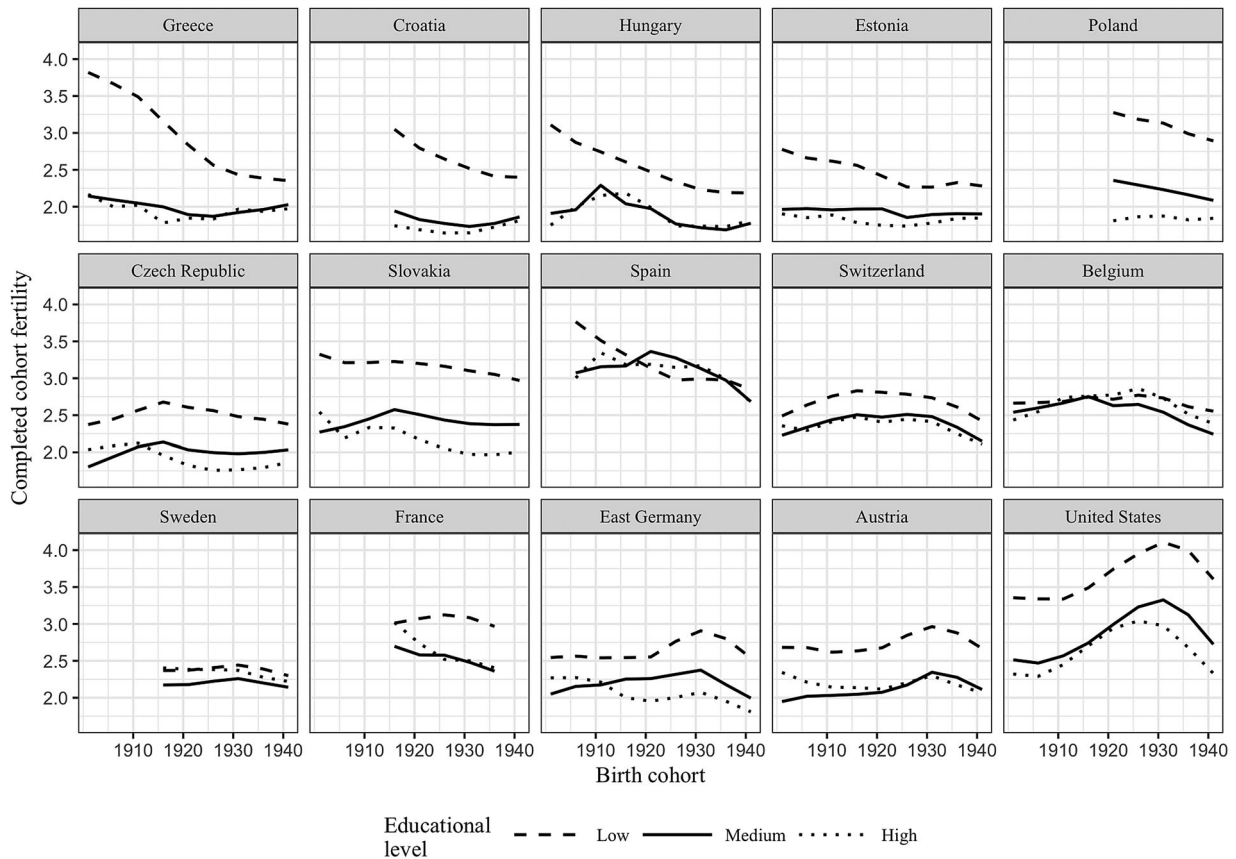


Figure 7 Completed cohort fertility for women with at least one child, by birth cohort and level of education in 15 countries

Note: Years on x-axis indicate the starting year of birth for each five-year cohort interval (1900–04 to 1940–44). Countries are ordered by the percentage change in completed fertility observed for all women (irrespective of education), as reported in Table 2. *Source:* As for Figure 1.

women with medium and high education, can be explained entirely by the declining proportions of childless women. There are some exceptions, including most notably the US with its exceptionally strong baby boom, as well as Austria and East Germany, where family size increased across the educational spectrum. In Sweden, completed fertility also increased marginally, except among the highly educated. In Greece and Poland, by contrast, family size increased only among the highly educated who started a family.

Parity distribution and parity progression

To what extent did the increase in cohort fertility involve a growing proportion of women reaching the normative two children, and to what extent did it involve progression to higher-order discretionary births? Figure 8 shows the proportions of women having no children, one child, two children, or three or more children, by country and

educational level. Figure 9 presents the corresponding PPRs. The top row of panels in both figures reiterates the lesson just learned about decreasing childlessness and the increasing propensity to start a family at all levels of education, but in particular among those who completed at least secondary education.

Next, we can see that the rising proportion of women having at least one child did not result in rising proportions having only one child (Figure 8, second row). On the contrary, there was a tendency for the proportions of women having just one child to either decline or stabilize, Hungary being an exception. This results from rising parity progression after the first child: among those who had one child, the propensity to have a second child increased across the board, but particularly among those with at least secondary education (Figure 9).

After the second child, parity progression in most countries appears stable, if not already declining, in the earliest cohorts and typically declines in the

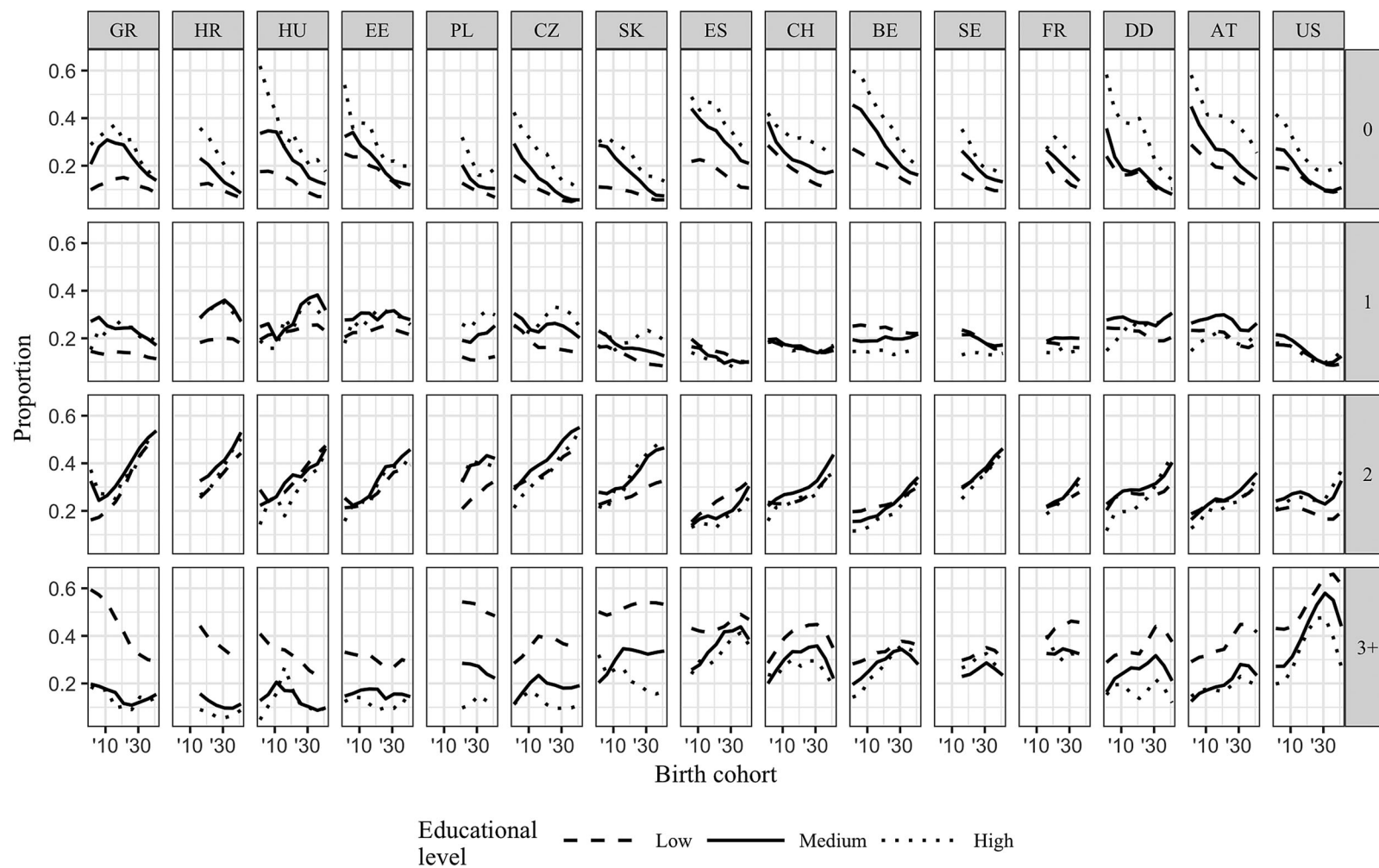


Figure 8 Parity distributions: proportions of women ending up with 0, 1, 2, or 3+ children, by birth cohort and level of education in 15 countries
Notes: See [Table 1](#) for country codes. Years on x-axis indicate the starting year of birth for each five-year cohort interval (1900–04 to 1940–44). Countries are ordered by the percentage change in completed fertility observed for all women (irrespective of education), as reported in [Table 2](#).
Source: As for [Figure 1](#).

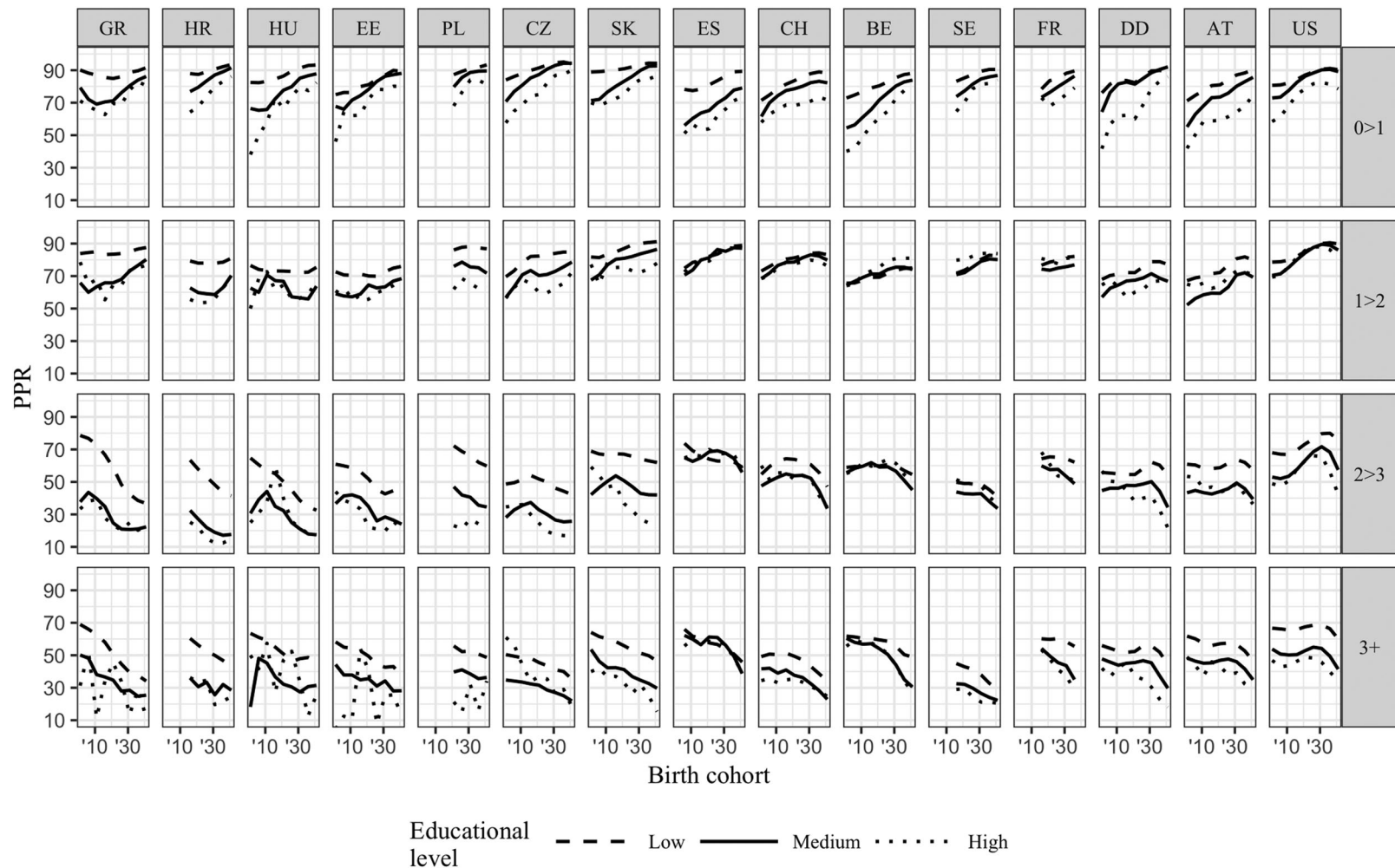


Figure 9 Parity progression ratios (PPRs): proportion among those with 0, 1, 2, or 3 children proceeding to have an additional child, by birth cohort and level of education in 15 countries

Notes: See [Table 1](#) for country codes. Years on *x*-axis indicate the starting year of birth for each five-year cohort interval (1900–04 to 1940–44). Countries are ordered by the percentage change in completed fertility observed for all women (irrespective of education), as reported in [Table 2](#). PPRs for highly educated women with three children are very erratic in Estonia, Greece, Hungary, and Poland due to the very low number of cases in this group.

Source: As for [Figure 1](#).

Table 3 Correlation coefficients for PPR0–1 vs. PPR2–3 over all cohorts by educational attainment

Country	Educational attainment		
	Low	Medium	High
Austria	0.12	0.05	–0.89
Belgium	–0.51	–0.57	–0.24
Czech Republic	–0.50	–0.42	–0.94
Croatia	–0.95	–0.96	–0.88
East Germany	0.52	–0.23	–0.87
Estonia	–0.97	–0.91	–0.92
France	–0.50	–0.94	–0.51
Greece	–0.29	–0.61	–0.56
Hungary	–0.99	–0.92	–0.13
Poland	–0.98	–0.92	0.61
Slovakia	–0.95	–0.35	–0.96
Spain	–0.84	–0.31	–0.48
Sweden	–0.72	–0.73	–0.77
Switzerland	–0.14	–0.16	–0.68
US	0.97	0.86	0.61

Source: As for Table 2.

cohorts born after 1930 (Figure 9); that is, the cohorts that could turn to modern hormonal contraception (available from the mid-1960s onwards in most countries) after having two children. In CEE countries, these women also made use of abortion liberalization after the late 1950s. PPRs after the third child were already in decline, even in the older cohorts. However, since progression from parities 0–1 and 1–2 had been on the rise, a larger proportion of the population was exposed to the risk of having a third or higher-order child. As a result, the proportion of women with three or more children could have risen for the baby boom cohorts, even if the propensity to have more than two children (as measured by the PPR2–3) did *not* increase. This occurred in a number of countries, including Austria, Belgium, Switzerland, and Sweden, and corresponds to the second of the two scenarios depicted in the background section ('The baby boom, fertility, and women's education').

The general pattern that stands out is the increasing dominance of the two-child family, not just in terms of parity distribution (Figure 8, third row of panels) but also in terms of parity progression (Figure 9): PPRs for those with fewer than two children were increasing, whereas PPRs for those with two or more children were decreasing. This occurred in all educational groups, but again, particularly for women who had completed at least secondary education.

To see whether the inclination to start a family (PPR0–1) was gaining ground particularly among women with advanced education, at the same time

as parity progression after the second child (PPR2–3) was declining, Table 3 presents the correlation coefficients for the association between the two parity progressions by educational attainment. In general, the correlation across cohorts between the lower and higher PPRs tends to be negative for all educational groups. Among highly educated women in particular, only the US and Poland appear to be exceptions; and in case of the US, in line with the evidence in Morgan (1991), the exception even holds for all educational groups. Apart from these, the general pattern suggests that the rising propensity to start a family (as indicated by the increasing PPR0–1 across cohorts) went hand in hand with the diffusion of stopping behaviour after having two children (as indicated by the decreasing PPR2–3). This holds particularly for educated women.

Conclusion and discussion

In this study, we aimed to explain the apparent paradox of the baby boom at a time when both fertility quantum and the educational attainment of women were on the rise. Our analysis shows that the trends in fertility and education were compatible because, in countries with a baby boom, the negative compositional effect of educational expansion was more than compensated for by an overall increase in cohort fertility. While women with education beyond the primary level did indeed continue to exhibit lower completed fertility than women with only primary education, the proportion of women

in the population who were more highly educated still tended to be relatively limited; this means that the revival in fertility rates outweighed the negative effect of the compositional shift. This dominance of the effect of changing rates over changing population composition was reinforced by the increase in fertility across all educational groups, at least in the countries experiencing a baby boom.

The fact that the recovery of fertility rates was not restricted to any specific educational group suggests that it was not significantly related to socio-economic status. Given the high weight of women with low education in the total population, the revival of fertility in this group was crucial for the occurrence, or not, of a baby boom in each country: if the fertility rates of the less educated did not increase (but instead continued to decrease as a lagged part of the fertility transition), then there was barely a baby boom. This was the case in many eastern and southern European countries.

The participation of women with more advanced education in the baby boom is, however, the most notable: among women with medium and high education, the increase in cohort fertility occurred in almost all countries, even in those that barely experienced a baby boom. For women with completed secondary education—who became the dominant group in the more recent cohorts—only those in Greece did not show an increase in fertility. Since highly educated women still represented a very small proportion of the population, their influence on the overall picture of completed fertility was still limited from a purely statistical point of view. However, their participation was very significant in sociological terms because it heralded, as we further argue in this section, a new demographic regime where pursuing a professional career after obtaining advanced education could be combined with motherhood, thanks to family size limitation.

The crucial trend among the cohorts analysed is the decline in childlessness. This decline was seen across countries and educational groups. The decrease in childlessness explains a large part of the revival of cohort fertility: for many countries, cohort trends in completed fertility are quite flat if the calculations are restricted to women with at least one child. To varying degrees in different countries, differential childlessness also explains the educational gradient in completed fertility. The decline in childlessness was typically much stronger among women with more advanced education than among those with only primary education. Virtually all countries show decreasing childlessness and increasing homogeneity in the incidence of family

formation across educational levels, irrespective of whether or not the overall picture implies a recovery in fertility levels and a baby boom. Reher and Requena (2015) showed that the decline in childlessness was not limited to Europe and North America: it also occurred in countries as diverse as Argentina, Mexico, Morocco, Turkey, and China. The fact that childlessness declined even in countries with almost universal and early marriage suggests that it was not only the result of changing marriage behaviour, but that factors such as improving reproductive health conditions may also have played a role.

The emerging picture among the baby boom generations is one of growing homogeneity and an increasing dominance of the two-child family. This holds within countries, both across and within educational groups. In all countries and educational groups, the proportion of women ending up with two children soared. At the same time, in many countries the proportion of women having more than two children also increased (although the latter trend was often reversed in the most recent cohorts). Yet the increase in the proportion of women with more than two children need not imply an increase in ideal family sizes or fertility intentions, since progression to third and higher-order births tended to remain stable or (especially in the more recent cohorts) go down. The two-child norm gained ever stronger ground in the very latest cohorts studied, which were able to benefit from the advent of efficient hormonal contraception: in these cohorts, the proportions having more than two children started to decline again. Accordingly, during the baby boom, if a greater proportion of women ended up with more than two children, it was because a greater proportion of them were at risk of having more than two, which followed from decreasing childlessness and increasing parity progression after the first child. All this combined—increasing parity progression up to the second child and decreasing parity progression thereafter—is indicative of a strong consolidation of the two-child norm across countries, generations, and educational levels. This norm would later turn out to be persistent and pervasive (Sobotka and Beaujouan 2014).

These observations explain why some countries showed a revival in cohort fertility (underlying a baby boom) and others did not. In both groups of countries, we find that PPRs for those with less than two children increased, while PPRs for those with two or more children decreased. Hence, whether cohort fertility rose or not hinged on the balance between these two opposing trends: the boom occurred only if the increase of the PPRs of

those with less than two children was stronger than the concurrent decrease of the PPRs for those with two children or more. This also explains why the baby boom was typically only observed in countries where the fertility transition had advanced considerably: in baby boom countries, most of the decline in parity progression after the second child had already occurred before the middle of the twentieth century, meaning that the increase in parity progression up to the second child more easily outweighed any further decline in parity progression at higher parities. In the other countries, mostly eastern and southern European, the increase in progression to the first and second child was often overwhelmed by strong declines at higher parities.

Likewise, the weakening of the Malthusian marriage pattern can be regarded as a salient part of the mechanism that led to the revival of cohort fertility. In particular, the fact that the proportion of women not starting a family was so high in Western Europe before the boom allowed the parity progression to first birth to increase markedly during the baby (and marriage) boom. Conversely, in countries where marriage was nearly universal (e.g., Greece and Slovakia; possibly also Croatia and Poland, see Frejka 2008), there was much less room for such an increase and hence no baby boom.

Overall, the baby boom involved a unique combination of factors. One factor was the male breadwinner–female homemaker model, with its heyday in Western countries with strongly specialized gender roles, despite the expansion of education among both sexes. The post-war decades were also a time of strong economic growth and an unprecedented expansion of welfare states. Although the revival of fertility had already started in many countries before the war, post-war prosperity boosted earlier and more widespread family formation (see Sandström 2017). Furthermore, having been through a period of below-replacement fertility, many countries saw family life culturally glorified and governments installed pronatalist policies (Van Bavel 2010). The 1950s became the so-called golden age of the family: marrying and having children were almost universally valued and widely shared aspirations, among both men and women. Moreover, marriage was still generally considered a lifelong commitment and marital dissolution was infrequent. Last but not least, all this took place in a context where fertility control was practised by traditional means (and, particularly in socialist states, through abortion), before the advent of more efficient contraceptive technology. From the mid-1960s onwards, this pattern was broken by the introduction of the contraceptive pill, which started

to be used not just to prevent higher-order births, but also to postpone or prevent first births.

Thus, the baby boom has emerged as an important link between a first and a second stage in the transition to low fertility, with the first stage typically ending around the 1930s (depending on the country) and the second stage starting in the 1960s. The first stage was driven by increasing investment in children's education, where the quest for higher child quality motivated parents to limit offspring quantity. In the second stage, this quest and motivation remained, but women were now far better educated than their mothers' and grandmothers' generations, and could make use of modern contraceptives. This heralded the subsequent changes in family life, including the postponement of parenthood, the rise of unmarried cohabitation, and the increase in divorce rates (Van de Kaa 1987; Lesthaeghe 2010). The baby boom can thus be seen as a period in which men and women were coming to grips with the implications of the first stage of the fertility transition. Even before the advent of medical contraception, family size limitation was becoming expected rather than unusual behaviour. Women could now pursue a professional career after completing advanced education, while also starting a family of a limited size rather than not having any children at all. This combination enabled subsequent changes in family life, leading to the gender revolution (Goldscheider et al. 2015).

Notes and acknowledgements

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