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Adaptation in the tempo and quantum of childbearing?

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Abstract

Immigrant women who have lived longer in a destination after migration often have relatively low levels of fertility, which is sometimes taken as evidence of the adaptation of behavior. This evidence is almost exclusively based on studies of immigrants from high-fertility settings, while the fertility of immigrants from low-fertility settings has been largely overlooked. Research has also rarely studied the fertility of immigrants who migrated as children, despite the methodological advantages of applying such an approach. This study focuses on women who grew up in Sweden with a migration background from low-fertility origins. We expect that Sweden's welfare regime makes it easier for women to combine childbearing and employment, regardless of migration background, thereby facilitating an adaptation of fertility behavior towards that prevailing in Sweden. We find evidence of adaptation in terms of birth timing, for at least half of the country-origin groups that we study, but very little evidence of adaptation in terms of completed fertility. Further, we find that the completed fertility of second-generation women is often less similar to the native-Swedish pattern than that of childhood immigrants. This is evidence against the notion of 'straight-line' adaptation for the children of immigrants who are born in Sweden.

Keywords: fertility, immigrants, second generation, descendants, Sweden

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Introduction and motivation

In the last few decades, immigrant fertility has become an increasingly high-profile issue for demographers and policymakers alike, particularly in ageing societies with below-replacement fertility (Kulu and González-Ferrer 2014; Parrado and Flippen 2012). To a large extent this reflects an interest in the contribution of migration to population dynamics – the size and composition of a nation's future population (Sobotka 2008). In Europe, policymakers are particularly concerned about the impact of low fertility, and its potentially negative implications for society, including with respect to dependency ratios, intergenerational social support, and the funding of social welfare (Adserà 2005; Grant et al. 2004). Alongside increases in immigration, the childbearing of immigrants is one of the mechanisms that may potentially counteract the impact of depressed birth rates and help slow population ageing (Feichtinger and Steinmann 1992). This supposition is based on evidence which shows that some immigrant groups have higher fertility rates than the destination or native-born average in many European countries (OECD 2015a, 2015b; Sobotka 2008). Although some of this evidence may be biased due to the problems of measuring immigrant fertility using Total Fertility Rates (Parrado 2011; Sobotka and Lutz 2011; Toulemon 2006), the number of children born to immigrants – the *quantum* of immigrant fertility – may play an important role in ageing societies, for example by reducing dependency ratios for future working-age cohorts (Grant et al. 2004).

In addition to the consequences of quantum differentials, the timing of births to immigrant parents – the *tempo* of immigrant fertility – may also have significant implications for social policy. In many high-income settings, foreign-born women often experience an earlier age at first birth than those who are native-born (OECD 2015b). This may be a source of socio-economic inequality, both with respect to mothers and their children (Goisis and Sigle-Rushton 2014). For example, early parenthood may prevent women from gaining higher education or progressing in the labor market, with potentially detrimental life-long consequences (Myrskylä et al. 2017). Tempo differentials in childbearing can also have macro-level consequences, for example by generating differences in population composition between natives, immigrants and their descendants over the long-run, including with respect to the age structure and kinship networks (Espenshade 1986).

It follows that there are different motivations for studying either the *tempo* or the *quantum* of immigrant fertility. Perhaps for this reason, empirical research has tended to focus on one or the other, with a subsequent lack of research that contrasts the quantum and tempo of immigrant fertility (for recent reviews of research, see Kulu and González-Ferrer 2014; Milewski 2010a; Milewski and Mussino 2019). This is an important shortcoming, not least because conclusions about immigrant fertility behavior – in particular those relating to theories of fertility adaptation and convergence – may differ according to the measure of fertility that is used. For example, immigrants may differ from natives with respect to their fertility at younger childbearing ages, while still having the same levels of completed fertility at the end of their reproductive career (Wilson 2019).

Here, we seek to address this knowledge gap by carrying out a comparison of tempo and quantum outcomes in fertility for selected groups of immigrants and their descendants in Sweden: We focus on young adults with a migration background in countries with lower fertility than that prevailing in Sweden (see below). We follow previous research in arguing that much can be learned by contrasting tempo and quantum differentials in fertility (Wilson 2013). One benefit is to generate more nuanced evidence about variations in fertility differentials over the life course, which can in turn be used to carry out more specific tests of existing theories. For example, the fertility adaptation hypothesis is usually defined as predicting that all aspects of migrant fertility will converge toward the destination norm – i.e. the average fertility behavior in the destination – with increasing duration of residence (Hervitz 1985; Milewski 2007). Comparisons of ages at first birth with completed fertility make it possible to evaluate whether – and for which immigrant groups – tempo adaptation also leads to quantum adaptation. In the absence of such comparisons, knowledge about immigrant fertility is restricted to particular aspects of the childbearing career, and is therefore much harder to generalize.

Despite the lack of direct comparisons between the tempo and quantum of immigrant fertility, there have been many studies that have tried to test whether immigrants adapt their fertility behavior after arrival in a new country. These studies cover a range of developed societies (for summaries, see: Kulu and González-Ferrer 2014; Milewski 2010a), focusing on measures of fertility quantum (e.g. Parrado and Morgan 2008), tempo (e.g. Milewski 2010a), or measures that are a composite of quantum and tempo (such as the TFR; e.g., Dubuc 2012). This literature almost exclusively focuses on adult immigrants from high-fertility origin countries (Milewski 2010a). Consequently, there is a lack of research that focuses on

immigrants who were born in countries with below-replacement fertility. This is unfortunate because studies of immigrants from low-fertility origins have a similar or perhaps even better potential for testing theories of fertility adaptation than studies of immigrants from high fertility origins (Tønnesen and Mussino 2019). At present, there is little evidence whether fertility adaptation occurs for immigrants from low fertility settings, despite the prominence of migration streams from low fertility origins in many destinations (Castles et al. 2013; Livi Bacci 2012). Many immigrant-sending countries with previously high fertility have now completed the fertility transition, while other countries with substantial emigration have had low (or even very low) fertility levels for several decades (Neyer et al. 2013; UN 2019). Global fertility dynamics have led to a much smaller pool of countries with high fertility behavior, and a much larger pool of countries with low fertility (Billari and Wilson 2001; Dyson 2010).

Another advantage of studying immigrants from low fertility origins is that they might be less likely to have children before migration, which minimizes one of the challenges in studies of fertility adaptation, namely the bidirectional relationship between fertility and migration (Toulemon 2006). The study of immigrant fertility adaptation is fraught with many difficulties, not least because migrants may postpone childbearing in anticipation of their migration (Hoem and Nedoluzhko 2016). Patterns of low fertility for immigrants with longer durations of residence, as compared with elevated fertility for those with short durations since migration, may be the result of interrelationships between migration and family formation rather than adaptation (Andersson 2004; Hoem 2013; Hoem and Nedoluzhko 2016). Likewise, it is difficult to imagine how immigrants from high-fertility origins can adapt toward the destination norm if they arrive having already had more children than this norm. These issues concern studies of migrants who arrive at adult ages, in the midst of their family-formation and reproductive careers. As argued in recent research, one way to avoid such issues is to study child migrants, who arrive prior to reaching childbearing age, and can therefore be studied in absence of concerns about reversed causality or selective migration based on factors linked to fertility or family formation (Adserà et al. 2012). Studies of child migrant fertility make it easier to draw conclusions about fertility adaptation and can also focus on the role of age at arrival, which produces differential childhood exposure in countries of origin and destination, and therefore allows an examination of one of the main mechanisms of adaptation (Adserà and Tienda 2012).

In this study we focus on the fertility of immigrants who were born in low fertility origins and migrated to Sweden as children. Our aim is to examine the adaptation of both the quantum

and tempo of fertility, distinguishing between child migrants by age at arrival, and also as compared with both ancestral natives (the Swedish-born children of Swedish-born parents) and the second generation (the Swedish-born children of foreign-born parents). As a European country with relatively high fertility, close to replacement level, we consider Sweden an interesting case to study when focusing on migration from low-fertility settings. Sweden's welfare regime offers a context where it is relatively easy for women and men to combine childbearing and employment (Neyer and Andersson 2008; Andersson and Scott 2005, 2007). Consequently, Sweden represents an ideal destination in order to study whether immigrants from low fertility origin countries – which often lack policies that support the reconciliation of childbearing with working life – can more easily realize their fertility intentions than those who remain in their origin country. In most cases, these low fertility countries have similar levels of desired (completed) fertility to those in Sweden (see Appendix Table A1), but much higher unmet demand in terms of realized fertility. This raises the question of whether immigrants from low-fertility countries – where women more often do not meet their desired fertility – are as able as Swedish ancestral natives to achieve a fertility quantum that is similar to the Swedish norm. A similar question can be asked in terms of their fertility tempo. Structural conditions related to living in Sweden may be impediments or incentives to early or late fertility, irrespective of migration background, but Sweden may provide more favorable conditions for early childbearing than those prevailing in low-fertility origins, which in turn may enable a convergence toward the Swedish quantum norm.

Given this background and motivation, our main research questions are: *(i) How does the fertility of child migrants from low fertility origin countries compare to the typical pattern of fertility in Sweden?, (ii) Is there evidence of adaptation, or a lack of adaptation, for quantum, tempo or both*, and *(iii) How does this evidence vary by country of origin?*. To answer these questions, we compare child migrants from different low fertility countries that will enable us to study the interaction between origin and destination in determining subsequent fertility in Sweden. We aim to gain a deeper understanding of patterns of fertility adaptation and the potential impact of fertility-supporting conditions in Sweden. In addition to the contextual advantages of studying Sweden, we are able to make use of high-quality longitudinal data on the demographic careers of the entire population. This allows us to analyze the complete fertility profiles – both in terms of tempo and quantum – of all registered immigrants, while also disentangling variation by country of origin and age at arrival.

Background: Old theories for a new approach

A variety of hypotheses have been used to explain and predict the fertility of immigrants and their descendants (Kulu and González-Ferrer 2014; Milewski 2010a). Most explanations have been generated in the context of migration from origins with higher fertility than the destination, and may or may not fit the context of migration that we study here: from origins with lower fertility. In this section we therefore focus on the theories and hypotheses that are most relevant for our specific context and the analysis that we undertake.

The hypothesis of *adaptation* typically asserts that the fertility of migrants will initially (i.e. on arrival) be different from that of the destination, but will afterwards converge to become more similar to that of the destination (or at least the average or 'norm' for the majority) with increasing duration of residence (Farber and Lee 1984; Hervitz 1985; Kahn 1988; Milewski 2010a). Although typically used when studying immigrants from origins with higher fertility, adaptation can be applied similarly to the study of immigrants from low fertility origins. The adaptation process may partly be driven by shifting norms, but also by responses to the institutional context of the host society, in relation to, for example, labor market structures or different systems of parental benefits (Andersson and Scott 2005). Previous research on Sweden suggests that the parity-specific birth rates of most immigrant groups from high-fertility countries tend to resemble that of the native population relatively soon after arrival, and that various socioeconomic factors, such a labor market participation, play a similar role in relation to fertility for Swedish- and foreign-born women alike (Andersson and Scott 2005, 2007; Lundström and Andersson 2012). However, recent research has recognized that it is hard to study the adaptation of fertility for immigrants who arrive as adults (Adserà et al. 2012), in part because they may arrive having already had more children than the reference for adaptation (and cannot adapt by decreasing their fertility) (Tønnessen and Wilson 2019; Wilson and Sigle-Rushton 2014), and in part because migration often interacts with family formation (Andersson 2004; Milewski 2010a), but these factors are avoided entirely when studying immigrants who arrive as children.

As opposed to adaptation, the hypothesis of *selection* proposes that immigrants may show particular fertility behavior due to the way that they are 'selected' into migration from their origin country, for example because they have certain characteristics that are associated with fertility, or because of any previous childbearing (Forste and Tienda 1996; Harbison and Weishaar 1981; Singley and Landale 1998; Stephen and Bean 1992). Related to this are the hypotheses of *anticipation* and *disruption*, such that patterns of fertility behavior which look

like adaptation may instead be explained by the disruption of fertility due to anticipation of migration (e.g. withholding births until after arrival; Milewski 2010a). The latter explanations – disruption and anticipation – are of little relevance here because we study child migrants, i.e. immigrants who arrived prior to reaching childbearing age. Similarly, selection is less likely to play a part in determining child migrant's fertility, although parental selection could in theory play a role (we are not aware of any evidence on this). In the same vein, our focus on child migrants means that we can ignore hypotheses related to the role of *legitimacy*, which predicts that some immigrants will migrate prior to childbearing in order to gain citizenship for their children (Bledsoe 2004).

One explanation that is certainly relevant for our study is the hypothesis of *childhood socialization*, which is based on the idea that fertility behaviors depend on exposure to norms and behavior during childhood (Goldberg 1959, 1960; Hervitz 1985). *Childhood socialization* can explain why immigrants from different origins exhibit different fertility patterns in the same destination, in particular if they conform with norms from their country of origin. This hypothesis also has the capacity to make predictions for the descendants of immigrants who were born in the destination – e.g. the second generation. As the second generation spend their entire childhood in the destination, this hypothesis is usually interpreted to mean that they are more likely to have similar fertility to ancestral natives, as compared with those who are born abroad (Milewski 2010b). This can be contrasted with the hypothesis of *cultural entrenchment*, which predicts that exposed to preferences and values held by their parents or influenced by a minority subculture, some descendants of immigrants will maintain cultural norms that are different from destination norms, even if they are born in the destination, and that these norms will lead to different patterns of childbearing (Abbasi-Shavazi and McDonald 2002). In many ways, this is similar to the theory of *segmented assimilation*, which challenges the notion that adaptation is guaranteed to occur for the second and later generations. They may instead (choose to) adapt to the norms of minority groups, rather than those of the majority population (Portes et al. 2005). Both childhood socialization and cultural entrenchment are explanations that can apply to immigrants from low fertility origins, as well as their descendants.

As already mentioned, only a limited number of studies have examined the fertility of immigrants from an origin country that has substantially lower fertility than their destination. Moreover, the research that has been carried out is hard to generalize, because it often draws different conclusions, and hard to interpret, not least because it focuses on adult immigrants and is therefore subject to the issues already discussed. There is some evidence that the fertility

levels of 'low-fertility' immigrants (measured in different ways) are higher for those who have a longer duration of residence, as compared with those who recently arrived. For example, this appears to be the case for Romanians in Italy (Mussino and Strozza 2012), German immigrants in Norway (Tønnesen and Mussino 2019) and immigrants from the Soviet Union in Israel (Nahmias 2004), although the latter is somewhat contradicted in another study of the Israel (Okun and Kagya 2012). It is tempting to interpret these findings as evidence for or against adaptation, but it is potentially confounded by anticipation, disruption and selection. The same can be said for research on Chinese immigrants to the United States (Hwang and Saenz 1997), which nevertheless shows that the fertility of female immigrants from China is distinct from that in their origin country. To the best of our knowledge, there are only a few studies that have estimated the fertility of child migrants from any low-fertility origins (Adserà and Ferrer 2014; Andersson 2004; Scott and Stanfors 2011; Wilson 2019). In general, these studies indicate that child migrants from low fertility origins – such as Eastern European countries – have lower fertility rates than the native-born population. However, they do not compare quantum and tempo measures of childbearing, they do not analyze differences by age at arrival, and they do not make systematic comparisons across a wide range of origin countries or country groups. These are some of principal gaps in research that we seek to address here.

With this background in mind our study focuses on female child migrants born in a range of European countries with lower fertility than Sweden (Figure 1 and Appendix Table A1). As comparison groups we use ancestral Swedes (Swedish-born women with two Swedish-born parents), as well as the second generation (Swedish-born women with a mother who was born in one of the lower-fertility countries that we study here). To answer our main research questions, we set out to test the adaptation hypothesis, as well as two other competing hypotheses, as follows:

Adaptation (H1)*: The differences in fertility outcomes between child migrants and ancestral Swedes will be smaller for child migrants who arrived in Sweden at younger ages*

Childhood socialization (H2)*: The fertility outcomes of child migrants will be different from those of ancestral Swedes, and the second generation will exhibit less difference*

Cultural entrenchment (H3)*: The fertility of some second-generation groups will remain different from ancestral Swedes*

By comparing child migrants who arrive at different ages, we are able to test the adaptation hypothesis (*H1*), which examines differences in fertility according to the amount of exposure to the destination. By comparing female child migrants with second-generation women who have parents from the same origin countries, we are able to test the childhood socialization hypothesis (*H2*). By including the second generation, we are also able to test the hypothesis of cultural entrenchment (*H3*). We move beyond most previous research by studying both the quantum and tempo of fertility, which allows us to examine whether evidence for or against these theoretical predictions depends upon the aspect of fertility that is considered. At the same time, we examine variation across twelve different low-fertility origin country groups, which allows us to consider the generalizability of our results.

The Swedish case

Sweden offers a compelling context for examining whether women are able to achieve their desired fertility, in particular for women who were born – or whose parents were born – in countries that have lower fertility. One of the most important factors here is the strong support provided by the Swedish welfare regime, not only in terms of family support and gender equity, but also in its integration policies. Sweden formulated a multicultural immigrant policy in the mid-1970s, encouraging cultural diversity and equality within the area of culture and education, which means that immigrants and their children have the right to "retain their own language, develop their own cultural activities and maintain contact with their original country" (Borevi 2012, p. 41). In other words, equality and freedom of choice are promoted, and immigrants can maintain their own distinct cultural identity. The origin countries of immigrants to Sweden have become more diverse over time, and this has resulted in increasing variation in immigrant fertility (Andersson 2004; Andersson et al. 2017; Lundström and Andersson 2012).

Close to 20 percent of the Swedish population is currently foreign-born (SCB 2020), which is one of the highest proportions in Europe. Moreover, despite the well-publicized receipt of large numbers of refugees since 2011, this proportion has its roots in a long history of receiving immigrants from many countries, including most countries in Europe. After the expansion of the European Union in the early 2000s, migration from European countries also changed in character and begun to include larger proportions of migrants from, for example, Poland and Romania. Previous research indicates that the macro-level context of the Swedish welfare regime seems to be important in shaping the childbearing behavior of both natives and

immigrants in the country (Andersson and Scott 2005, 2007). During the past decades, immigrant women have had period trends in parity-specific fertility that are very similar to those of Swedish-born women (Andersson 2004). The parity-specific fertility of the descendants of immigrants is often depressed, when considering the children of both high-fertility and low-fertility origins, but there is considerable heterogeneity by sex, education, labor market status and parental nativity (Andersson et al. 2017; Scott and Stanfors 2010, 2011). Andersson and Scott (2005) show that there is a positive effect of being established in the labor market on the propensity to become a mother in Sweden, as well as a striking similarity across immigrant groups in this positive relationship. Lundström and Andersson (2012) also provide evidence that, on average, foreign-born women tend to have similar childbearing behavior of native-born Swedes, and that the same appears to be true for men. However, the association between labor-market status and the continued childbearing of parents is much weaker than for first births, and this applies to Swedish-born and foreign-born women alike (Andersson and Scott 2007). It seems that once childbearing has started, the role of labor-market status is not that important in childbearing decisions. This suggests that childbearing and employment can readily be reconciled with each other in the Swedish context, which is not the same in many other European countries. Moreover, Sweden has a long history of offering parental leave – to women and men – as well as low cost childcare (primarily through the provision and support of places in kindergarten from ages 1-6). Taken together, these factors mean that Sweden is one of the most supportive environments for all women to have and raise children, irrespective of their migration background, a fact that is well-established in the comparative literature on European fertility (Chesnais 1996; Frejka and Sobotka 2008; Neyer and Andersson 2008).

Data and method

As we argue above, Sweden represents an ideal context for this study, in part because of the availability of high-quality longitudinal demographic data from its population registers. Our main data source is the *Migrant Trajectories* data collection from Statistics Sweden, which enable us to study the population who were resident in Sweden from 1968-2017. Data are stored at Statistics Sweden and can be accessed via SCB's micro-online access system MONA. Members of the population in Sweden enter the register when they are born (if they are born in Sweden) or when they receive a resident permit or register their immigration (which is required in order to live in Sweden, and coverage of the population is close to 100% because it is very difficult to live in Sweden without registering – e.g. it is impossible to access public services or hold a bank account). All members of the population have a unique person number, which is available in our data in an anonymized format.

Swedish population registers collect all demographic events, including the date of the event. Children can be linked to their parents using a register of personal identification numbers (as long as the parents have lived in Sweden, either now or at some point in the past). This enables us to estimate the entire childbearing history of all women living in Sweden with a high degree of accuracy, including for child migrants (who are highly unlikely to have had any children prior to arrival) and the second generation. With respect to migration, our data include all recorded immigrations (and emigrations), which enable us to calculate age at (registered) arrival to Sweden for all immigrants.

Our data therefore contain life course histories of childbearing and migration that allow us to test the three hypotheses mentioned above. Given our research questions, we are able to make use of our longitudinal data in order to compare and contrast measures of tempo and quantum. Although the term 'quantum' can be defined generally as the frequency that an event occurs (e.g. number of births), and hence can be measured at any age (Pressat 1985; Ryder 1980), here we focus on quantum at the end of childbearing, measured using completed fertility at age 40 and beyond. This has the advantage of enabling a comparison of differences between population groups in terms of their fertility quantum that are unaffected by differences in birth timing between the same groups. The disadvantage is that we are unable to cover the fertility outcomes of younger cohorts. Similar to fertility quantum, we also note that tempo can be measured in different ways, for example with reference to different birth parities, but here we measure tempo using age at first birth.

To facilitate comparison, our analysis of completed fertility and our analysis of birth timing both use the same study population. This population includes only those women who have completed (or almost completed) their childbearing, thereby enabling us to compare their birth timing with their realized completed fertility (i.e. to examine their entire completed fertility profiles). In general, our aim is to restrict our study population to those women who are older than 40, which is an age by which most women in Sweden have completed their childbearing, regardless of their migration background. More specifically, we select only women who were born from 1940-1976 (i.e. aged 40-76 in 2017) and did not emigrate or die prior to age 40.

For the analysis of completed fertility (number of children ever born) we use Generalized Linear Models (GLMs) with a Poisson link function. For the analysis of age at first birth, we use GLMs with an identity link function. In both sets of GLMs, for completed fertility and age at first birth, we control for birth cohort, grouped into four categories (1940-49, 1950-59, 1960-69, and 1970-76). We do not consider it appropriate to control for other variables because this would not only render our results more difficult to compare across groups, but also entail the assessment of (time-varying) variables that in many cases are endogenous to the outcomes we want to study (see: Hoem 2013; Hoem and Kreyenfeld 2006a, 2006b, including for related discussions of anticipatory analysis). Although our GLM analysis of age at first birth effectively drops those women who remain childless, we favor this approach because it makes it more immediately comparable with our analysis of completed fertility, including because it produces similar coefficients for the independent variables. Nevertheless, we also analyze the transition to first birth using event history models of time to event. For this analysis, the process time is age, ending at first birth, and where cases are censored if no first birth has occurred by age 40 (i.e. the age of last observation).

In each of the models – for quantum and tempo – we compare the fertility of (a) child migrants with that of (b) the second generation and (c) ancestral Swedes. Child migrants are defined as women who are born in one of the lower-fertility European origins that we study (see Figure 1 and Appendix Tables). There are many potential ways to classify countries as having low (or lower) fertility (than Sweden), so here we follow the most prominent approach in the demographic literature by using period Total Fertility Rates (TFRs). Although this is not the same measure as we use in our analysis, it has the advantage of being readily available and measured for all countries. The TFR for Sweden in 2016 was 1.9 and this is also close to the completed fertility across cohorts of women in Sweden over almost a century. We choose to

focus on all European origins with a TFR below 1.9 in that year. Most of these countries have been classified by other authors as having 'low' or 'lowest low' fertility at extended periods of time in the last few decades. Our data include a detailed classification of countries of birth, which in some cases – e.g. Finland, Poland or Hungary – allows us to separately identify immigrants from individual countries. However, some countries of birth are required to be grouped together, largely in order to help minimize issues with disclosure. As a result, we analyze a total of 12 different origin groups (countries of birth or groups of countries of birth). In most cases, these are natural groupings – e.g. Spain and Portugal or Latvia, Lithuania and Estonia. In some cases, such as the Former Yugoslavia and Former Czechoslovakia, they also reflect the history of European geography in close relation to childhood background. We note that to a large extent, our data do not allow us to separately identify immigrants from lower-fertility origins outside Europe (e.g. Japan or South Korea). For this reason, we choose to study only immigrants from lower-fertility countries in Europe, although we note that this constraint is not highly material in the Swedish context because our study population nevertheless represents most of the immigrants in Sweden from countries with a recent history of depressed fertility.

Second generation women are defined here as Swedish-born children with a mother who was born in one of the lower-fertility countries that we study. Mother's country of birth is used to classify the ancestral origin of these women. Furthermore, in order to minimize the heterogeneity of this group of second-generation women we include only those whose fathers are also from one of the same lower-fertility countries in Europe (i.e. we drop those who have a father who was born in Sweden or any of origins not studied here). We also drop the small number of women who were adopted. As a result of these selection criteria, our study population includes more than 36,000 female child migrants, 32,000 second generation women, and more than 1.5 million female ancestral Swedes (see Appendix Table 3 for frequencies by country of birth or mother's country of birth). These data enable us to compare female child migrants with second generation women from the same ancestral countries of origin, thereby allowing us to investigate the hypotheses of childhood socialization and cultural entrenchment. In addition to comparing across generations, we also disaggregate the analysis by age at arrival in three categories: 0-5, 6-12 and 13-17, primarily as a means of investigating adaptation in socialization.

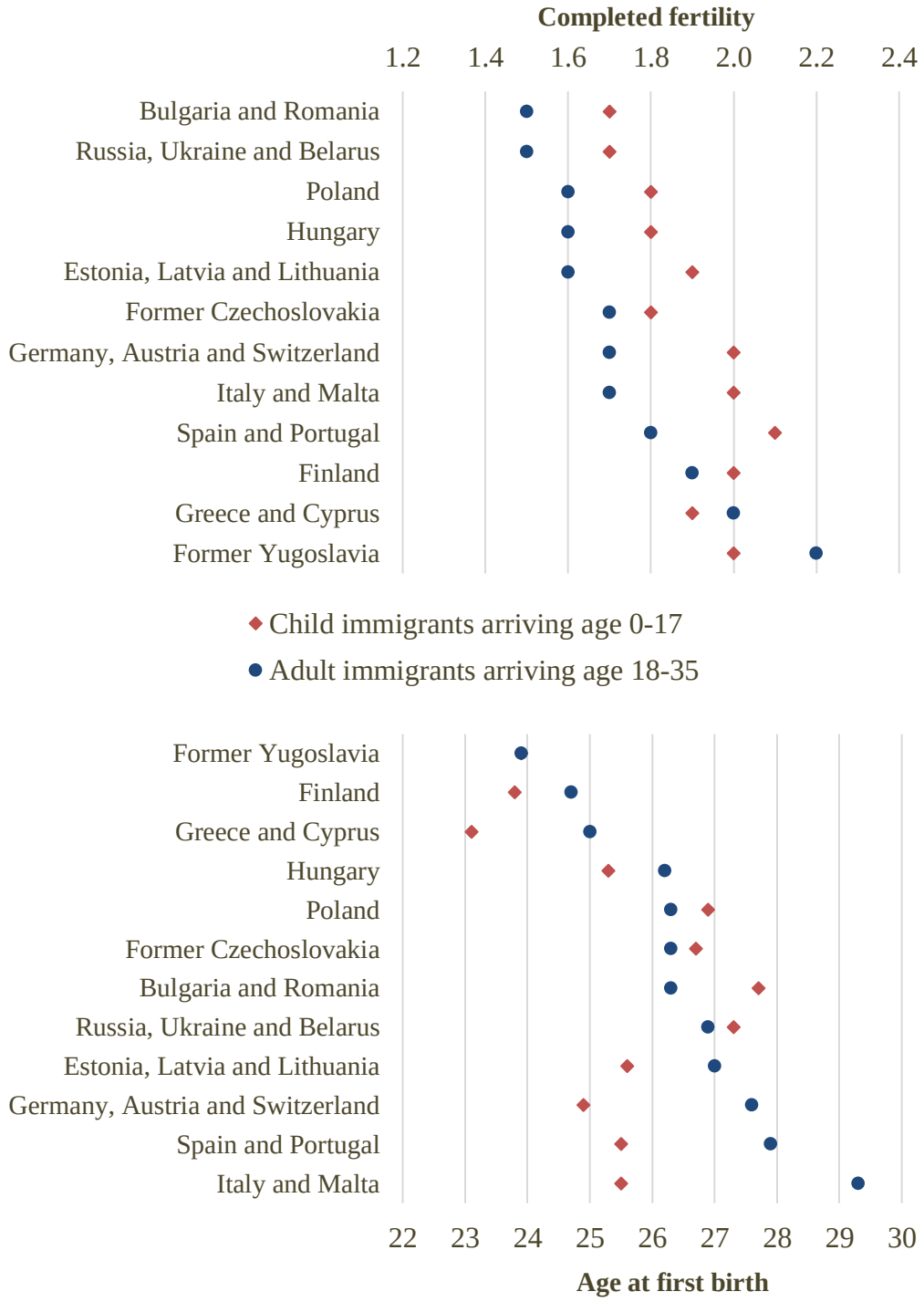
Results

There are many determinants of adult immigrant fertility, including the interrelationship between migration and childbearing that may lead to selective migration, anticipation or disruption of behaviors. It is for this reason that we prefer to focus on child migrants, for whom migration occurs before childbearing commences. Nevertheless, in Figure 1 we compare the completed fertility of child migrants with the fertility of immigrants from the same origin who arrived as adults (adult migrants). This not only helps to contextualize our study population, but also shows that female child migrants from a given country typically exhibit quite different fertility behavior – both in terms of quantum and tempo – as compared with adult migrants from the same origin.

Given our selection criteria, it is unsurprising that most adult immigrants have levels of completed fertility below the ancestral Swedish outcome of 2.0 children per woman (for these birth cohorts). Of our 12 origin groups, the exception is Former Yugoslavia with 2.2, while the origins with the lowest levels of completed fertility for adult immigrants are all in Eastern Europe. In general, age at first birth for adult immigrants ranges from 24, for those from Former Yugoslavia, to 29, for those from Italy and Malta.

Although these patterns are interesting, they can sometimes be hard to explain. For example, many of these adult immigrants appear to exhibit a later age at first birth than the Swedish outcome (which was around 26 for the cohorts covered here). On the one hand, this may be due to a lack of adaptation in behavior, but on the other hand it may be due to pre-migration constraints or to the impact of anticipation of migration and family formation, or to different modes of selection into migration. Rather than trying to interpret all these results, it may be most useful in the context of this study to compare the fertility outcomes of adult immigrants with that of child migrants from the same context in order to see whether child migrants differ from other member of the population in Sweden, before we begin to separate them by age at arrival.

Figure 1: A comparison of completed fertility and age at first birth for adult immigrants and child immigrants from European countries with lower fertility than Sweden



Note: Results are for women who were born 1940-1976 (i.e. aged 40-76 in 2017) and did not emigrate or die prior to age 40. Each plot is sorted according to the values for adult immigrants. Completed fertility was 2.0 and age at first birth was 25.9 for equivalent Ancestral Swedes (Swedish-born women from the same birth cohort whose parents were both Swedish born, and who did not emigrate or die before age 40). The source for this figure (and throughout, unless otherwise stated) is the authors' analysis using Swedish register data.

With the exception of the Former Yugoslavia, as well as Greece and Cyprus, child migrants tend to have an average completed fertility that is around 0.1-0.3 children higher than adult immigrants. This pattern is much clearer than for age at first birth, where child migrants sometimes have an earlier transition to parenthood than adult immigrants, for seven of our origin groups, while the opposite holds true for at least four other origin groups. For child migrants the range of completed fertility is more narrow than for adult immigrants, from 1.7 – for migrants from Russia, Ukraine and Belarus, as well as from Bulgaria and Romania – to 2.1, for child migrants from Spain and Portugal. For the age at first birth of child migrants, the equivalent range is from 23, for migrants from Greece and Cyprus, to almost 28, for those from Bulgaria and Romania.

Comparing quantum and tempo for child migrants that arrived to Sweden at different ages, and the second generation

Despite what can be said about the average fertility of child migrants from different low-fertility origins, there are considerable variation between origin groups by age at arrival. In general, these differences are much more apparent for age at first birth (Fig.2b) than they are for completed fertility (Fig.2a).

In line with the adaptation hypothesis, the age at first birth of child migrants is frequently closer to that of ancestral Swedes for those who arrive at younger ages (Fig.2b). This pattern is observed for more than half of our origin groups, with a particularly strong gradient evident for child migrants from Greece and Cyprus, Former Yugoslavia, and Finland. There are exceptions to this pattern, but they are less common for age at first birth than they are for completed fertility (Fig.2a). Not only does there appear to be no evidence of an age at arrival gradient for completed fertility, but it is sometimes the case that child migrants are more different from ancestral Swedes if they arrive younger (rather than older), in contrast with the expectation of adaptation. Even before considering the second generation, it appears that fertility patterns are highly heterogeneous. Not only is there heterogeneity in the evidence for or against adaptation, by the degree of childhood exposure to origin and destination, but our conclusions about adaptation depend on whether we consider quantum or tempo.

Figure 2a: Completed fertility by immigrant background (second generation or age at arrival for child migrants), relative to ancestral Swedes

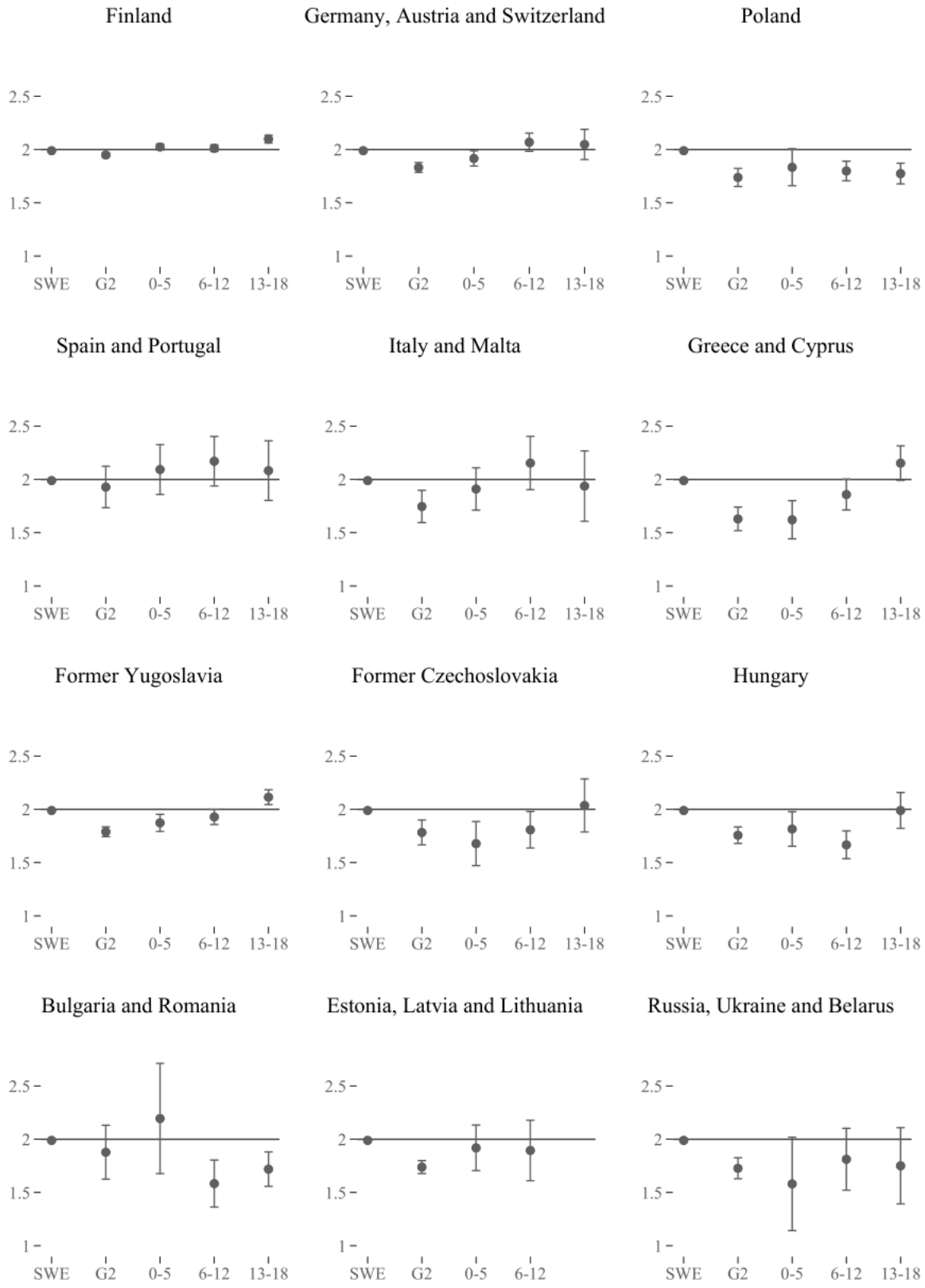
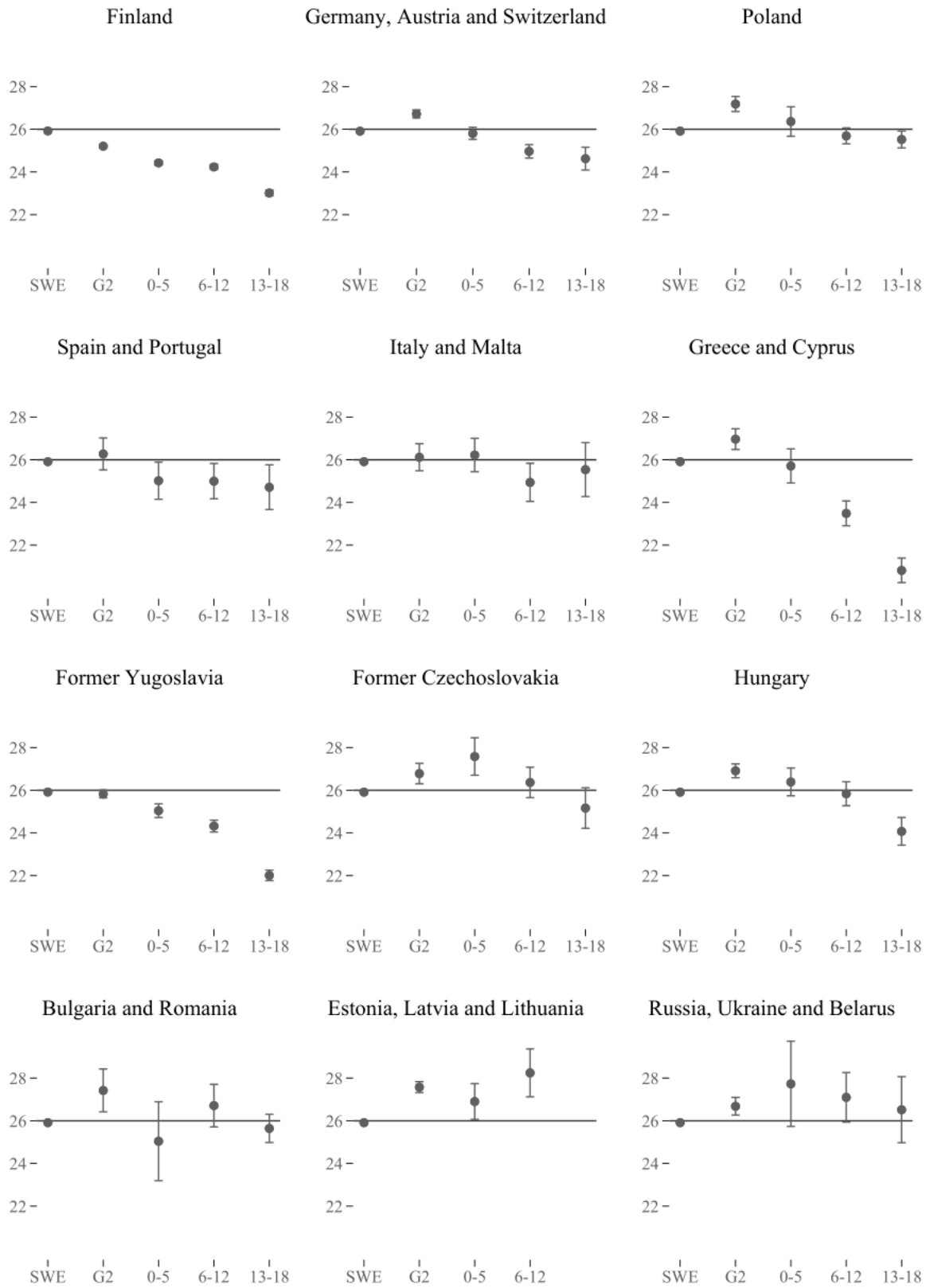


Figure 2b: Age at first birth by immigrant background (second generation or age at arrival for child migrants), relative to ancestral Swedes



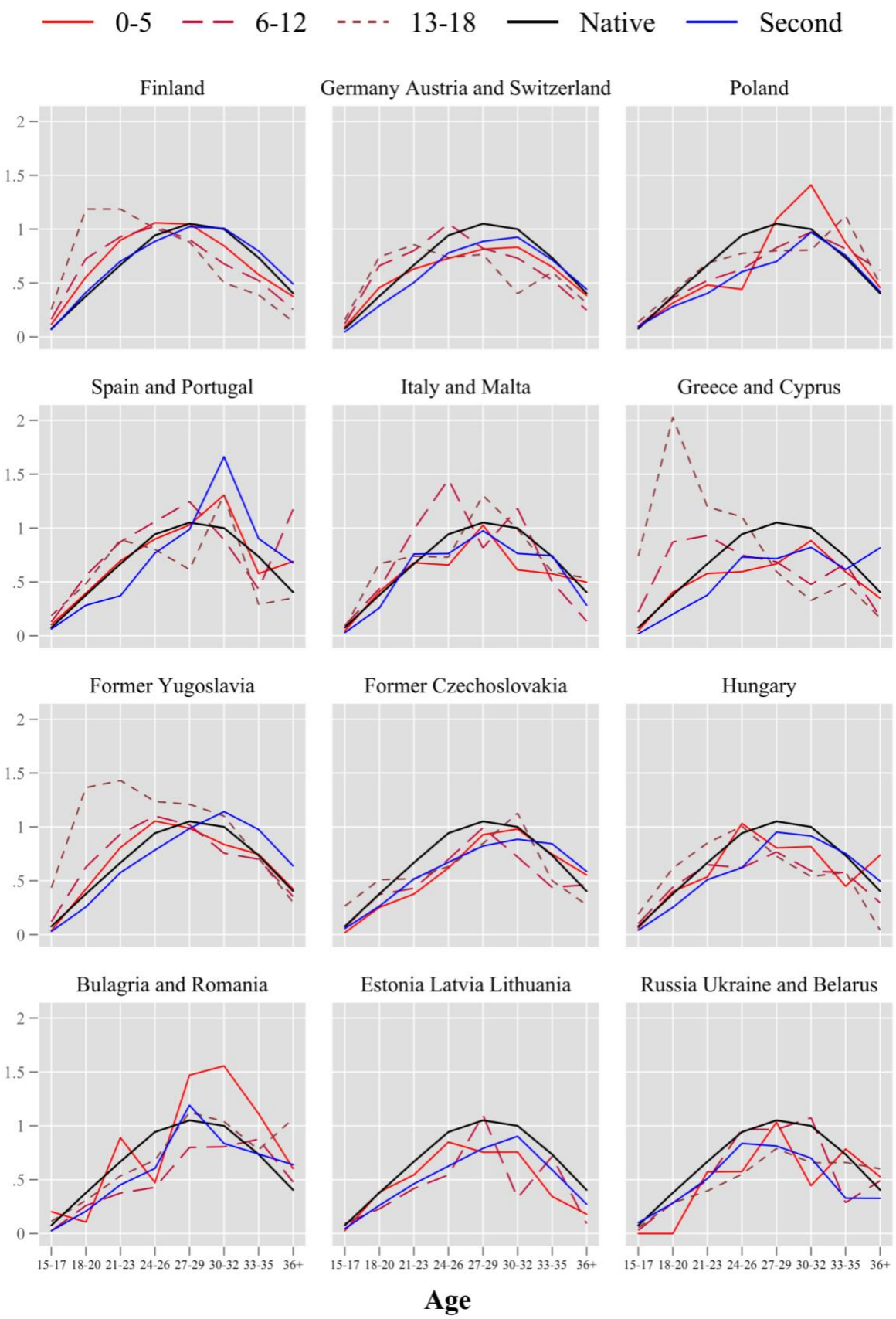
Similar observations can be made with respect to the results for the second generation. For several origin groups, the second generation show smaller age at first birth 'differentials' (i.e. differences from ancestral Swedes) than child migrants (Fig.2b). As such, there is some evidence in support of the childhood socialization hypothesis. However, this is not always the case, and the second generation often exhibit larger differences – in terms of quantum and tempo – as compared with child migrants who arrived at the youngest ages (i.e. 0-5). Examples include women born in Sweden whose mothers were born in Poland or Hungary, who show evidence of a relative postponement of entry into parenthood (Fig.2b), which could also explain the relatively lower completed fertility for these second generation groups (Fig.2a).

For completed fertility, the second generation are even more likely to exhibit a different pattern compared to ancestral Swedes. This is true for at least half of the origin groups that we study, and provides strong evidence against childhood socialization. If anything, the results for completed fertility for the second generation appear to confirm a predominant pattern of declining completed fertility with increasing exposure to destination. This can be viewed as evidence in support of cultural entrenchment for most origin groups, which suggests a stronger role of migration background than exposure to the destination.

Hazard rates by age

In Figure 3, we go beyond our analysis of average age at first birth to examine variations in the risk profile of first births by age (using event history analysis). As expected, the results provide tentative evidence of a predominant pattern of adaptation, thereby aligning with the results in Figure 2b, to which they correspond. The relatively large early age hazard rates for child migrants from Greece and Cyprus, Former Yugoslavia, and Finland who arrived when aged 13-17 rather indicates a pattern where migration and teen-age couple formation coincides.

Figure 3: Variation in hazard rates of first birth by age and immigrant background



In many cases, the second generation exhibit a largely similar age profile of hazard rates as compared with ancestral Swedes, but there are some noticeable differences. For example, Swedish-born women whose mothers were born in Spain and Portugal appear more likely to postpone their childbearing than Swedish-born women whose mothers were born in Sweden, with a peak in hazard rates at ages 30-32 rather than 27-29. For the Finnish second generation, the age-profile of hazard rates is almost identical to that of ancestral Swedes, suggesting a convergence in the timing and intensity of first birth rates across generations. There appears to be a similar convergence in timing for the second generation whose mothers were born in the German-speaking countries (Germany, Austria and Switzerland). As for the earlier results, we find complex and sometimes random variation and no single common pattern across origin groups. For example, with respect to these hazard rate age-profiles, there is sometimes strong evidence of a lack of convergence towards the pattern of ancestral Swedes. In particular, this appears to be the case for immigrants and their descendants from ex-Soviet countries.

Discussion

By studying child migrants from low-fertility contexts we have shown how differential exposure to the Swedish context is related to the tempo and quantum of childbearing. Our focus on women who arrive prior to reaching childbearing age allows us to ignore many potential explanations for the fertility of immigrants, including those related to disruption, anticipation, reverse causality and selection, and to focus explicitly on the role of childhood socialization in adult childbearing behavior. Our focus on women from low fertility origins allows us to examine adaptation for groups of immigrants and their descendants who are largely overlooked in prior fertility research.

In general, we show that age at migration is often an important determinant of the timing of becoming a parent for child migrants from low fertility origins. There is considerable evidence of adaptation (*H1*) for age at first birth, our measure of fertility tempo. This is based on the existence of smaller differentials for child migrants who arrived in Sweden at younger ages for more than half of our origin groups. However, we do not find similar evidence of adaptation (*H1*) for completed fertility, our quantum measure. The results for age at first birth and completed fertility do not point in similar directions, which not only challenges the generalizability of our conclusions, but also the generalizability of conclusions from all prior

research on immigrant fertility that does not simultaneously examine the tempo and (completed) quantum of childbearing.

For the second generation we almost always observe depressed completed fertility, relative to ancestral Swedes. This is in line with previous studies of Sweden (Andersson et al. 2017; Scott and Stanfors 2010, 2011), but for the first time we confirm that this is evident when the focus is on children of immigrants from a wide range of low fertility countries including as compared with child migrants from the same origin. These findings provide evidence against the childhood socialization hypothesis (*H2*) and rather support for the cultural entrenchment hypothesis (*H3*). This entrenchment could be referred to as a form of segmented assimilation, and may be determined by a range of different explanations. It may be due to an exposure to preferences, values and norms (relating to childbearing) that are different from those that are typical in Sweden, for example via the influence of peers, role models, community environments, parents and other family members (Abbasi-Shavazi and McDonald 2002; Forste and Tienda 1996). At the same time, it could also be determined by factors that are unrelated, or not primarily related, to culture (or more specifically an individual's cultural background). For example, differential fertility among the second generation may be due to difficulties in balancing employment and family formation (Andersson et al. 2017; Scott and Stanfors 2011). Having said all this, conclusions about the second generation also depend upon whether we look at age of becoming a parent or completed fertility. We might expect that depressed completed fertility follows from postponed parenthood (relative to ancestral Swedes), but while there is evidence of this for several groups, such as second generation women with a Polish background, there is also evidence to the contrary, for example for those with a Finnish background. In this case, our findings may relate to the contextual similarities between Sweden and Finland, which may make (social, cultural and economic) integration easier than for immigrants and their descendants from other low fertility origins. The postponement of parenthood among some second generation groups, compared with both ancestral Swedes and child migrants, may also relate to delays in partnership among the second generation that have been observed in other research on Sweden (Andersson et al. 2015; Wiik and Holland 2018).

While contributing to an underexplored aspect of the research on migration, some limitations have to be taken into consideration when evaluating our results. First, despite examining a range of low-fertility origin countries, we only focus on European sending contexts. Our findings may or may not generalize to non-European sending countries such as those in East Asia. Further research would be required to examine this and the generalizability

of our findings for immigrants and their descendants in other destinations as well, even when they have a migration background from the same low-fertility European countries that we study here. Second, although we have compared two different types of fertility measure, it may be that further heterogeneity would be discovered if additional (comparable) measures of childbearing were analyzed. Examples might include birth intervals or measures of quantum at other stages in the reproductive life course. A third limitation is that, because we set out to compare age at first birth and completed fertility for similar women, we restricted our study population to those women who could be observed up to age 40 – i.e. older birth cohorts who in most cases arrived in Sweden several decades ago. It is perfectly possible that our results would vary if we were to analyze the childbearing of more recent cohorts (once that becomes possible in the future).

Despite these limitations, our results provide clear answers to our research questions and our tests of several prominent hypotheses that make predictions about the fertility of immigrants and their descendants. Our first research question asked how the fertility of child migrants from low fertility origins compares to the typical pattern of fertility in Sweden. We found that, for most country groups, child migrants tend to have an average completed fertility that is higher than adult immigrants but still considerably below the ancestral Swedish norm of 2.0 (for the same birth cohorts). The results for age at first birth show that child migrants often have an earlier transition to parenthood than adult immigrants, possibly because they do not experience any disruption in childbearing due to migration, but surprisingly the age at first birth of child migrants is for many groups also far below that of the ancestral Swedes.

Our second research question asked whether there is evidence of fertility adaptation, or a lack of adaptation by the degree of childhood exposure within the receiving context. We examined the fertility outcomes of child migrants from the same low-fertility origins by their age at arrival, and compared them to both the second-generation and ancestral Swedes. This allowed us to test if different exposure to the destination country during childhood is associated with fertility. We found evidence of adaptation for child migrants while analyzing age at first birth, confirming that childhood age at migration matters for fertility tempo, at least for most childhood migrants from low-fertility European origins. We also found that for many groups there was no material differences in age at first birth when comparing the second generation and ancestral Swedes, which is evidence of fertility adaptation across generations.

However, similar conclusions cannot be derived from our analysis of completed fertility. Our second research question set out to establish whether there was evidence of adaptation for

tempo, quantum, or both. Although we found considerable evidence for tempo adaptation (with some exceptions), we actually found very limited evidence of adaptation in completed fertility, the measure we chose for fertility quantum. Indeed, we found evidence of depressed completed fertility for the second generation (relative to ancestral Swedes) and quite some heterogeneous patterns by origin and age at arrival. This could be interpreted as evidence against the importance of childhood exposure to destination as an explanation for completed fertility (unless the effect of such exposure is masked by a similarly strong effect of some other factor). A range of factors may play a role in determining the depressed fertility of the second generation, including socioeconomic factors – such a labor market participation and career ambitions – that may directly or indirectly affect these groups differently than for child migrants. We have noted that our results are in line with previous studies of Sweden, but go beyond what is already known in a number of ways, not least in showing the importance of distinguishing between quantum and tempo. At the same time, we acknowledge that more research is needed in order to explain why there are so weak signs of adaptation for completed fertility, in particular for the second generation with parents who were born in countries with low fertility.

Our final research question asked whether evidence about adaptation and the fertility of child migrants varies by country of origin. In contrast to most studies of the fertility of immigrants and their descendants, we not only focus on low-fertility origins, but also examine variation across a wide range of such origins. We confirm that, although there appears to be evidence of adaptation in behavior for some groups, for some aspects of fertility (notably age at becoming a parent), there is considerable heterogeneity in the patterns we observe. Our study underlines the advantages of testing the roles of adaptation and childhood socialization when we are able to disentangle fertility from the direct process of migration. Some of the findings may raise doubts about the very importance of childhood socialization in fertility behavior. However, our study leaves much of the mechanisms of adaptation, or a lack of adaptation in behavior, largely unexplored. Future research may keep examine the role of fertility norms, values and preferences in explaining different patterns of fertility adaptation, for example as absorbed through exposure to parents, peers or residential communities, including as compared to structural explanations, such as social and gender inequalities or barriers to the maintenance of employment and family careers. Given that the Swedish context offers strong support for childbearing and parenthood, we expect that depressed completed fertility may be even more likely to be observed in other destinations for the second generation with parents who were

born in countries that have low fertility. This remains to be examined by future research, which we recommend places far greater attention on immigrants and their descendants from low-fertility origins, not least because their fertility adaptation is far from guaranteed.

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Appendix Table A1: An overview of completed fertility for child migrants in Sweden compared with fertility levels and ideals in the largest immigrant-sending countries with lower fertility than that in Sweden

	Children ever born: Immigrants who arrived in Sweden age 0-17 [2]	Children ever born: Immigrants who arrived in Sweden age 18+ [2]	TFR in the origin country [3]	Mean ideal number of children in the origin country [4]	Estimated difference between TFR and ideal number of children [5]
Finland	2.0	1.9	1.8	2.5	-0.8
Germany, Austria and Switzerland	2.0	1.7			
Germany			1.4	2.2	-0.8
Austria			1.4	2.0	-0.6
Switzerland			1.5	2.4	-0.9
Poland	1.8	1.6	1.3	2.3	-1.0
Spain and Portugal	2.1	1.8			
Portugal			1.2	2.2	-1.0
Spain			1.3	2.2	-0.9
Italy and Malta	2.0	1.7			
Italy			1.4	1.9	-0.5
Malta			1.4	1.9	-0.5
Greece and Cyprus	1.9	2.0			
Cyprus			1.3	2.4	-1.1
Greece			1.3	2.2	-0.9
Former Yugoslavia	2.0	2.2			
Bosnia			1.3	**** 2.6	-1.3
Croatia			1.5	2.5	-1.0
Macedonia			1.5	** 2.5	-1.0
Montenegro			1.7	** 3.1	-1.4
Serbia			1.4	** 2.6	-1.2
Slovenia			1.6	2.4	-0.9
Former Czechoslovakia	1.8	1.7			
Slovakia			1.5	2.1	-0.6
Czech Republic			1.5	2.0	-0.5
Hungary	1.8	1.6	1.4	2.1	-0.8
Bulgaria and Romania	1.7	1.5			
Bulgaria			1.5	**** 2.0	-0.5
Romania			1.4	2.0	-0.6
Estonia, Latvia and Lithuania	1.9	1.6			
Estonia			1.5	2.5	-1.0
Latvia			1.5	2.4	-0.9
Lithuania			1.6	2.2	-0.6
Russia, Ukraine and Belarus [1]	1.7	1.5			
Russia			1.7	***** 2.1	-0.4
Ukraine			1.5	***** 1.9	-0.4
Belarus			1.7	* 2.1	-0.4
Moldova			1.2	*** 2.5	-1.3

*1: Includes a very small number of immigrants from Moldova; 2: Authors' own analysis of women aged 40+ in 2017; 3: OECD (2019a, 2019b); 4: Eurobarometer 2011, except * 1996; ** World Values Survey 2001; *** 2002; **** 2011; ***** 2012; (Mussino and Ortensi 2019; OECD 2019c); 5: Calculated as the difference between the previous two columns.*

Appendix Table A2: An overview of age at first birth in Sweden as compared with the largest immigrant-sending countries with lower fertility

	Mean age at first birth: Immigrants who arrived in Sweden age 0-17 [2]	Mean age at first birth: Immigrants who arrived in Sweden age 18+ [2]	Mean age at first birth in the origin country [3]
Finland	23.8	24.7	28.5
Germany, Austria and Switzerland	24.9	27.6	
Germany			29.2
Austria			28.8
Switzerland			30.4
Poland	26.9	26.3	26.7
Spain and Portugal	25.5	27.9	
Portugal			28.9
Spain			30.4
Italy and Malta	25.5	29.3	
Italy			30.6
Malta			28.4
Greece and Cyprus	23.1	25.0	
Cyprus			29.0
Greece			29.9
Former Yugoslavia	23.9	23.9	
Bosnia			* 28.7
Croatia			28.0
Macedonia			26.4
Montenegro			26.6
Serbia			27.3
Slovenia			28.5
Former Czechoslovakia	26.7	26.3	
Slovakia			27.7
Czech Republic			28.1
Hungary	25.3	26.2	27.7
Bulgaria and Romania	27.7	26.3	
Bulgaria			25.7
Romania			25.8
Estonia, Latvia and Lithuania	25.6	27.0	
Estonia			26.5
Latvia			26.1
Lithuania			26.7
Russia, Ukraine and Belarus [1]	27.3	26.9	
Russia			25.2
Ukraine			24.5
Belarus			25.1
Moldova			24.3

*1: Includes a very small number of immigrants from Moldova; 2: Authors' own analysis of women aged 40+ in 2017; 3: Mean age at first birth, OECD (2019a, 2019b), except Bosnia (*World Values Survey 2011) which is mean age for all births*

Appendix Table A3: Study population by migration background (frequency)

Origin country[1]	Ancestral Swedes	Second generation	Child migrants: arrived age 0-5	Child migrants: arrived age 6-12	Child migrants: arrived age 13-17
Sweden	1,548,793				
Finland		19,514	10,073	7,745	5,937
Germany, Austria and Switzerland		3,203	1,442	1,105	392
Poland		930	237	834	722
Spain and Portugal		198	148	154	102
Italy and Malta		292	186	132	68
Greece and Cyprus		519	194	337	312
Former Yugoslavia		3,400	1,114	1,438	1,676
Former Czechoslovakia		507	151	236	126
Hungary		1,114	265	379	270
Bulgaria and Romania		113	32	127	258
Estonia, Latvia and Lithuania		1,790	160	90	*(11)
Russia, Ukraine and Belarus [2]		687	32	83	53
All	1,548,793	32,267	14,034	12,660	9,927

1: Country of birth for child migrants (and ancestral Swedes) or mother's country of birth for the second generation (and ancestral Swedes); 2: Includes a very small number of immigrants from Moldova;
** Excluded from the fertility models due to low numbers*

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