Transition to third birth among immigrant mothers in Sweden: Does having two daughters accelerate the process?

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Abstract

In this study, we investigate whether immigrant parents hold sex preferences for children in Sweden, a country that promotes gender equality and where parental preference for having a girl prevails. By applying event-history models to Swedish register data, we investigate the transition to third birth by the sex composition of children born among immigrants. In particular, we examine whether women who come from countries with strong son-preference cultures accelerate their process of having a third child if their prior children are both girls. We pay particular attention to immigrants from China, Korea, India and the former Yugoslavia, where son preference culture has been well documented in the literature. Our results show that women from China, Korea, India and the former Yugoslavia are more likely to have a third child if they have two girls than if they have two boys or a boy and a girl. Interestingly, mothers from China, Korea and India tends to accelerate their process to get a son, whereas mothers from the former Yugoslavia do not hasten. Furthermore, the 1.5 generation and the immigrant mothers with a Swedish partner from China, Korea and India demonstrate a girl preference, as the native Swedes do, whereas the 1.5 generation immigrant mothers from the former Yugoslavia do not show any sign of adaptation.

Keywords Immigrant · Sex preferences · Sweden · Event-history

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Introduction

There is a vast literature on sex preferences for children around the world. A preference for sons over daughters is mainly observed in East Asia (e.g., China, South Korea), South Asia (e.g., India), the countries of the former Soviet Union, and—more recently—in Albania and the Balkans (Arnold 1997; Bongaarts 2013; Fuse 2010; Guilмото 2009; UNFPA 2012a, b). In these countries, son preference has largely been driven by the perceived greater economic utility for parents—over the course of the life cycle—of having sons versus daughters (e.g., Das Gupta et al. 2003). However, the preference for sons can also be influenced by social and cultural factors (Arnold and Kuo 1984). In many East Asian societies where the concept of patrilineality is treasured and Confucianism has been historically an important ideology, a woman's traditional primary duty was to bear sons to perpetuate her husband's lineage (Arnold and Kuo 1984; Tang 2013). The number of sons she had borne greatly impacted her value in her family and community (Mitra 1979; Das Gupta et al. 2003; Murphy et al. 2011). Furthermore in old ages, parents would depend on their sons and daughters-in-law for care. Under such a system, the desire for a son would drive couples to continue childbearing if their previous children were all girls (Ma 2016; Poston 2002).

In most developed countries, however, children are not seen predominantly as a source of economic security. They are valued largely for social and psychological reasons. Socially, children increase the attractiveness of families (Durkheim 1984) and decrease the likelihood of separation or divorce (Andersson 1997; Morgan et al. 1988). Psychologically, children provide parents with opportunities for self-realization such as expansion of the self-affiliation, stimulation, accomplishment or social comparison (Hoffman and Hoffman 1973). Furthermore, parents might prefer a child of the same sex (Marleau and Saucier 2002; Dahl and Moretti 2004; Hank 2007) even if different benefits may come by the sex of the children for each of the partners. In some contexts (e.g., the US and China), couples with a boy in the household have lower divorce risks than those with only girls (Morgan et al. 1988; Ma et al. 2018). On the other hand, girls might be considered as more rewarding companions (Marleau and Saucier 2002).

Existing research has provided evidence of parents' preference for having at least one child of each sex, mainly in developed societies. Studies for North America and Europe have shown that parents with only daughters or only sons are more likely than other parents to have another child (Andersson et al. 2006; Andersson et al. 2007; Jacobsen et al. 1999, Hank and Kohler 2003; Pollard and Morgan 2002). Moreover, in some of the Nordic countries (Denmark, Norway and Sweden), parents who only have sons are more likely to have another child compared with parents who only have daughters (Andersson et al. 2006, 2007). Such findings reflect parental preferences for daughters on childbearing behavior in that region (Andersson et al. 2006, 2007).

Lately, increased attention has been paid in the literature to the preferences for the sex of children among immigrant parents and their childbearing behaviors in different destination countries. Relevant studies are often conducted from

two angles based on the research methods. Some studies exploring the sex ratio at birth (SRB¹) have found elevated ratios in third or higher-order births among immigrant women of an Asian background, indicating sex selection of children among this immigrant group (Almond and Edlund 2008; Almond et al. 2013; Dubuc and Coleman 2007; Hwang and Saenz 1997; Mussino et al. 2018; Singh et al. 2010). A few other studies have looked at parity progression based on the sex composition of previous children (Almond et al. 2013; Adsera and Ferrer 2016; Lillehagen and Lyngstad 2018; Okun 1996; Ost and Dziadula 2016; Tang 2013). A common finding of these studies is the extensive sex preference in favor of boys at higher parities among women of East and Southeast Asian origin.

Overall, parental preference for sex of children, among all other things, is an important indicator of a society's cultural norms (Adsera and Ferrer 2016) and contributes to study immigrant's cultural integration (Lillehagen and Lyngstad 2018). Exploring whether preferences for the sex of children among migrants are similar to those of their counterparts in the home country and whether those preferences change over time in the destination country allow us to test *cultural persistence* versus *cultural adaptation* hypothesis.

In the present paper, we extend this line of research by focusing on Sweden, a universal welfare state where the value of gender equality is highly valued (Esping-Andersen 1990; Thévenon 2011). According to Pollard and Morgan (2002), in modern and industrialized societies with greater gender equality, parents would weaken their preferences for the sex of children. However, empirical studies in the Nordic countries show that modernization and increasing gender equality are not necessarily related to parental gender indifference (Andersson et al. 2006). Studying the third birth risks based on the sex composition of previous children, Andersson et al. (2006) find that when a new type of parental sex preference (in favor of girls) has evolved in Sweden, Denmark and Norway, the culturally rooted son preference has strongly persisted in Finland despite the notable improvement of women's empowerment in this country (Andersson et al. 2006). More interestingly, the Finnish-born immigrants in Sweden have adhered to the son-preference culture of their home country despite their exposure to a society where a preference for girls has developed (Andersson et al. 2007).

These studies evoke our curiosity about the childbearing behaviors and parental sex preferences of other immigrant groups in Sweden. In the 2000 s, Asia became the largest source of immigrants (Allwood et al. 2006). A recent study of Mussino et al. (2018) showed a substantially elevated SRB only at third birth among immigrant mothers from China, Korea and India if both of their previous children are girls. The SRBs of mothers who migrated to Sweden from other regions were closer to the natural range. Nonetheless, we do not have much knowledge as to whether those with two girls transit to the third birth at a faster speed than those with at least a son. Nor do we know much about whether there is any third-birth transition

¹ The sex ratio at birth is defined as the number of male births per female birth. Its natural value lies within the range of 1.04–1.06. An elevated sex ratio at birth (with a value above 1.06) refers to a sex ratio skewed toward boys.

differences between adult migrants and those who migrated at younger ages, and whether duration of stay in Sweden or having a Swedish partner plays a role.

By applying event-history models to Swedish register data, we investigate the transition to third birth by the sex composition of children born among immigrants in Sweden. Specifically, we study whether immigrants coming from countries with strong son-preference cultures have a higher likelihood of third births if their previously born children are both girls; and more importantly, we explore whether they tend to accelerate their process of childbearing if the previous children are both girls. Furthermore, we look into whether the sex-preference-driven childbearing behavior of certain immigrant groups changes over time following migration, and whether immigrants who came to Sweden at younger ages or who has a Swedish partner tend to exhibit the same childbearing behavior as native Swedes. We will pay particular attention to immigrants from East and Southeast Asian countries, as well as South-east European countries, because of the son-preference culture in their home country (Arnold 1997; Bongaarts 2013; Fuse 2010; Guilmoto 2009; UNFPA 2012a, b).

This study contributes to the literature on sex preferences for children in a few ways. First, existing research on immigrants' childbearing behavior based on parity progression has largely focused on the likelihood of having another birth rather than the duration of the interval to the next birth. In addition, this study enriches our knowledge by addressing how quickly immigrants have a third birth based on time since the second birth and the sex composition of first two children. If mothers with two girls transit to a third birth sooner than those with at least a son, we argue that this acceleration indicates that those mothers place a stronger value in having sons over daughters. Second, our findings regarding how duration of residence, age at migration and having a Swedish partner shape childbearing behavior of immigrants improve our understanding of how sub-groups of immigrants adapt to the local conditions of the host country: those who came during childhood or adulthood, those who stay in Sweden for a short or a long period of time. Third, findings of this study provide evidence, from the Swedish context, for the theoretical argument on whether the childbearing behavior of immigrants and their parental sex preferences in the host country are mainly due to the persistence of cultural norms of the home country, and whether the behaviors and preferences that resemble that of the host country are mainly due to the cultural adaptation to the new country (Lillehagen and Lyngstad 2018).

This study also contributes to the on-going social debate regarding the integration of immigrants in the host society and the importance of migration. With the proportion of population with foreign background rapidly increasing and the composition of immigrants dynamically changing in Sweden, a better knowledge of childbearing behaviors of immigrants and their sex preferences of children can provide some implications and help forecast the patterns and trends of childbearing and family building of the total population. Further, family behavior is a reflection of social behavior. How immigrants adjust their childbearing behaviors to the local cultural conditions and norms of the host country across time might provide some implications on how they adjust their social behaviors to that of the host society. A better knowledge of this adjustment process improves our understanding of the immigrants' integration process. Additionally, the findings of this study not only enrich

our understanding of how different groups of immigrants balance the social norms of their home country and those of the destination country, but also improve our understanding of the gendered nature of their family behavior and their integration into the Swedish society.

Sweden as a destination country

Sweden is an interesting case to study for different reasons. First, despite being a country of relative short migration history, Sweden has attracted immigrants from different fertility settings and preferences since the middle of the twentieth century. Around the 1950 s, the Nordic and Baltic regions were the major sources of immigrants, followed by other European countries. Since the 1960s, with the increase in immigrants from different parts of the world, the composition of immigrants has been dynamically changing. In 2005, Asia became the largest source of immigrants, accounting for 28% of all immigrants residing in Sweden (Allwood et al. 2006). Today, Sweden is a multicultural country; immigrants arrive from various regions of the world, bringing with them different fertility behaviors and cultural preferences.

Additionally, high-quality administrative data is available on the entire population of Sweden, including demographic characteristics such as information on fertility and immigration. This allows us to disentangle—in detail—variations in sex preferences for children by country of origin by studying immigrant groups' transition to third birth by the sex composition of the children already born without running into problems such as selection attrition and small numbers of observation.

Furthermore, Sweden is a universalistic welfare state that has taken positive action to promote gender equality (Esping-Andersen 1990; Thévenon 2011). Correspondingly, Swedish women do not show any sign of sex-selective abortion (Mussino et al. 2018). Instead, Swedish parents often openly express some degree of preference for having daughters over sons. Earlier empirical research (e.g., Andersson et al. 2006, 2007) manifested Swedish parents' preference for having daughters. A recent study by Miranda et al. (2018) on parity progressions provides evidence that the preference for daughters has increased over the last decade. This tendency is shown not only among two-child parents but also among one-child parents.

Andersson et al. (2007: 137) propose three basic mechanisms through which childbearing behaviors and parental sex preferences of immigrants may either persist to that of home country or change in accordance with the local conditions: social interaction, culture and national institutions. The authors argue that social interaction via “innovative interpersonal communication” facilitates information flow whereas social interaction via “conservative cultural forces” encourages adherence to behavioral norms. Additionally, individuals' cultural normative attitudes and values may change at various stages during life course and in different contexts. They found that the traditional son-preference value among immigrants who came from countries with strong son-preference culture (i.e., the Finnish-born immigrants in Sweden) retain a foothold (Andersson et al. 2007). A recent study for Norway by Lillehagen and Lyngstad (2018) demonstrates similar results. Namely, immigrants from son-preference cultures tend to adhere to the culture of son-preference in the

host country, despite that the host country is a welfare society where gender equality is highly valued and where girl preference has started to prevail. So far, however, we have little knowledge about whether this gender-equality oriented environment may shape immigrants' sex preferences for children, whether immigrants share the gender-neutral childbearing norm to the same extent as the native mothers do, and whether parental sex preference affects timing between pregnancy. With the availability of high-quality register data and the universal welfare state context where gender equality is valued, Sweden offers us a compelling context to fulfil the aforementioned goals.

Preferences for sex of children among immigrants

Immigrants' fertility behavior often indicates the cultural norms of their home country (Algan et al. 2012). Meanwhile, the general climate of childbearing in the destination country may influence immigrants' reproductive behavior (Andersson 2004; Andersson and Scott 2005). During the past decades, the fertility behavior of immigrants has attracted interest among family demographers, leading to different and sometimes conflicting theories on the fertility patterns of immigrants (see Andersson 2004; Kulu and González-Ferrer 2014; Mussino and Strozza 2012a).

The *theory of socialization* and the *theory of adaptation* are frequently used to explain how immigrants juggle their childbearing behavior in destination countries. The former theory (also referred to in this paper as *cultural persistence*) looks at how the culture of origin, often taken as the country of birth, persists in the destination country and affects reproductive behaviors (Kahn 1994; Schoenmaeckers et al. 1999; Alders 2000). The latter theory (also referred as *cultural adaptation*) assumes that as more time is spent in the destination country, immigrants tend to adapt their reproductive behavior to the material and cultural circumstances of their new institutional context (Andersson 2004; Schoorl 1995). Because they represents society's cultural norms, parental preference for sex of children might serve as an important indicator of *cultural persistence* of norm from the country of origin or *cultural adaptation* to the social norms of the country of destination (Adsera and Ferrer 2016).

Using the Canadian Census, Adsera and Ferrer (2016) show that if the first child is a girl, the sex ratio at second birth for South Asian immigrants is higher when compared to that of the native population and other immigrants. Normally, an elevated sex ratio at birth indicates a voluntary use of prenatal sex testing and sex-selective abortion (Goodkind 1996). For the Swedish context, where the preference for a mixed sex composition of children or even girl preference prevails among the native born population, Mussino et al. (2018) found that a longer duration of residence in the country may decrease the differences in sex ratio at birth between immigrants and natives. Looking into parity progressions, both Andersson et al. (2007), for Finnish-born immigrants in Sweden, and Lillehagen and Lyngstad (2018), for immigrants to Norway coming from son-preference culture such as China and India, found that parental sex preference is a longstanding cultural phenomenon that is related to childhood socialization in the home country. Immigrants' sex preference

of children is culturally persistent with that of their home country, rather than modified by exposure in the host country.

Age at migration also matters. Asian immigrant mothers in the US who arrived at younger ages showed behavior similar to that of the natives, suggesting assimilative behavior with regard to sex preferences for children among immigrants who arrived as children (Ost and Dziadula 2016). In Norway, child immigrants from India are more likely to demonstrate a girl-preference childbearing behavior than those adult immigrants from India. This finding is consistent with the adaptation theory (Lillehagen and Lyngstad 2018). In Sweden, the difference in sex ratio at birth between immigrants who arrived at young ages and native-born Swedes is small (Mussino et al. 2018). A similar adaptive behavior in childbearing and sex preference has also been found in Israel among immigrants from Asia and Africa (Okun 1996).

In some contexts, such adaptive behavior is remarkably pronounced among the second generation of immigrants. For example, Chinese-born immigrants in the US show a preference for sons over daughters, whereas American-born Chinese women prefer one son and one daughter, similarly to native-born Whites (Tang 2013). However, findings for some other contexts challenge the adaptation theory. An indication of cultural persistence is observed among the second generation of some immigrant groups in Canada. Studying the parity progression in Canada, Almond et al. (2013) found that among two-girl mothers the likelihood of having a third birth was significantly higher among first- and second-generation immigrants from South or East Asian immigrants compared to other immigrant groups.

Having a native-born partner has also been found to increase one's opportunity of having innovative social interactions in the host country and to accelerate immigrants' adaptation process. In Italy, it increases the risk of having a second child for immigrants coming from lower fertility countries and decreases the second-birth risk for immigrants coming from countries with higher fertility level (Mussino and Strozza 2012b). We might expect a similar effect when looking at sex preferences. However, Lillehagen and Lyngstad (2018) found that, in Norway, having a native-born partner is not generally associated with preference for the sex of children among immigrant women.

Hypotheses

Sex preferences for children is closely associated with the number of children as well as the timing of the next birth, especially when the sex composition of the children already born is taken into account. Couples may continue childbearing until they have a child of the desired sex, and couples who have obtained their desired number of sons or daughters may stop having more children (Bongaarts 2013; Clark 2000).

Regarding birth intervals, a study by Teachman and Schollaert (1989) shows that in the United States, women tend to have a third birth sooner after the second one if they have two sons or two daughters than if they have a boy and a girl. The authors argue that this pattern is largely driven by parents' desire to balance the genders of their children rather than their preference for boys or girls. A different scenario

unfolds in contexts with strong son-preference cultures. In India, for example, the interval between the second and third birth for couples with two sons is longer than that of those with two girls (Nath, Leonetti and Steele 2000).

The reasons for having a child of desired sex may vary across individuals in different societies. The strategies that couples use to achieve their desired number of sons and daughters might include shortening birth intervals, irrespective of whether they are migrants or non-migrants. Therefore, it is important to investigate both the timing and intensity of the transition to a third birth when investigating sex preferences for children. We study these aspects testing two different competing hypotheses:

Socialization hypothesis When migrants come to a destination country, they hold cultural traditions from their home country, including values and ways of thinking. Their behavior in the destination country, including their reproductive behavior, might be influenced by their pre-migration norms. Hence, we hypothesise that,

- (1) immigrants coming from countries with strong son preference cultures are expected to be more likely to have a third child if they have had only daughters than if they have had at least one son;
- (2) immigrants coming from countries with strong son preference cultures are expected to be more likely to accelerate their process of having a third child if their first two children are both girls than if there is at least one boy among the first two children.

Adaptation hypothesis Behavior might change over time. Although immigrants might continue to draw on pre-migration norms after they settle in the destination country, they might gradually modify their behavior and preferences because of the influence of the social, economic and cultural factors in the destination country (Foner 1997). Specifically, as the time spent in the destination country increases, the differences in sex preferences for children between the natives and immigrants should shrink. Exposed to the culture of the destination country since childhood, those who migrate at younger ages should exhibit behaviors similar to that of the native. Hence, we hypothesise that,

- (3) immigrants who stay in Sweden for a longer period of time should show a lower tendency for son preference than those whose residence time in Sweden is shorter;
- (4) exposed to the cultural norm of Sweden since childhood, those who migrated to Sweden before age 16 (1.5 generation immigrants) should demonstrate a gender-neutral or even girl-preference reproductive behavior, as the native-born Swedes do.
- (5) immigrants having a native partner should have gender-neutral or even girl-preference reproductive behavior.

In particular, but not exclusively, the study gives more focus on migrants coming from China, South Korea, India and the former Yugoslavia. The first three origin

countries represent an important source of East Asian immigrants in Sweden today, while the former Yugoslavia is an important source of immigrants from South-East Europe. These countries share a son-preference culture. In China, son preference has deep cultural roots (Arnold and Liu 1986). Before the introduction of the population control policy, if the existing children were all girls, couples would normally continue with childbearing until they had a son. Once they had a son, they might delay or stop childbearing (Poston 2002). This normative requirement for sons can also be seen in other Asian societies. In South Korea, son preference was rather prevalent and a strong indicator for continued childbearing. In the 1980s, Korean women who bore a girl for the first birth had a substantially higher likelihood of having a second child than those who had had a boy. In the 2000s, however, the gender of the first child ceased to make a difference for second-birth fertility, indicating that son preference has lost its importance in Korean society in the new century (Ma 2016). In India, a preference for sons also prevails. Upon their weddings, Hindu women often receive a blessing that they will become a mother of a hundred sons (Bumiller 1990). In addition, the need to pay dowries for daughters further drives parents to show preferences for sons (Das Gupta et al. 2003).

Apart from South and East Asia, parental preference for having sons seems to be observed in South-East and Eastern Europe. A rise in sex selection at birth has been noted in several Balkan states and, in general, after the wars of Yugoslav succession (Guilimoto 2009). The economic crisis of the 1990s and conditions of conflict, as well as patriarchal norms and the emergence of sex-detection technology, had an effect on sex imbalances at birth, especially in several countries that are part of the former Yugoslavia, such as Montenegro, Kosovo and Macedonia (UNFPA 2012b).

Several of the mechanisms listed above explaining son preferences in these origin countries are associated with norms that should not represent an industrialised and gender egalitarian context such as Sweden (Andersson et al. 2006; Hank 2007; Lillehagen and Lyngstad 2018). Still the question of the persistence of the norms from the country of origin is a complex one because some of those norms might be internalised and, consequently, transferred across countries.

Data and methods

The data come from the Swedish population register, which is kept by the Swedish national bureau of statistics. These administrative data began to be digitised in the 1960s and they include all individuals registered as residents in Sweden, as well as births, deaths and international migrations. This data source has been widely used by previous studies, and an in-depth description of its content and availability to researchers has been published elsewhere (e.g., Miranda et al. 2018; Statistics Sweden 2003).

Maternal birth histories were constructed using data on all first, second and third births that occurred in Sweden between 1990 and 2017 to women born in 1954 or later. Information on the country of birth of women and the number and sex of their existing children was used. Mothers who had multiple births at any point in their lifetime were not included in the study, and only live births were considered.

Event-history models were estimated to study women's transition to third-order childbearing in Sweden. The data are organised with monthly precision of exposures and birth outcomes. In particular, because we hypothesise that women accelerate their process of having a third child if their prior children are both girls we need an assumption about the baseline. This is why we use a semiparametric specification: piecewise exponential model. This variant of the basic exponential model assumes that the baseline time under risk (t) of experiencing the transition to the third birth (the duration of the process) is divided into j predefined intervals. The risk is constant for these time-intervals, but is allowed to vary across them (Allison 1984). In this study, time since second birth, our basic time factor, is categorised into 0–1 year, 1–2 years, 2–3 years, 3–5 years, and more than 5 years after the birth of the second child. Women are right-censored in the study if they do not experience a third birth within ten years after the second birth, if they turned age 46, they die, or they emigrate from the country.

We measure the relative risks of having an additional child by the sex composition of the previous two children, and the birth risks are expressed in relation to the birth rate of mothers of one boy and one girl. In other words, we interpret significant differences in relative risk ratio (RRR) by sex of existing children as an indication of parents' preferences for the sex of children (see Miranda et al. 2018).

Time since migration is another important time variable in this study. This variable is grouped into 1st and 1.5 generation. Immigrants who arrived in Sweden during their childhood (before they turned 16 years) are categorised as 1.5 generation immigrants (see Kulu et al. 2017) while those who arrived as adults (1st generation) are categorised by years since migration into 1–3 years, 4–5 years, and more than 5 years in Sweden (e.g., Mussino et al. 2018). We additionally control for calendar years (ranging from 1990 to 2016), age of the mother at the birth of the second child, and country of birth of the father of the second child (native, same country of the mother, another foreign country and missing).

We use country of origin as a proxy of cultural traditions from the home country.² As analytical strategy we run separate models for each country of birth³ (see Lilliehagen and Lyngstad 2018) and our results are presented as RRR standardized by the mentioned variables. We present both the level of significance and confidence intervals to better interpret our results.⁴ Table 1 presents the distribution of second births

² We categorised individual by geographical area of origin: Sweden; China, Korea, India; Iran; Iraq; Poland; Turkey; Syria; Afghanistan, and Pakistan; Horn of Africa (Somalia, Ethiopia, Eritrea, Djibouti); Southeast Asia (Brunei Darussalam, Cambodia, East Timor, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam); Former Yugoslavia (Croatia, Slovenia, Bosnia and Herzegovina, Macedonia, Serbia, Montenegro, Kosovo); Rest of Europe (any other European countries not mentioned until now); America and Oceania; Rest of Africa (any other African countries not mentioned until now); Rest of Asia (any other Asia countries not mentioned until now).

³ See Tables 2, 3, 4 and 5.

⁴ Regarding the use of p value when using complete populations, we agree and follow Jan Hoem reasoning (2008, p. 439): “[A]n issue that has long been settled among statisticians but that still seems to arise occasionally among demographers, namely the question whether statistical significance is relevant to data that cover a complete population or whether it only pertains to the sampling error that arises in sample surveys. I want to state firmly that individual life histories are seen most fruitfully as realizations

Table 1 Distribution of second and third births by women's country of origin, Sweden (1990–2017).
Source: Swedish register data, authors' calculations

Country of origin	2nd births				Person Years	3rd births	Mean age at 2nd birth
	Total	2 boys	2 girls	1 girl, 1 boy			
Afghanistan, Pakistan	5442	1495	1263	2684	18,221	2104	27.62
Americas and Oceania	18,723	4909	4381	9433	96,607	5123	30.66
China, Korea, India	10,138	2593	2429	5116	51,517	1874	31.63
Horn of Africa	15,596	4087	3623	7886	50,116	8700	28.08
Iran	10,947	2879	2634	5434	65,202	1593	31.12
Iraq	23,220	6270	5330	11,620	102,076	9835	28.63
Poland	12,409	3285	2866	6258	66,242	2236	30.22
Rest of Africa	12,907	3329	3026	6552	53,096	5358	29.80
Rest of Asia	16,852	4493	3978	8381	70,779	6981	28.65
Rest of Europe	63,987	16,857	14,950	32,180	322,242	14,768	30.53
Southeast Asia	16,086	4193	3784	8109	86,237	4176	30.21
Sweden	979,718	258,734	229,180	491,804	6,131,589	276,182	30.05
Syria	13,427	3720	2944	6763	38,280	5202	27.52
Turkey	9547	2576	2187	4784	49,331	4299	27.92
former Yugoslavia	31,301	8393	7136	15,772	167,201	8911	28.23

and third births by women's country of origin. It also shows the sex composition of existing children for two-child mothers and mean age at second birth.

Finally, three interaction terms are tested—between time since second birth and sex composition of the previous children; between time since migration and sex composition of the previous children; and between the country of birth of the father and sex composition of the previous children.

The first interaction term helps us observe how soon mothers have a third child after the second birth. We run this interaction for mothers coming from countries where parental son preference are stronger (China, Korea, India and former Yugoslavia), for native-born mothers and mothers from countries with parental neutral preference (Rest of Europe) for comparative reasons. The second interaction reveals how the sex preferences of children among immigrant mothers may develop as they reside in Sweden for a longer period of time. The third shows whether sex preference of children might be strengthened or weakened if the father comes from the same country as the mother does or if the father is native born.

Footnote 4 (continued)

of stochastic processes each of which is subject to random variation, and that this should be taken into account even when the set of observations contains all members of a population or population segment.”

Fig. 1 Relative risk ratios of third birth by sex composition of the previous born children and women's country of birth, Sweden (1990–2017) (Reference category: 1 girl, 1 boy). *Note:* Swedish register data, authors' calculations, (see the “[Appendix](#)” for confidence intervals) white bar not significant. Separate regressions by country of birth of the mother. The models include controls for age at birth of the second child, time since the birth of the second child, time since migration (for the foreign-born only), calendar year, father's country of birth, and sex of the previous children. Estimated results from the main effects models are presented in the “[Appendix](#)”

Gender versus gender neutral preference

Figure 1 shows the relative risks of having a third child by the sex composition of the previous children among women of different countries of origin, while other covariates are standardised (i.e., time since the second child, time since migration, calendar year, and mothers' age at birth of the second child and father's country of origin- for the full model see “[Appendix](#)”). Separate models were estimated by the country of birth of the mother.

The results for the native-born mothers are consistent with earlier findings (Andersson et al. 2006, 2007; Miranda et al. 2018). Namely, the third birth risks of two-boy and two-girl mothers are elevated when compared to that of boy–girl mothers. Moreover, the birth risk of two-boy mothers is higher than that of two-daughter mothers. These results suggest not only native-born mothers' preference for having at least one child of each sex, but also their stronger desire to have at least one daughter compared to having at least one son.

Our results for women who migrated to Sweden from the Americas, Oceania, and the rest of Europe do not show a particular preference for the gender of their offspring. In this group, the birth risks of two-boy and two-girl mothers are elevated when compared to boy–girl mothers. However, there is no clear distinction in birth risks between two-boy and two-girl mothers. These results reflect that immigrants from these regions do not have strong preference for sons or daughters. Instead, they have a preference for having at least one child of each sex. The reproductive behavior of these women resemble that of women in their home countries (e.g., Pollard

and Morgan 2002; Tian and Morgan 2015). Surprisingly, immigrant mothers who migrated to Sweden from Southeast Asia, an area with strong son-preference culture (Guilmoto 2012), manifest a similar pattern. However, a study by Fuse (2010) found evidence of daughter preference in the country.

A preference for having sons over daughters can be seen among almost all the other groups of immigrant women. However, we can distinguish two different patterns. The first includes immigrant mothers from China, Korea and India, as well as mothers from Iran, Poland, and the rest of Africa. In this group, the birth risks of two-boy and two-girl mothers are both elevated significantly when compared to boy–girl mothers. Additionally, the birth risk of two-daughter mothers is noticeably higher than that of two-boy mothers. This pattern suggests not only these mother's preference to have at least one child of each sex, but also their stronger desire to have at least one son compared to having at least one daughter. This pattern appears to be especially pronounced among mothers from China, Korea and India.

The second pattern includes immigrant mothers from the former Yugoslavia, Turkey, the rest of Asia, Iraq, Syria, Afghanistan and Pakistan, and the Horn of Africa. The special feature of this second pattern is that compared to the birth risk of boy–girl mothers, the birth risk of two-girl mothers is significantly elevated, especially that of mothers from the former Yugoslavia, while the birth risk of two-boy mothers is not significantly different. This pattern suggests that mothers coming from these countries or regions have a notably strong preference to have at least one son, whereas their desire to have one child of each sex is not strong.

As a whole, we found evidence for sex preferences where we expected to (see Arnold 1997; Edlund 1999; Fuse 2010; Rossi and Rouanet 2015) supporting the hypothesis of cultural persistence. However, our results also show a few exceptions: women from Poland, whom Hank and Kohler (2000) found having neutral preferences, show son preference in Sweden; and women from Southeast Asia who are expected to show a son preference demonstrate a neutral preference in Sweden. These might be explained by the different composition of women in the group, in fact results at origin are more diverse (e.g., Philippine girl-preference (Fuse 2010); Thailand neutral preference (Knodel and Prachuabmoh 1976; Knodel et al. 1996); Vietnam boy preference (Haughton and Haughton 1998)).

How parental sex preference accelerates transition to third child

To explore in depth whether immigrants coming to Sweden from regions with son preference cultures accelerate their process of having a third child if the previous children are both girls, we estimate the interactive effect of time since second birth and sex composition of children, while other covariates are standardised. Figure 2 shows the results of this analysis for women coming from China, Korea and India, and the former Yugoslavia. The results for native-born women and women from the

Fig. 2 Interactive effect of time since second birth and sex composition of previous children on third birth risk, Sweden (1990–2017) (Reference category: 5+ years after the second birth; 1 girl, 1 boy). *Note:* Swedish register data, authors' calculations, time points with markers indicate statistically significant level at $p < 0.05$. Separate regressions by country of birth of the mother. The models include controls for age at the birth of the second child, time since migration (for the foreign-born only), calendar year, and father's country of birth

rest of Europe are also shown for comparison as a representative of daughter- and neutral preference.⁵

Figure 2 displays that native-born Swedes have an elevated third birth risk over time if they have two boys, indicating their preference for having a girl. The peak time for the native mothers to have a third child falls around 2–2.5 years after the birth of the second child, irrespective of the sex composition of the prior children. The difference in birth risks between two-boy and two-girl mothers tends to remain relatively stable over time. These findings suggest that for native-born women, the trajectory is more about having another child rather than shortening birth intervals. Women from the rest of Europe do not show any sign of son or daughter preference. Instead, they manifest a preference for having a child of each sex. Their peak time of having a third child also falls around 1.5–2.5 years after the second birth, irrespective of the sex composition of previous children.

Among immigrants from China, Korea and India who have two girls, there is a peak of third birth risk 1.5–2 years after the second birth. Their intensity of having a third child slowly declines thereafter, but their third birth risk remains higher than that of two-boy and boy–girl mothers. Mothers with two boys, have a similar third-birth peak but over time the risk declines faster. Those with a boy and a girl

⁵ Additional results for other immigrant groups are available on request.

have lower parity progression hazard ratios over time, and their peak of having a third child comes around 2–2.5 years after the second birth. These findings convey two messages. First, both mothers with two girls and those with two boys tend to speed up their third birth transition process so that they can have a child of desired sex soon after the second birth. Second, the intensity of having a third child is more pronounced over time among two-girl mothers than among two-boy mothers.

Among women from the former Yugoslavia, two-girl mothers have a substantially higher risk of third birth than two-boy and boy–girl mothers over time. Two-boy mothers and boy–girl mothers have quite similar patterns. These results indicate a strong son-preference childbearing behavior among this immigrant group. Interestingly, different from two-girl and two-boy mothers from China, Korea and India who tend to speed up their third birth process to have a child of desired sex, two-girl mothers from former Yugoslavia do not hasten in the transition process. Instead, they increase their third birth risks over time. Their peak time of having a third child comes around 3–6 years after the second birth.

Taken together, these results indicate that mothers from China, Korea and India tend to speed up their third birth process in order to have a child of desired sex, especially a son. In comparison, mothers from the former Yugoslavia adopt a strategy of maintaining a higher third birth intensity over a longer period of time in order to have a son.

Time in Sweden and gender preference

To explore whether and how immigrants coming from son-preference cultures may modify their childbearing behavior as their residence time in Sweden increases, we estimate the interaction term of time since migration and sex composition of children while standardising other covariates. The results are shown in Fig. 3. Results for women from the rest of Europe are shown for comparison.⁶

Surprisingly, immigrants from China, Korea and India do not show any sign of adjusting their childbearing behavior to the Swedish norm. They have a notably higher likelihood to have a third birth if they have only girls, irrespective of the duration time they reside in Sweden. Two-girl mothers who reside in Sweden for more than 5 years have notably higher likelihood of third birth than all other mothers. In contrast, the reproductive behavior of the 1.5 generation immigrants resembles that of the native-born Swedes. Specifically, they have a higher likelihood of third birth if the previous children are of the same sex, especially if both of the children are boys.

Immigrants from the former Yugoslavian countries do not adjust their childbearing behavior, either. Although their likelihood of a third birth declines as their residence time in Sweden increases, their preference for having a son continues. Women with only girls have a significantly higher likelihood of a third birth compared with those with at least one son, regardless of their time spent in Sweden. Strikingly, such son-preference-driven childbearing behavior can even be seen among the 1.5 generation immigrants.

⁶ Results for other immigrant groups are available on request.

Fig. 3 Interactive effect of time since migration and sex composition of previous children on third birth risk, Sweden (1990–2017) (Reference category: 1.5 generation; 1 girl, 1 boy). Note: Swedish register data, authors' calculations, 95% CI, white bar not significant. The model includes controls for time since the second child, calendar year, age at the second child, and father's country of birth

For immigrant women from the rest of Europe, the sex composition of children does not have any strong effect on the likelihood of third birth during the early years of their time in Sweden. However, as their time in Sweden extends beyond 5 years, they show a tendency towards a preference for having at least one child of each sex, as those with two boys or two girls have notably higher likelihood of pursuing a third birth than those with a boy and a girl. The 1.5 generation immigrants also exhibit a similar pattern.

Swedish partner and gender preference

Figure 4 shows how father's country of birth and sex composition of children interactively affects transition to third birth. Immigrant women from China, Korea and India show significant differences in childbearing behavior across father's country of birth. If the father is Swedish born and if they have had two sons, their likelihood of having a third child is significantly higher than if they have a boy and a girl. These results suggest that they actually show a girl preference.

On the contrary, immigrant women from the former Yugoslavian countries with only girls have a significantly higher likelihood of a third birth compared with those with at least one son, irrespective of the father's country of origin (except when the information on the father is missing).

Among immigrant women from the rest of Europe, girl preference are noticed when they have a partner from Sweden. If they have a partner from the same country, they have a neutral preference of children. Surprisingly, they exhibit son preference if they have a partner from another foreign country.

Limitations

Awareness should be drawn to limitations in understanding our results. First, we interpreted our results as indicators of sex preferences. This could potentially create bias if sex-selective abortion as well as other relevant issues are taken into account. Following previous studies, we assumed the exogeneity of sex of previous children (Angrist and Evans 1998). Thus, we do not control for other variables (see for similar approach in Lillehagen and Lyngstad 2018). We need to acknowledge that our results for third birth risks based on sex composition of existing children might be a conservative test on the existence of parental sex preferences. For the Swedish context, Mussino et al. (2018) provide evidence of sex-selective abortion among women with Chinese, Korean, and Indian background at the third parity if previous children were both girls. However they did not find any evidence for lower parity. Furthermore, with regard to migrant selection, we have to address that immigrants arriving in Sweden are not selected at random from the population in their home country. However, because we do not know their sex preference before migration, we cannot deny the probability that some already had similar sex preferences for children as the native Swedish population do before they migrated to Sweden.

Fig. 4 Interactive effect of father's country of birth and sex composition of previous children on third birth risk, Sweden (1990–2017) (Reference category: same country of origin; 1 girl, 1 boy). *Note:* Swedish register data, authors' calculations, 95% CI, white bar not significant. The models include controls for age at the birth of the second child, time since migration (for the foreign-born only), calendar year and time since the second child

Conclusion

In this study, we explore immigrant mothers' transition to third birth in Sweden. In particular, we examine how the sex composition of prior children is associated with third birth risks and whether having only daughters speed up the process. Meanwhile, we demonstrate how immigrants exhibit their sex preferences for children in Sweden, a country that promotes gender equality and where parental preference for having a girl prevails. We pay particular attention, but not only, to immigrants from China, Korea, India and the former Yugoslavia, where son preference culture has been well documented in the literature. Event-history models were applied to longitudinal data from the Swedish registers to study the transition to third birth.

Our results confirmed the first hypothesis. Immigrants from countries with strong son-preference cultures such as China, Korea, India, and the former Yugoslavia did have a higher likelihood of transitioning to a third birth if the children born were both girls. They tend to maintain the son-preference driven childbearing behavior of the home country in the destination country. In comparison, immigrants from the rest of Europe and other Western societies did not show signs of son preference. Instead, as their counterparts do in their home country, they show a preference for having at least one child of each sex. These findings for the context of Sweden support the theory of socialisation: the culture and norms of immigrants' home countries play an important role in affecting their reproductive behavior in the destination country. These results are in line with previous studies on Finnish migrants in Sweden (Andersson et al. 2007) and immigrants in Norway (Lillehagen and Lyngstad 2018), indicating a sign of cultural persistence.

Our results partially confirmed the second hypothesis. For the native-born mothers, the peak time of having a third birth fell around 2–2.5 years after the second birth, irrespective of the sex composition of prior children. In comparison, immigrant mothers from China, Korea and India accelerated this process if the children born were of the same sex, especially if both children were girls. The peak time for these mothers to have a third child was brought forward to 1.5–2 years after the second birth. Thereafter, their intensity slowly declined. The strategy of immigrant mothers from the former Yugoslavia is different: compared to mothers with at least one boy, those with two girls shows a higher likelihood of having a third child approximately 3–6 years after the birth of the second child. It is noteworthy that their intensity of third birth persists at a high level over a longer term. In short, the acceleration process of mothers from China, Korea, and India, and the long-term-effort style of mothers from the former Yugoslavia imply that different immigrant groups pursue their goal of having a child of desired sex in different ways.

Our estimations to test the third and fourth hypotheses reveal interesting results as well. Our results cannot sufficiently support the theory of adaptation. Mothers who migrated to Sweden during adulthood (first-generation migrants) from China, Korea and India did not show any sign of adaptation, while their counterparts from the former Yugoslavia showed only weak signs of adjusting their reproductive behavior to the cultural norm of Sweden as their residence time in Sweden increased. If they had two girls, their intensity of having a third child remained

significantly higher than if they had two boys or a girl and a boy, regardless of their time spent in Sweden. Hence, our third hypothesis cannot be confirmed.

Our fourth hypothesis cannot be fully confirmed either. Our results were mixed with regard to the importance of arriving as a child in the host country as an adaptive mechanism. Among the 1.5 generation immigrants from former Yugoslavia, those with only girls had a significantly higher likelihood of pursuing a third birth than those with two boys, and those with a boy and a girl. In sharp contrast, the 1.5 generation immigrants from China, Korea and India have a higher likelihood of pursuing a third birth if the existing children are two boys. These results indicate that the 1.5 generation immigrants from former Yugoslavia exhibit as strong a son preference as their parents' generation did, whereas the 1.5 generation immigrants from China, Korea, and India display a sign of adaptation: their reproductive behavior shows a daughter-preference, which is similar to the reproductive behavior of the native-born Swedes. These results seem to suggest that relative to immigrants from the former Yugoslavia who came to Sweden during childhood, their counterparts from China, Korea and India are more engaged in adapting into Swedish culture and norms. Similar results have also been found for migrants in other destination countries (see Almond et al. 2013; Ost and Dziadula 2016).

Our fifth hypothesis addresses the interactive effect of father's country of origin and sex composition of previous children. Lillehagen and Lyngstad (2018) did not find a clear role of fathers' country of origin in the progression to third birth for the context of Norway. Our study for the Swedish context demonstrates interesting results. Women from China, Korea and India as well as women from the rest of Europe present a clear girl-preference childbearing behavior if they have a Swedish partner, indicating a certain degree of cultural adaptation. In contrast, the son-preference childbearing behavior of women from former Yugoslavia is not affected at all by the partner's country of origin.

This study contributed to literature on sex preference for children. First, our findings imply that immigrants tend to maintain aspects of their previous culture and way of life in the destination country. In our case, the persistence of son-preference among immigrants from China, Korea, India and the former Yugoslavia, combined with the persistence of having at least one child of each sex among immigrants from the rest of Europe, empirically support this viewpoint.

Second, our findings suggest that adapting to the norm of the destination country is not a pattern shared among all immigrant groups. In our case, the persistence over time of son preference among first-generation immigrants from China, Korea, India and former Yugoslavia proves that the influence of the cultural norm of the home country can last longer than expected. Our findings suggest that Sweden's tolerance of cultural diversity and the multiculturalism that has been encouraged in Swedish society provide immigrants with better opportunities to maintain their cultural traditions and values. In addition, the girl preference tendency among the 1.5 generation immigrants from China, Korea and India and among those with a Swedish partner implies that growing up in the host country context and closer social interactions (having a Swedish partner) may trigger a change of cultural norms.

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Appendix

See Tables 2, 3, 4 and 5.

Table 2 Results from main effects models for Sweden, Rest of Europe, China, Korea and India, and former Yugoslavia

	Sweden			Rest of Europe			China, Korea, India			former Yugo- slavia		
	RRR	95% CI		RRR	95% CI		RRR	95% CI		RRR	95% CI	
<i>Sex composition of children</i>												
2 boys	1.29	1.28	1.30	1.17	1.13	1.22	1.26	1.13	1.40	1.01	0.96	1.06
2 girls	1.17	1.16	1.18	1.14	1.10	1.19	1.43	1.28	1.60	1.63	1.55	1.71
1 girl, 1 boy	1			1			1			1		
<i>Time since second birth</i>												
0–1.5 years	0.15	0.15	0.16	0.19	0.18	0.20	0.23	0.19	0.27	0.23	0.21	0.26
1.5–2 years	0.89	0.88	0.91	1.02	0.95	1.09	1.14	0.95	1.36	0.96	0.87	1.05
2–2.5 years	1			1			1			1		
2.5–3 years	0.88	0.87	0.90	0.90	0.84	0.97	0.90	0.74	1.10	0.98	0.88	1.08
3–6 years	0.88	0.87	0.89	0.78	0.74	0.82	0.88	0.75	1.02	1.14	1.06	1.23
6+ years	0.61	0.60	0.61	0.53	0.50	0.57	0.70	0.59	0.84	1.03	0.95	1.13
<i>Time since migration</i>												
1–3 years				1.25	1.18	1.33	0.77	0.61	0.98	1.52	1.41	1.63
4–5 years				1.15	1.08	1.22	1.06	0.85	1.31	1.27	1.18	1.37
5+ years				0.98	0.94	1.02	0.98	0.86	1.13	0.90	0.85	0.95
1.5 generation				1			1			1		
<i>Calendar years</i>												
1990–1994	1.17	1.16	1.18	1.04	1.00	1.09	1.69	1.43	2.01	0.55	0.51	0.60
1995–1999	0.75	0.75	0.76	0.74	0.71	0.78	1.06	0.91	1.24	0.60	0.56	0.63
2000–2004	0.83	0.82	0.84	0.84	0.79	0.88	0.98	0.85	1.13	0.60	0.56	0.64
2005–2009	0.98	0.97	0.99	0.98	0.93	1.04	1.06	0.93	1.20	0.88	0.83	0.94
2010–2017	1			1			1			1		
<i>Mother age</i>												
15–19	1.42	1.13	1.79	1.99	1.27	3.14	1.97	0.27	14.11	3.33	2.43	4.56
20–21	1.53	1.43	1.63	1.70	1.39	2.09	1.06	0.34	3.34	2.65	2.25	3.11
22–23	1.52	1.47	1.57	1.39	1.22	1.57	1.42	0.94	2.13	1.83	1.64	2.05
24–25	1.30	1.28	1.33	1.36	1.24	1.48	1.46	1.13	1.88	1.50	1.38	1.64

Table 2 (continued)

	Sweden			Rest of Europe			China, Korea, India			former Yugo- slavia		
	RRR	95% CI		RRR	95% CI		RRR	95% CI		RRR	95% CI	
26–27	1.14	1.12	1.16	1.08	1.01	1.17	1.20	0.97	1.47	1.17	1.08	1.26
28–29	1			1			1			1		
30–31	0.86	0.85	0.87	0.92	0.87	0.98	0.91	0.76	1.08	0.86	0.80	0.92
32–33	0.74	0.73	0.75	0.78	0.73	0.83	0.69	0.58	0.82	0.72	0.67	0.78
34–35	0.62	0.61	0.63	0.68	0.64	0.73	0.59	0.49	0.71	0.54	0.50	0.59
36–37	0.47	0.46	0.48	0.54	0.50	0.58	0.52	0.43	0.63	0.35	0.31	0.39
38–39	0.32	0.31	0.32	0.39	0.36	0.42	0.39	0.31	0.48	0.27	0.24	0.31
40–41	0.17	0.17	0.18	0.23	0.21	0.26	0.24	0.18	0.32	0.14	0.12	0.17
42–45	0.06	0.06	0.06	0.09	0.07	0.10	0.09	0.06	0.14	0.05	0.04	0.07
<i>Father's country of birth</i>												
Sweden	1			1.17	1.12	1.22	1.24	1.07	1.45	0.81	0.75	0.89
Other country	1.18	1.16	1.19	1.28	1.21	1.35	1.52	1.31	1.77	1.25	1.11	1.40
Same country	(NA)			1			1			1		
No father information	1.52	1.42	1.62	1.31	1.17	1.46	1.01	0.60	1.70	0.58	0.47	0.70
Intercept	0.01			0.01			0.01			0.01		

Table 3 Results from main effects models for America and Oceania, Southeast Asia, Iran, and Poland

	America and Oceania			Southeast Asia			Iran			Poland		
	RRR	95% CI		RRR	95% CI		RRR	95% CI		RRR	95% CI	
<i>Sex composition of children</i>												
2 boys	1.18	1.11	1.26	1.24	1.15	1.33	1.15	1.02	1.30	1.18	1.07	1.30
2 girls	1.17	1.09	1.25	1.22	1.14	1.32	1.32	1.18	1.49	1.26	1.14	1.39
1 girl, 1 boy	1			1			1			1		
<i>Time since second birth</i>												
0–1.5 years	0.24	0.21	0.27	0.26	0.23	0.30	0.38	0.30	0.48	0.28	0.24	0.34
1.5–2 years	1.11	0.99	1.25	1.08	0.95	1.23	1.22	0.95	1.55	1.18	0.98	1.41
2–2.5 years	1			1			1			1		
2.5–3 years	0.89	0.78	1.01	0.92	0.80	1.06	1.09	0.84	1.41	0.77	0.62	0.95
3–6 years	0.89	0.81	0.98	0.81	0.73	0.90	0.99	0.81	1.20	0.91	0.78	1.06
6+ years	0.78	0.71	0.87	0.69	0.62	0.78	1.21	0.99	1.48	0.83	0.70	0.97
<i>Time since migration</i>												
1–3 years	1.13	1.03	1.24	1.16	1.04	1.30	1.09	0.86	1.38	0.85	0.73	1.00
4–5 years	1.05	0.95	1.16	0.89	0.79	0.99	1.07	0.84	1.34	0.83	0.71	0.98

Table 3 (continued)

	America and Oceania			Southeast Asia			Iran			Poland		
	RRR	95% CI		RRR	95% CI		RRR	95% CI		RRR	95% CI	
5+ years	0.92	0.86	0.98	0.76	0.70	0.84	0.89	0.74	1.07	0.79	0.70	0.89
1.5 generation	1			1			1			1		
<i>Calendar years</i>												
1990–1994	1.22	1.13	1.33	1.81	1.64	2.01	1.15	0.97	1.36	0.98	0.87	1.11
1995–1999	0.91	0.83	0.99	1.30	1.18	1.43	0.91	0.77	1.07	0.73	0.63	0.84
2000–2004	0.97	0.89	1.06	1.11	1.01	1.22	0.96	0.82	1.14	0.82	0.70	0.94
2005–2009	1.09	1.00	1.18	1.10	1.01	1.20	1.01	0.86	1.18	0.98	0.87	1.11
2010–2017	1			1			1			1		
<i>Mother age</i>												
15–19	1.52	0.63	3.66	0.51	0.13	2.04	0.00	0.00	0.00	2.67	1.18	6.02
20–21	1.23	0.83	1.81	0.70	0.43	1.16	1.68	0.74	3.82	1.27	0.72	2.21
22–23	1.16	0.95	1.43	1.17	0.94	1.45	0.91	0.52	1.57	1.34	0.97	1.86
24–25	1.04	0.90	1.21	1.24	1.07	1.44	0.99	0.70	1.40	1.14	0.90	1.45
26–27	1.19	1.05	1.34	1.06	0.93	1.21	1.31	1.03	1.67	1.20	0.99	1.44
28–29	1			1			1			1		
30–31	0.99	0.89	1.10	0.98	0.88	1.10	0.87	0.71	1.07	0.96	0.82	1.13
32–33	0.83	0.75	0.93	0.89	0.79	0.99	0.76	0.62	0.93	0.77	0.66	0.90
34–35	0.73	0.66	0.82	0.72	0.64	0.81	0.79	0.65	0.96	0.66	0.57	0.78
36–37	0.61	0.54	0.68	0.65	0.57	0.73	0.64	0.52	0.78	0.49	0.41	0.58
38–39	0.42	0.37	0.48	0.52	0.45	0.60	0.42	0.33	0.53	0.35	0.28	0.43
40–41	0.26	0.22	0.31	0.35	0.29	0.42	0.32	0.24	0.43	0.27	0.21	0.35
42–45	0.10	0.08	0.13	0.11	0.08	0.15	0.16	0.11	0.22	0.13	0.09	0.18
<i>Father's country of birth</i>												
Sweden	1.01	0.95	1.07	0.66	0.62	0.71	1.85	1.53	2.23	1.13	1.02	1.27
Other country	1.06	0.96	1.17	0.81	0.72	0.92	2.11	1.79	2.49	1.27	1.12	1.44
Same country	1			1			1			1		
No father information	1.22	1.04	1.42	0.97	0.86	1.10	1.28	0.89	1.84	1.95	1.58	2.39
Intercept	0,01			0,01			0,00			0,01		

Table 4 Results from main effects models for Rest of Africa, Turkey, Rest of Asia, and Iraq

	Rest of Africa			Turkey			Rest of Asia			Iraq		
	RRR	95% CI		RRR	95% CI		RRR	95% CI		RRR	95% CI	
<i>Sex composition of children</i>												
2 boys	1.11	1.04	1.18	1.01	0.94	1.09	1.05	0.99	1.11	1.04	0.99	1.09
2 girls	1.22	1.14	1.30	1.41	1.31	1.52	1.26	1.19	1.34	1.27	1.21	1.34
1 girl, 1 boy	1			1			1			1		
<i>Time since second birth</i>												
0–1.5 years	0.24	0.22	0.27	0.29	0.26	0.34	0.25	0.22	0.27	0.26	0.24	0.29
1.5–2 years	1.03	0.92	1.15	1.04	0.90	1.19	0.96	0.88	1.06	1.06	0.97	1.16
2–2.5 years	1			1			1			1		
2.5–3 years	1.02	0.90	1.15	0.99	0.85	1.14	1.02	0.92	1.13	0.96	0.87	1.05
3–6 years	1.10	1.00	1.20	1.07	0.96	1.20	1.00	0.92	1.08	1.20	1.11	1.29
6+ years	0.81	0.73	0.91	1.18	1.05	1.33	0.91	0.83	1.00	1.16	1.08	1.26
<i>Time since migration</i>												
1–3 years	1.39	1.23	1.57	1.32	1.15	1.51	1.13	1.04	1.23	1.77	1.61	1.96
4–5 years	1.27	1.12	1.43	0.97	0.85	1.11	1.35	1.24	1.46	1.73	1.57	1.91
5+ years	1.03	0.92	1.15	0.92	0.86	0.98	1.00	0.93	1.07	1.17	1.07	1.28
1.5 generation	1			1			1			1		
<i>Calendar years</i>												
1990–1994	1.03	0.94	1.14	1.37	1.25	1.51	1.52	1.41	1.64	1.22	1.10	1.35
1995–1999	0.89	0.81	0.97	1.00	0.91	1.10	1.23	1.14	1.32	1.01	0.93	1.09
2000–2004	0.92	0.85	1.01	0.93	0.85	1.02	1.09	1.01	1.17	0.98	0.92	1.04
2005–2009	1.04	0.96	1.12	1.01	0.92	1.10	1.04	0.97	1.11	1.06	1.01	1.12
2010–2017	1			1			1			1		

Table 4 (continued)

	Rest of Africa		Turkey		Rest of Asia		Iraq	
	RRR	95% CI	RRR	95% CI	RRR	95% CI	RRR	95% CI
<i>Mother age</i>								
15–19	1.05	0.39	2.80	0.86	3.52	1.55	1.22	0.69
20–21	1.14	0.78	1.67	0.62	1.39	1.04	1.24	1.00
22–23	1.21	1.00	1.46	0.91	1.33	1.18	1.20	1.06
24–25	1.18	1.03	1.35	0.98	1.27	1.04	1.11	1.02
26–27	1.19	1.06	1.33	0.91	1.13	1.03	1.03	0.95
28–29	1						1	
30–31	1.10	0.99	1.21	0.92	1.13	0.82	0.99	0.92
32–33	0.99	0.90	1.10	0.76	0.94	0.64	0.93	0.87
34–35	0.86	0.78	0.96	0.68	0.86	0.56	0.80	0.74
36–37	0.82	0.73	0.91	0.49	0.66	0.43	0.81	0.74
38–39	0.64	0.56	0.73	0.39	0.56	0.35	0.64	0.58
40–41	0.39	0.32	0.46	0.22	0.37	0.23	0.48	0.42
42–45	0.18	0.14	0.23	0.10	0.20	0.07	0.17	0.14
<i>Father's country of birth</i>								
Sweden	0.52	0.47	0.57	0.63	0.80	0.57	0.72	0.57
Other country	0.86	0.79	0.93	1.22	1.47	0.94	0.99	0.90
Same country	1						1	
No father information	0.69	0.61	0.78	0.36	0.82	0.45	0.49	0.40
Intercept	0.01			0.01		0.01	0.01	

Table 5 Results from main effects models for Syria, Afghanistan and Pakistan, and Horn of Africa

	Syria			Afghanistan, Pakistan			Horn of Africa		
	RRR	95% CI		RRR	95% CI		RRR	95% CI	
<i>Sex composition of children</i>									
2 boys	0.97	0.91	1.04	0.95	0.86	1.06	1.02	0.97	1.08
2 girls	1.25	1.16	1.33	1.21	1.09	1.35	1.06	1.01	1.12
1 girl, 1 boy	1			1			1		
<i>Time since second birth</i>									
0–1.5 years	0.26	0.23	0.29	0.23	0.19	0.27	0.28	0.26	0.30
1.5–2 years	1.00	0.88	1.13	0.90	0.75	1.07	1.18	1.10	1.27
2–2.5 years	1			1			1		
2.5–3 years	0.99	0.87	1.13	0.93	0.77	1.13	0.81	0.74	0.89
3–6 years	1.23	1.12	1.36	0.93	0.81	1.07	0.71	0.66	0.76
6+ years	1.02	0.91	1.14	0.87	0.74	1.03	0.51	0.46	0.55
<i>Time since migration</i>									
1–3 years	1.42	1.28	1.58	1.25	1.02	1.53	1.67	1.51	1.84
4–5 years	1.16	1.03	1.30	1.22	1.00	1.50	1.68	1.52	1.85
5+ years	0.95	0.86	1.05	0.91	0.75	1.10	1.29	1.18	1.42
1.5 generation	1			1			1		
<i>Calendar years</i>									
1990–1994	1.55	1.40	1.72	1.40	1.17	1.69	0.75	0.68	0.82
1995–1999	1.29	1.17	1.42	1.06	0.89	1.26	0.85	0.80	0.91
2000–2004	1.07	0.98	1.18	1.01	0.87	1.17	0.78	0.73	0.84
2005–2009	1.12	1.02	1.23	1.10	0.98	1.23	0.85	0.79	0.90
2010–2017	1			1			1		
<i>Mother age</i>									
15–19	1.03	0.63	1.70	0.96	0.36	2.58	0.83	0.55	1.23
20–21	1.13	0.89	1.42	0.88	0.53	1.45	0.97	0.82	1.14
22–23	1.08	0.93	1.25	0.84	0.64	1.10	1.09	0.99	1.21
24–25	1.17	1.04	1.30	1.20	1.01	1.43	1.10	1.01	1.19
26–27	0.97	0.88	1.07	1.12	0.96	1.30	1.08	1.00	1.16
28–29	1			1			1		
30–31	0.95	0.87	1.05	1.14	0.99	1.32	0.87	0.81	0.94
32–33	0.95	0.86	1.04	1.03	0.88	1.20	0.75	0.69	0.81
34–35	0.81	0.73	0.91	0.95	0.80	1.13	0.62	0.56	0.68
36–37	0.75	0.67	0.86	0.73	0.59	0.91	0.53	0.48	0.58
38–39	0.60	0.51	0.70	0.68	0.53	0.88	0.41	0.36	0.46
40–41	0.35	0.28	0.44	0.48	0.33	0.68	0.25	0.21	0.30
42–45	0.14	0.11	0.20	0.16	0.09	0.29	0.14	0.11	0.18
<i>Father's country of birth</i>									
Sweden	0.80	0.66	0.97	0.46	0.33	0.65	0.44	0.38	0.51
Other country	1.05	0.99	1.13	0.80	0.66	0.95	0.67	0.58	0.77
Same country	1			1			1		

Table 5 (continued)

	Syria			Afghanistan, Pakistan			Horn of Africa		
	RRR	95% CI		RRR	95% CI		RRR	95% CI	
No father information	0.41	0.31	0.54	0.42	0.31	0.55	0.59	0.55	0.64
Intercept	0.01			0.01			0.03		

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