SEX IMBALANCES AT BIRTH IN ARMENIA

DEMOGRAPHIC EVIDENCE AND ANALYSIS

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FOREWORD

The skewed sex ratio at birth has become a serious issue in recent decades in many parts of the world. Initially it was identified as "missing women" in Asia, particularly in India, Nepal, Pakistan, Bangladesh, China and Vietnam. But now the problem is observed beyond these countries. Some countries of Eastern Europe and the Caucasus including Armenia have begun to identify skewed sex ratio at birth as a growing challenge.

Prenatal sex selection is deeply embedded in cultural norms, which attribute a lower value to girls in comparison with boys, in other words – norms that support son preference. However, in order for prenatal sex selection to come into being there are two more factors required: first is availability of reproductive technology, and second is low fertility. All these three conditions have existed in Armenia since early 1990s. According to official statistical data from National Statistical Service of Armenia, the country has witnessed skewed sex ratio at birth starting from 1991 and peaking to 120 boys to 100 girls in 2000's and stabilizing at 114 boys to 100 girls in 2012.

A research study conducted in 2011 in cooperation with RA Ministry of Health, Institute of Reproductive Health, Perinatology, Obstetrics and Gynecology, and the National Statistical Service of Armenia and UNFPA confirmed that the skewed sex ratio at birth was indeed attributable to prenatal sex selection. The first ever study (not only for Armenia but for the South Caucasus region) suggested that because of this son preference, each year Armenia was losing around 1400 girls – a severe blow to already challenged demographic situation of the country.

The current study, built on the 2001 and 2011 Census data and the above research study, and conducted by one of the leading experts in this area, Mr. Christophe Z. Guilmoto, provides a sound analysis of the magnitude, determinants and implications of skewed sex ratio at birth in Armenia and offers a number of recommendations to address the challenges.

Efforts made by the UNFPA Country Office under the leadership of Mr. Garik Hayrapetyan and Dr. Vahe Gyulkhasyan to conduct and publish this research study is highly appreciated. I thank all members of the research team and partner agencies for carrying out this excellent research.

It is indeed rewarding to see the wide-ranging cooperation with and growing acknowledgment of the challenges of skewed sex ratio at birth by a broad spectrum of stakeholders including the RA Government, health-care providers, faith-based organizations, international donor community, as well as the media and the general public. We hope that this study report will serve as a source of reliable and representative data for developing and implementing extensive measures to meet the challenge, including policy and advocacy measures to end this culturally deeply rooted and dangerous practice of prenatal sex selection.

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EXECUTIVE SUMMARY

Since the 1980s, sex imbalances at birth have been observed in many countries across the world as the proportion of boys simultaneously increased in the child population. Over the last twenty years, research on countries such as China, India and South Korea has demonstrated the primary role played by sex selective abortions in the gradual rise in the sex ratio at birth above its biological level of 104-106 male births per 100 female births. Currently, this male surplus is a reflection of serious discrimination against women. In the forthcoming decades, it will also transform population structures and severely affect the dynamics of marriage.

It is only recently that attention has started to focus on Europe and North America. Elevated levels of birth masculinity have, for instance, been found among many Diaspora and immigrant communities living in the industrialized world. The demographic situation in Southeastern Europe and in the South Caucasus has also been the subject of interest as the gap between the number of male and female births has been growing since the 1990s in several countries. Armenia, the focus of this report, has witnessed a growing sex imbalance at birth. The sex ratio at birth rose immediately after Armenia's independence to a high level and today it remains at the very high level of 114-115 of male births per 100 female births. This corresponds to one of the highest levels of birth masculinity observed anywhere in the world, surpassed only by China (118) and Azerbaijan (116).

This study has arisen out of concern for the nature and implications of the sex imbalances observed in Armenia for almost two decades. It aims at providing a systematic review of available statistical evidence in order to establish the magnitude of adverse sex ratios, their demographic and socioeconomic determinants as well as their potential consequences for Armenia's population dynamics. The methodology is based mostly on the in-depth analysis of two original anonymized datasets made available to us by the National Statistical Service for this study: the exhaustive 2001 census records including 478,000 children under the age of 10, and the database of 386,000 individual births registered in the country from 2001-2010. We have also made use of other survey data on reproductive health and sex selection issues, as well as the limited qualitative documentation on gender and family issues in contemporary Armenia.

Prenatal sex selection is a relatively new phenomenon, sitting at the crossroads between old gender bias and modern technology supply. While it occurs in regional settings that are characterized by extremely diverse cultural, political and social circumstances, sex selection is known to stem in all settings from the same distinctive features: a strong bias towards male progeny, a rapidly decreasing average family size, and easy access to modern reproductive technologies. These three factors act as necessary preconditions for the rise in male births. They are themselves determined by a host of other social, demographic, anthropological and economic factors.

The three preconditions for sex selection that we have identified are met in Armenia. First, the patriarchal structures of Armenian society create a social imbalance among children and tend to strongly favor boys over girls. In spite of the important progress in gender equity recorded during the Soviet period–advances that are, in particular, measurable in terms of women's access to education and employment–, the influence of traditional values has remained at the core of gender attitudes and perceptions. The traditional Armenia patrilineal family has become the strongest institution in a period characterized by a weakening of government institutions and public services, and a very in-

complete penetration of market-based institutions. Second, prenatal technology allowing women to know the sex of their child in advance of birth and abortion are easily accessible across the country. During the 1990s, newly imported ultrasound equipment spread throughout the country. Combined with the "abortion culture" inherited from the Soviet period, the diffusion of this new prenatal technology has provided new ways for couples to avoid unwanted female births. The new reproductive technologies or abortifacient drugs that are spreading today in the country are unlikely to reverse these trends towards strict gender planning of births. Third, birth rates have undergone a rapid plunge since the late 1980s when the average fertility was 2.5 children per woman. Family size has plummeted to a bottom level of 1.2 children per woman in 2002 and is still now well below replacement level (1.5 children per woman in 2011 according to birth registration figures). In other words, the decline of fertility observed in the country means that parents can hardly afford large families in today's Armenia and that repeated pregnancies is no longer the preferred solution to ensure the birth of a son. The reduction in average fertility levels has been accompanied by a drastic fall in the number of third or higher-order births and this has directly affected the gender strategy of parents with two daughters.

In particular, this report describes the intensity of son preference, on which sociological and other qualitative evidence otherwise remains sparse. First, we show that all surveys on the opinions of Armenian parents confirm their wish to have more sons than daughters. Only a minority among those surveyed professes any real indifference regarding the gender composition of their ideal family. Using the census data, we demonstrate for the first time that this system of gender preferences is at the root of distinct fertility behaviors favoring boys, especially among women who failed to have a son in their first two births. To a large extent, higher order births in the 1990s were determined by the absence of a son in the family, leading parents to have additional children in order to ensure a male birth. For instance, the probability to have another child was twice as high among parents with two daughters as among parents who already had a boy. Besides parity and the sex composition of the family, we also outlined some other characteristics associated with son preference in the country. Some of these characteristics include rural residence, lower socioeconomic status and multigenerational families. Son preference also seems distinctly more pronounced in a cluster of provinces in central Armenia. Finally, we explore the possibility of a slight excess in mortality among female newborns–a testimony toward discriminatory attitudes towards infant girls–that data from the three successive Demographic and Health Surveys (DHS) from 2000 to 2010 suggest.[1]

The demographic analysis then focuses on prenatal sex selection, the ultimate effect of gender preference in family strategy. In the absence of any direct measurement of selective abortions, we examine the sex imbalances at birth from 1991-2010 with the help of census and vital registration data. These data first indicate an obvious rise in sex ratio at birth during the first part of the 1990s. In-depth analysis of the available data demonstrates that the rise took place immediately after independence, among parents without boys or among high-parity births. The impact on the overall level of birth masculinity was felt only during the mid-1990s when the phenomenon started to spread more widely across the population. While the extreme sex ratio at birth of 120 recorded by the civil registration for 2000 may be an overestimate not corroborated by census measurement, it is clear that the sex imbalances at birth in Armenia peaked during that period. In the following ten-year period, the average level of birth masculinity has only slightly decreased. The sex ratio at birth has remained stable in both 2010 and 2011 at 114-115 male births per 100 female births.

[1] Official registration shows no excess female mortality among post neonatal deaths. The DHS results may stem from the small sample used.

The use of data for 1990-2010 from two different sources (census and vital registration) helps to identify the variables closely associated with high levels of birth masculinity. First and foremost, it is essentially the prior family composition which affects the sex of subsequent births. The sex ratio of third births and of births among sonless parents reached 150 male births per 100 female births in 2000. The vital registration data indicates that this very high SRB (sex ratio at birth) level has, in fact, increased during the last 10 years, reaching an average of 173 among third births in 2001-2010. The imbalances among third and higher-births account for almost three out of four excess male births in the country. This record level of birth masculinity has no known equivalent anywhere else in the world. Not only do parents opt for a third birth in Armenia–a decision which is crucial to lift the average fertility level above replacement level–mostly on account of gender considerations and the lack of a son, but they refuse almost systematically to take the risk of having an unwanted female birth.

In addition, our analysis has highlighted several factors associated with higher sex ratio at birth in Armenia. First, it confirms observations on son preference about the spatial patterning of high SRB levels within the country: a distinct cluster of provinces in Central Armenia displays markedly higher levels of birth masculinity with Gegharkunik recording the highest values. Yerevan province displays only a moderate level of sex imbalance in spite of the concentration of health facilities in the capital region. Interestingly, rural residence and lower socioeconomic status do not directly lead to higher SRB levels in spite of a higher son preference, a discrepancy probably attributable to more fertility flexibility or less access to prenatal technology than in cities and towns. The role of education seems also inconclusive. Among the factors associated with lower than average birth masculinity levels, we may stress the role played by the nuclear family pattern, multiple births, single mothers and woman-headed households. On the contrary, ethnic minority, higher status occupation and parents' age are overall linked to higher levels of birth masculinity.

The last section of the report consists of the presentation and discussion of population simulations for the next five decades based on a set of demographic and SRB parameters. High birth masculinity today will convert into high sex ratios among adults in the forthcoming decades. Our projections show that persistent prenatal sex selection would reduce the number of female births by up to 2,000 births per year in the future. However, the impact of this high proportion of male births could be partly offset by sustained male outmigration. In spite of the reduced number of women among younger cohorts, our findings indicate that they will remain a majority during the next decades. But with a mounting surplus of young men in the future, there will be increased migration pressures if they want to avoid the marriage squeeze.

Yet, high SRB levels on a permanent basis are bound to disturb the age and sex pyramids of Armenia in the forthcoming decades. A sizeable surplus of young men will materialize from 2020 onwards. If the sex ratio at birth remains at its current rate, the surplus of men would rise to 30,000 young adults by 2040 against a deficit of 10,000 if birth masculinity had remained at a normal level. The deficit of young women will unavoidably disturb the so-called "marriage market" in the country. This sex imbalance may in fact act as an additional "push factor" for male migration, especially as this male surplus is likely to delay marriage and increase the risk of singlehood among men who choose to stay in Armenia.

This study of sex imbalance in Armenia is the first of its kind, as no country in Eastern Europe has been systematically investigated. Its findings confirm the highly biased character of birth masculinity over the last twenty years in Armenia and its intimate connection with the high level of son preference prevailing across all sections of society. Yet, we still have limited corresponding qualitative studies on the aspects of the contemporary gender context leading to certain levels of sex discrimina-

tion, and only incomplete information on the supply side (infrastructures, technology, abortifacient drugs) of the observed sex imbalances at birth in Armenia.

The report ends with a list of detailed recommendations pertaining to the following broad domains:

- The need for further monitoring and analysis of statistical sources depicting the extent and determinants of sex imbalances at birth
- The need for new research on the mechanisms of skewed sex ratio at birth and factors behind son preference and gender inequity in families
- The need to increase awareness in society regarding the nature and consequences of sex imbalances at birth and to involve the medical communities in the process
- The need to launch a policy dialogue with all concerned government departments to tackle sex selection and other components of son preference

CHAPTER 1

SEX SELECTION AND THE REGIONAL CONTEXT

Over the last 25 years, Armenia has witnessed some of the most complex episodes of its demographic history. There was a major natural catastrophe and a series of conflicts that struck the country during the late 1980s and the ensuing decade. But two deep structural changes also affected the course of population dynamics in Armenia: the acceleration of its process of fertility reduction following independence and the intensification of mobility, when what used to be short-term moves within the Soviet Union became international migration. These transformations in its demographic regime have entirely reshaped Armenia's population structures, in particular leading to a rapidly shrinking child and youth population and to a large-scale departure of young adults to new international destinations. These two mechanisms have contributed to a gradual reduction in its rate of population growth, leading to the current stabilization of its population as low birth rates and international migration severely limit the demographic potential of the country.

Within Armenia, serious issues of inequality persist, both between and within regions. Gender inequity expressed through unequal access to employment, wages, political representation and social status is one of the major dimensions of the social heterogeneity that characterizes today's Armenia. Recently, a new feature of gender inequity has emerged in Armenia: the gradual masculinization of its child population caused by the reduction in the proportion of female babies born in the country over the last 20 years.

The increase in its sex ratio at birth (SRB) [2] beyond its usual level of 105 male births per 100 female births was first observed in 2001 by a team of scholars who analyzed demographic statistics in the new independent nations of Azerbaijan, Armenia and Georgia (Yeganyan 2001). They duly noted the unexpected rise in birth masculinity and compared it to the trend then observed in China, wondering if the Caucasian countries had just witnessed "the emergence or re-emergence of a very strong male preference". [3] In spite of further studies by the same team and by other demographers, this call for further investigation went largely unheeded. Today, apart from the pioneer study conducted last year by UNFPA (UNFPA 2012), there has been no systematic national study of sex imbalances at birth in any nation of the South Caucasus, neither demographic analysis of the sex ratio at birth nor qualitative investigations of its gender underpinnings.

This report aims at precisely providing an updated review of the current sex imbalances at birth in Armenia. Our study will make use of all statistical sources available in mid-2012, including the original 2001 census data and the records of the birth registration system assembled by the National Statistical Service. In particular, we will examine the timing and intensity of the rise in male births during the 1990s and identify its main demographic characteristics and its geographical aspects. We will also explore some of its social and economic correlates in order to better understand the process behind this gradual masculinization of births. A statistical assessment is a first step that should eventually lead to a more thorough review of its gender underpinnings and social consequences. In spite of the relatively well-established existence of this phenomenon in the 1990s, very little by

[2] All sex ratio (at birth, of children, of population etc.) estimates in this report are given in males per 100 females.

[3] This first observation on imbalanced SRBs was followed by a chapter in 2007 by Meslé et al. (2007). See also the reports by Brainerd (2010) and the most recent review found in Duthé et al. (2012).

way of qualitative and documentary evidence is available for understanding its causes. As a result, statistical figures still provide the best source for delineating the social and economic contours of the emergence of prenatal gender bias in Armenia.

1.1 Prenatal sex selection in the world: characteristics and trends

The existence of sex imbalances at birth only emerged in the 1990s when the combination of work by statisticians and field studies demonstrated that the sex ratio at birth was higher than normal in many countries. These studies also alleged that prenatal sex selection was the most probable explanation for this demographic anomaly. Before this period, the interest in demographic discrimination had focused on excess female mortality. The notion of "missing women", popularized in 1990 by Nobel Prize winner Amartya Sen (1990), drew attention to the apparent deficit of women in many countries of the world, but this demographic gap was primarily caused by excess female mortality. The ensuing rise in the proportion of male births was an entirely new phenomenon, so unanticipated that it took years to detect and confirm it. In many countries, including Armenia, it is still a disputed issue due to the lack of reliable data and in-depth analysis.[4]

One reason for this relative myopia is the large number of distinct factors likely to affect sex ratios. Some are endogenous factors, being biological or linked to the general social and economic environment. Such factors are unconnected to gender discrimination, but do affect the distribution of birth by sex. One crucial invariant is that more boys than girls are born in the human species. As a result, the sex ratio at birth among populations with no sex preference is usually close to 105 male births per 100 female births, with variations ranging from 104 to 106. There may not be perfectly reliable measurements of the sex ratio at birth in every country, but all available data suggests that the range of variations across countries or ethnic groups remains quite narrow.

There has been also some confusion linked to the varying impact of prenatal (intra-uterine) and postnatal (infant and child) mortality. But, in the absence of discrimination, the impact of mortality is always adverse to boys. Consequently, their higher proportion in the population decreases regularly with age, as men tend to die earlier than women. The sex ratio declines therefore with age, starting from 105 at the time of birth down to values close 100 during adulthood and even lower among the elderly.[5]

The biological female advantage in mortality should result in a global predominance of women. Yet, there are also factors that are directly related to gender preferences, including prenatal sex selection, selective infanticide or neglect (Chahnazarian 1988; Waldron 1998). In the past, women's life span was shorter than men's in many countries, especially when life expectancies began increasing and men were the first to take advantage of the new health resources. It is still visible today in several countries among children, when differential treatment –mostly related to health and nutrition behaviour– result in unexpectedly high female infant and child mortality.

Techniques of gender discrimination have, however, evolved rapidly over the last three decades, fueled to a large extent by advances in prenatal sex determination that allow for the selective elimina-

[4] This section is mostly based on the materials found in UNFPA (2012). Other sources include Croll (2000), Attané and Guilmoto (2007) and Miller (2001).

[5] Sex-selective migration and under-enumeration are other possible sources of sex ratio variations. In Armenia, international migration out of the country is, for instance, more common among men.

tion of girls. Several methods of discrimination toward unborn girls coexist today. The most recent methods are based on pre-conception selection and they require access to the elaborate equipment necessary to perform sperm sorting, pre-implantation genetic diagnosis (PGD) or in-vitro fertilization (IVF). Cost and accessibility factors, however, restrict these technologies to developed countries and to the most affluent populations, but clinics in the South Caucasus offering such services exist, as a rapid Internet search demonstrates (see also Badurashvili 2011). In comparison, sex selective abortions offer a more accessible method for avoiding female births. The gradual introduction of prenatal diagnosis technologies, like ultrasonography, during the 1970s, combined with abortion, has allowed millions of couples to eliminate unwanted female fetuses. This phenomenon is at the core of the disequilibrium in birth masculinity that has been observed since the 1990s.

1.1.1 Skewed sex ratios at birth observed from Asia to America

We will briefly present data from different countries. Currently, all countries except South Korea display significantly skewed SRB levels. As the data displayed in Table 1 suggests, the issue of adverse SRB levels is not limited to China and India. Prenatal sex selection is a more global phenomenon than usually acknowledged, with traces observed in several continents.

TABLE 1

Sex ratio at birth in various countries, 2007-2011

Country / regions	SRB	Period	Data source
East and Southeast Asia			
China	117.8	2011	*Annual estimate*
Singwapore	107.5	2009	*Birth registration*
South Korea	106.7	2010	*Birth registration*
Viet Nam	111.2	2010	*Annual demographic survey*
South Asia			
India	110.5	2008-10	*Sample registration*
Pakistan	109.9	2007	*Population and demographic survey*
South Caucasus			
Azerbaijan	116.5	2011	*Birth registration*
Armenia	114.5	2011	*Birth registration*
Georgia	113.6	2009-11*	*Birth registration*
Southeast Europe			
Albania	111.7*	2008-10	*Birth registration*
Montenegro	109.8	2009-11	*Birth registration*
Sources: national statistical offices, Eurostat; * Provisional data			

Today, China remains the major contributor to the growing sex imbalances at birth. The SRB started to increase in China in the late 1980s from 105 to a level close to 120 in 2000-2005. At present, the SRB may be close to 118, one of the highest levels in the world. The peak in birth imbalances seems to have been reached in 2005, at 120 male births per 100 female births. Available annual estimates for China suggest a slight decrease over the last five years. China is characterized by a high level of regional heterogeneity, with many Chinese provinces reaching levels above 130 in 2005. In South Asia, the most affected country is India, where prenatal sex selection was first reported in the 1980s.

The overall level of birth masculinity at 109 remains moderate in comparison with China. But it also conceals wide regional variations as in China: SRB levels around 120 are common in Northwest India, while many other regions have simply recorded no sex imbalances at birth. Viet Nam presents a case of a country where the rise in SRB has been both unexpectedly recent–occurring only after 2003–and rapid, as it has already reached 112. The situation in many countries like Pakistan or Nepal is not well documented. South Korea stands apart as it is the only country where the SRB rose up to 113 in the early 1990s and declined afterwards, reaching now normal levels close to 106. In South Korea, the so-called "sex ratio transition" is most probably over.

In addition to the national levels reviewed here, high SRB values have also been observed in industrialized countries with significant Diasporas from Asia or Southeast Europe. Among these subpopulations made up of recent migrants, studies have demonstrated the existence of skewed levels of sex ratio at birth. There is, for instance, evidence of such biased SRB levels in the United States, Canada, the United Kingdom and Italy. Sex selection among migrants is especially revealing, since it shows that discrimination may not be as much due to local circumstances (conflict, birth control, economic crises, social customs, etc.) as to ingrained cultural attitudes that migrants carry with them in their country of residence. This suggests that the bias against girls is not a superficial behavior that could be easily changed by acting on local factors.

1.1.2 Birth masculinity in Eastern Europe

Of special interest to us is the case of countries from "Eastern Europe", taken here as a vast area encompassing the former socialist regimes of East Europe and of the Soviet Union. Two specific clusters of high SRB emerge in Southeastern Europe and in the South Caucasus. Levels above 110 are observed in Albania and Montenegro, as well as in Azerbaijan, Armenia and Georgia. Statistics are often imperfect in these countries. Sex imbalances have been confirmed by census figures and other sample survey estimates.[6] It should be emphasized that the available documentation on skewed sex ratios is imprecise in Eastern Europe, with almost no in-depth qualitative or statistical surveys. However, the new round of censuses across Eastern Europe will provide potential confirmation of recent SRB estimates, but there remains a dearth of qualitative evidence on reproductive behaviour and gender preferences.

Albania is the westernmost country in which the sex ratio at birth has risen above 110 over the last two decades. But, interestingly enough, Albania seems to be part of a larger regional cluster of high SRB in Southeastern Europe, encompassing Montenegro, Kosovo and parts of Macedonia. The ethnic dimension of sex imbalances is a first explanation behind this strong geographical patterning in the Western Balkans.

In the South Caucasus, birth masculinity levels briefly reached levels as high as 118 during the previous decade. Data from all three countries tends to converge and provide ample evidence of high SRB levels from the 1990s onwards. The rise in birth masculinity in these three countries seems to have immediately followed the collapse of the Soviet Union. The rise was especially rapid in Azerbaijan and Armenia where the SRB was deemed to have already reached 115-120 male births per 100 female births during the late 1990s. Statistical evidence is more fragmentary for Georgia, but the proportion of male births and children in this country most probably remains as high as its neighbors.

Interestingly enough, we have even identified data related to Nagorno-Karabakh, an Armenian-dominated region that was part of Azerbaijan during the Soviet period. Nagorno-Karabakh (rechristened

[6] See Meslé Vallin, and Badurashvili (2007), and Brainerd (2010). The Council of Europe has offered a recent review of data from Eastern Europe (Stump 2010).

today as Artsakh) has recently published birth statistics for 2004-2011 showing a sex ratio at birth of 118 for the 19,000 registered births–a level very close to what is observed in both Azerbaijan and Armenia.[7] However, we have not been able to access direct or indirect data on birth masculinity among immigrant communities from the South Caucasus, as, for instance, among Armenians migrants in Russia.

As is the case Southeastern Europe, the geographical clustering of high birth masculinity in the South Caucasus region is puzzling. On the one hand, in spite of several common historical and geographical features among the three newly independent countries, there are obvious linguistic, religious, and ethnic differences across their national populations. This has also led to long-standing cross-border tension, political rivalry and conflicts. Unlike Southeastern Europe where the Albanian dimension to the rise in prenatal sex selection is conspicuous, there seems to be no obvious communality across the three countries beyond their sheer spatial contiguity. On the other hand, neighboring nations such as the Russian Federation to the North and Turkey or Iran to the South have also shared a long history with countries in the South Caucasus and greatly influenced its social and political system. Armenia, for one, has been greatly influenced by the Saffavid, Qajar, Ottoman and Russian empires as well as by the Soviet Union since the 1920s. But none of these adjacent regions display any significant departure from the usual, biological distribution of births.

Therefore, the South Caucasus emerges as a singular island of skewed birth masculinity within a broader region mostly exempt of prenatal sex discrimination. Yet, high sex ratios at birth often combine with higher mortality among girls in Asia. In the Caucasus, there is apparently no trace of contemporary excess female mortality among children of the kind observed in East or South Asia (see Section 3.2). For that reason, we will not explore this aspect of the gender discrimination regime at length in the course of this study and focus instead on prenatal sex selection.

1.1.3 Variations in sex ratio at birth across social groups

A trait of the current distortions in birth masculinity crucial to understanding its mechanisms relates to the extent of variations observed across households, regions, ethnic groups. Studies also emphasize that sex selection is part of the family-building processes and can be understood only in relation to fertility choices. The best-known variation in SRB levels pertains to birth order (parity).

In the past, parents were ready to repeat births indefinitely in their quest for a boy, but access to contraception and abortion, and the rapid decline in fertility have entirely changed their strategies. They can avoid pregnancies once the proper composition is attained and they may want to reduce the size of their family by limiting the number of unnecessary female children. While parents are often indifferent to the gender of their first child, the gender imperative emerges more clearly during the subsequent pregnancies in the absence of a male child. This is most notably the case for the last child, who is expected to redress the sex composition of the family.

As a result, the sex ratio at birth increases with birth order. The sex of the previous births, when available, is an even stronger predictor of the sex ratio at birth of the next birth. In South Korea, when birth masculinity was high, it was only after the first two births that the SRB shot up. Armenia's analysis will provide a spectacular illustration of such features. But, in China the impact of the fertility restrictions is already reflected after the first birth. In several Chinese provinces, the sex ratio of the second-order births even exceeds 160. Recently, the SRB among first births has also increased in some countries like Viet Nam or China. Prenatal sex selection affecting first-order births has poten-

[7] Data is from the National Statistical Service of Nagorno-Karabakh. See http://www.stat-nkr.am/

tially important consequences, since first births account for more than half of all births when fertility is below replacement level.

We have already hinted at the extent of regional differences in birth masculinity in China and India. This is also true in Viet Nam and this appears mostly related to the pace of fertility decline and to regional differences in kinship systems and gender attitudes. But, disaggregated data has also highlighted other determinants of variations in the sex ratio at birth, such as ethnic, religious, or rural-urban differentials. Of great relevance is also the extent of variations by socioeconomic status. For instance, the link is clearly positive in India and in Viet Nam: birth masculinity tends to be close to a normal level of 105 among the poorest households, but higher levels are observed among the richest households. Higher education and better standard of living are almost inevitably linked to higher SRB in these countries. Note that this association between female education and prenatal discrimination at odds with the beneficial effects usually attributed to social and economic development and to women's uplift. Poverty seems to slow down the spread of sex selection through higher birth rates and limited access to modern technology.

1.2 The factors behind prenatal sex selection

We have briefly described some of the demographic aspects of sex imbalances, while leaving unanswered the question of its origin and underlying causes. Local studies point to a large array of potential drivers and determinants of the gender bias. Overall, what they suggest is that sex selection is firstly an adaptive behaviour for avoiding births of the unwanted sex. It represents a rational strategy coming in response to inherited cultural constraints and modern opportunities. In no way should it be construed as an archaic behavior, fueled by superstitions. The fact that the more educated strata of society have been at the forefront of sex selection is indeed a clear indicator of its "modernist" content.

Sex selection is often interpreted in narrow contexts and national or regional studies are usually dominated by "local narratives", in which cultural, economic or political circumstances are given precedence. Explanations such as dowry inflation in India, family planning regulations in China or Confucian patriarchal norms elsewhere in East Asia are usually presented. In Eastern Europe, high birth masculinity –when acknowledged–is often associated with conflict, war or economic crisis. These local narratives fail to account for the near simultaneous emergence of sex selection in countries scattered around the world.

There are, however, obvious social and demographic commonalities from Korea to Albania over the last thirty years that are likely to explain the rise of male births. The three specific preconditions for sex selection have indeed already been identified:[8]

1. Sex selection should be feasible. Parents require access to acceptable and efficient methods to alter the random, biological distribution of children by sex.
2. Sex selection should be advantageous. Parents will resort to sex selection only when they perceive clear benefits in having boys rather than girls.
3. Sex selection should be necessary. Small-family norms represent a distinct precondition for sex selection. Otherwise, parents would simply have other births in order to achieve their gender objectives.

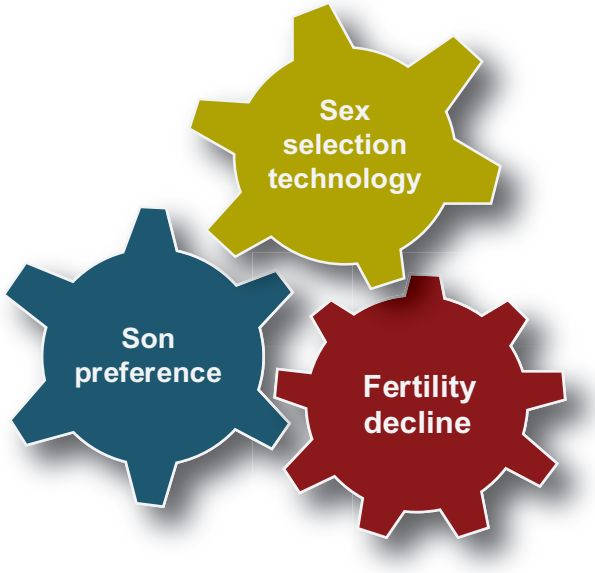
[8] This analysis is based on Guilmoto (2009), borrowing an exploratory framework devised by Coale (1967) for fertility decline in Europe. See also UNFPA (2012).

These three conditions (see also Figure 1) can be translated into a simple framework: parents have to be *able* (first condition), *ready* (second condition) and *compelled (*third condition) to resort to sex selection. The first precondition corresponds to a rather straightforward **supply factor**: the availability of enabling technology is an indispensable ingredient for adequate sex selection. This entails many independent conditions, such as the effectiveness of the available methods, their cost and accessibility, as well as the legal environment. Methods also need to be socially acceptable, as specific techniques like infanticide or abortion may be considered objectionable for ethical reasons. Sex preference is nothing new, and all societies have devised ways to preselect the sex of pregnancies. These techniques range from prenatal folk techniques based on the calendar or diet and on ritual and religious formulas, to cruder forms of postnatal infanticide or abandonment. However, there was a revolution in discriminatory techniques, heralded by contraception that allowed parents to stop childbearing once the desired sex composition was reached (the so-called "stopping rules"), but brought to its climax by prenatal sex selection and access to abortion. The introduction of new reproductive technologies starting from the 1980s, the spread of effective contraception and the liberalization of abortion where it was previously illegal represent key milestones in this evolution. Sex selection technologies are still continuously improving, with new methods available to influence the sex before conception or to diagnose the sex of the fetus earlier during pregnancies.

The second precondition corresponds to the **demand factor:** the various facets of son preference. Sex selection and the birth of male children should, in fact, carry distinct social, cultural or economic benefits. Many contextual criteria make male births preferable across the world. Some relate to very prosaic considerations: sons require less care from their parents and may offer protection to them later, be it physical protection or economic support. Sons also often live with their parents, or close to them, after marriage and provide them with all types of support while daughters are to be married off to other families. Men may work on the family land or in the family business, they may earn more through migration or local employment than women and they may economically support their parents until their death in an environment characterized by the absence of social security and pensions. In addition to worldly benefits, many traditional settings insist on the role of sons for the after-life of their parents, be it in terms of spiritual salvation or family honor. Daughters in traditional settings appear deprived of these competences or capacities.

FIGURE 1

The three preconditions of prenatal sex selection



The last precondition corresponds to the exacerbating **squeeze effect** of fertility decline on gender preference: people will need sex selection because they want to avoid additional, unnecessary births of girls. In a more flexible fertility system, parents would simply bear more children until they get a son. However, low birth rates act today as a "squeeze factor", forcing parents to make serious choices in making decision regarding a subsequent pregnancy. By increasing the marginal cost of an additional child, the small-family norm compels parents to limit the maximum size of their family. Strict birth control regulations in countries like China have added an additional constraint to the childbearing strategies of parents. Left to biological chance, an increasing proportion of couples would risk remaining sonless without active prenatal sex selection: on average, about one out of four couples will have no son when the fertility level is of two children per woman.[9] In Armenia where fertility is below replacement level, the probability of having only daughters is greater than 30%.

These three conditions are indispensable for prenatal sex selection. They operate like "intermediate variables" through which any social factors influencing prenatal sex selection must operate. Each of them may in turn be influenced by other factors such as kinship systems, education, ethnicity or economic development. Economic development may, for instance, simultaneously impact all three factors: access to technology (income effect), fertility behavior (decline in birth rates) and ultimately gender valuation system (narrowing down of gender inequity). The intensity of gender preferences biased towards male progeny is the central factor. This can be seen in most of Western Europe where low birth rates and large access to modern reproductive technologies have not lead to any sex ratio distortions–simply because there is no strong gender preference.

1.3 Demographic situation in Armenia

This section will present a brief review of Armenia's main demographic trends during the last two decades. We emphasize fertility decline and access to abortion, as these are the main factors associated with the spread of prenatal sex selection in the country.

1.3.1 Population distribution and growth

Armenia's population is estimated today at about 3.0 million people. The *de facto* population residing in the country, however, is significantly lower due to the departures of migrants. The final results of the 2011 census were not available during the preparation of this report, but they will soon offer a more exact picture of the demographic situation.[10] The country is divided into 11 regions (10 marzes and the capital region), with Yerevan accounting for a third of the country's inhabitants while some provinces like Vayots Dzor have a much smaller population.

[9] It takes on average two pregnancies to ensure the birth of one boy. This also applies to families who have had two daughters in a row and who still want to have a son.

[10] The population totals quoted here are based on preliminary estimates of the 2011 census. Most figures reported here are derived from estimates prepared by the National Statistical Service (NSS) of the Republic of Armenia.

FIGURE 2

Armenian provinces (marzes)

Overall, urban areas represent about 64% of the population. Internal mobility has mostly been directed towards Yerevan and the metropolitan capital area. Economic considerations such as employment opportunities and better wages are crucial in the decision to move towards cities. Internal migration includes an increasing proportion of women. But, the country has also been affected over the last 25 years by mass migration towards the former constituents of the Soviet Union (mostly Russia and Ukraine) and several Western countries. International moves are mainly made by young male adults, a feature that has directly impacted the age and sex structure of the country. In fact, Armenia's population has been dominated by women since the 1960s because of migratory trends–in addition to the well-known effects of female mortality advantages. Today's overall sex ratio is estimated at 94 men per 100 women in the *de jure* population, a level almost identical to what was observed in 1990 on the eve of the dissolution of the Soviet Union. Another demographic consequence of migration is the large number of Armenian households headed by women whose husbands have migrated.

Recent figures of border crossings suggest that migration may have slowed down during the last decade and may therefore be of lesser influence on population growth than the massive departures observed during the 1990s. Yet, these are provisional estimates in the absence of detailed census figures for 2011 that will document the impact of net migrations on Armenia's age and sex distribution. It should be also added that migrations proceed along certain traditional networks and that some provinces, such as Aragatsotn and Gegharkunik, have been more affected than the rest of the country.

Another distinct feature of Armenia's recent demographic transformations is the rapid decline in birth rates, especially since independence in 1991. The crude birth rate was divided by two within ten years from 23 to 10 per 1000 during the 1990s. Since 2002, it has only modestly recovered to 14 per 1000 in 2010. This brutal fall in birth rates is the product of an equally rapid decline in fertility. Previously, fertility was well above replacement level at 2.5 children per woman on the eve of independence and subsequently plummeted to 1.8 in 1995 and finally 1.2 in 2002. Such a level cor-

responds to the ultra-low fertility regime found in only a few countries of Europe and East Asia. The TFR (total fertility rate) has increased modestly to 1.5 children per woman during the last few years. Fertility used to be significantly lower in urban areas, but the gap between urban and rural areas has now disappeared. Combined with migration, the reduction in fertility rates has inverted the sustained population growth observed up to the early 1990s and the *de jure* population has remained almost stable at a constant level close to 3.2 million over the last ten years.

The significant improvements in mortality, unlike many republics of the former Soviet Union where life expectancies have decreased or stagnated, have combined with rapid fertility decline and migration to cause a deep transformation in population structures. The main factor is, of course, the reduction in the youth population resulting from the fall in birth rates. The population under the age of 15 has for instance shrunk from 32.2% of the population total in 1991 to an estimated 19.6% today. Armenia is presently ageing at a rapid pace. While today's population aged 60+ years still represents less than 15% of the total, this proportion will rapidly increase in the forthcoming decades, reaching 22% in 2025 and 30% by 2050. In particular, the rise in the dependency ratio will exert severe pressure on Armenia's economy and social system in the next thirty years.

1.3.2 Fertility decline and abortion

The reduction in average fertility levels has been accompanied by a drastic fall in the number of third or higher-order births. But, the share of second births has also diminished. As in many former socialist countries, abortion plays a major role in reducing birth rates. The average number of abortions per woman was estimated at 2.6 per woman of reproductive age before 2000, a level higher than the average number of births. Abortion is often associated with the failure of more traditional contraception methods such as withdrawal. The recourse to modern contraception (IUD, pills and condoms) among women is comparatively far less common than in Western or Central Europe. Apparently, many women are afraid of the alleged health and side effects of modern contraception, while cost may constitute another factor. DHS surveys have shown that a large proportion of women had not heard of campaigns for modern contraception.

Abortion has been legal in the country since 1920, was banned in 1936 and reintroduced in 1955. In independent Armenia, abortion is covered in the 2002 law on reproductive health and rights. Today it is authorized on request up to the 12th week of pregnancy. Prices for an abortion vary, usually costing around 30-50 USD. Under the Law on Reproductive Health and Reproductive Rights passed in 2002, abortions can be performed later than 12 weeks only under specific health conditions or in cases of rape. It is performed by health professionals in both licensed government and private facilities, and it is remarkably safe in the country in spite of the inherent risks of complications.[11] Some abortions are also performed by unregistered practitioners at a lower cost according to the Armenian Association "For Family and Health". While included in surveys, abortion remains poorly-known in quantitative terms for lack of systematic statistical registration. However, DHS surveys suggest a significant drop in the number and frequency of abortions in the country during the recent period: the number of abortions per woman has decreased to 0.8 according in the latest DHS survey and 29% pregnancies may end in an induced abortion–as opposed to 55% ten years earlier. One factor for this reduction in the frequency of abortions may be the decline in the use of traditional contraceptive methods and the more use of condoms in Armenia reported by the latest DHS survey.

Another reason for this reported decline may lie in the success met by the recently introduced abortifacient drug Cytotec (misoprostol). This drug, generally used to treat ulcers, is obtainable in phar-

[11] The overall maternal mortality rate is estimated at a low level of 9 per 100,000 births.

macies without prescription and at limited cost. But it is mainly used to induce abortion. Thanks to Cytotec, self-prescribed abortion turns out to be significantly cheaper than an abortion performed under supervision in a medical facility. Self-induced abortion through misoprostol (also in association with mifepristone) is especially common among unmarried pregnant women who do not want to visit clinics for reasons of confidentiality. At the same, it may often be regarded as menstrual regulation by women and therefore be undercounted during surveys involving abortion experiences.

Most childbearing occurs among women below 30 years of age, with a peak around 25 years. The mean age at childbearing has slightly increased over the last ten years and the move is closely related to a parallel rise in the average female age at marriage which is now closer to 25 years–from a level of 23 years ten years ago. Delayed marriage has been associated with an overall decline in registered marriages. There has been also a parallel rise in the number of divorces, a phenomenon new to Armenian society, which used to frown on divorce in the past. All these trends point to the rapid evolution of the family system and the emergence of traces of the Second Demographic Transition.

The provision of reproductive health services is rather satisfactory in the country. The levels of prenatal and delivery assistance are high in Armenia, and there are little variations across the country. 93% of women undergo four or more prenatal care checkups[12] and more than 99% of deliveries take place at health facilities. Child mortality is on the decline. It has now reached a level under 12 per 1000 births according to vital statistics, and DHS estimates are only slightly higher. Life expectancy has increased regularly, but progress tends to be rather slow now that it has reached 71 years of age for men and 77 for women. [13] It may be noted that no obvious sex differentials in mortality have been observed in the country, unlike many areas in South and East Asia where gender bias leads to adverse mortality conditions for girls and women.

[12] While the DHS data describes in detail reproductive health components, there is no mention in the survey of the use of ultrasound checks.

[13] See also alternative mortality estimates in Duthé et al. (2010).

CHAPTER 2

MAIN RESEARCH QUESTIONS AND METHODOLOGY

This report is based on the first systematic study of sex imbalances in a specific country of the South Caucasus region. It is limited by available statistics as well as by the paucity of qualitative studies covering related issues like son preference, family systems and gender inequity. We have refrained from quoting existing documentary or statistical sources related to Azerbaijan and Georgia, in order to focus on the situation in Armenia and to emphasize the relative lack of original studies on sex imbalances in this country. We first present the list of the main research issues tackled in this report and then describe some of the main methodological choices made to examine available datasets.

2.1 Research questions

The first issue to explore is the existence of a distorted sex ratio at birth in Armenia. This question is mostly related to the type of statistical evidence available on the distribution of births by sex in the country from the 1990s onwards. As we know, the statistical system in Armenia has undergone massive changes following the dismantling of the Soviet Union. Some of these changes directly affected the demographic monitoring system (vital registration and censuses) and their quality (Duthé et al. 2010). These changes have introduced a certain level of uncertainty, compounded by the unexpected character of the rise in birth masculinity in the 1990s. This period has also seen the introduction of new surveys that may offer indirect evidence on many aspects of sex imbalances at birth. We will therefore strive to combine all available sources to confirm the trend and provide a coherent picture of the rising levels of birth masculinity.

The second research question stems from the first one. Once we establish the presence of an excess number of male births, we need to understand when and where this trend can first be detected in Armenia and how it has evolved since then. Going beyond this mere description of trends and regional variations, we would also like to identify all potential correlates of higher SRB levels: birth parity, sex composition of the family, age of the parents, family structure, socioeconomic status, ethnicity, etc. Data permitting, this will help us flag the most typical characteristics of the early adaptors of sex selection in Armenia.

A third research question relates to the overall context of sex selection and son preference in the country. Some of the contextual elements, such as rapid demographic change, fertility decline and international migration have already been documented. Other factors have been documented on a much smaller scale. In particular, this is the case for the change in the medical technology available in Armenia as well as the broader question of the importance of sons in Armenian families.

The final research question corresponds to the consequences of prenatal sex selection, in terms of both gender equity and future demographic imbalances. We will draw specifically on the results of a projection analysis to forecast the future impact on the adult population of current sex imbalances at birth.

2.2 Sources and methodology

2.2.1 The 2001 census dataset

After independence, Armenia successfully conducted two censuses, one in 2001 and in 2011. Each census collected the standard individual and household data used to describe the sociodemographic situation of the country as well as many socioeconomic characteristics. These two censuses provide important sources for studying sex imbalances. More specifically, they provide the exhaustive age and sex distribution of the population at the subregional level. The age-specific sex ratio is an important indicator of sex imbalances. Most particularly, the sex ratio among children closely reflects the intensity of prenatal sex selection for the few years prior to the census.

What was crucial to our study was access to raw census data to perform analyses not included in the standard tabulations published by the NSS. Unfortunately, the 2011 census data is not available at the time of the writing of this report as the census was taken less than a year ago. But, regarding the 2001 census, we had the privilege to work with the NSS on the original dataset. Since I was not present in Armenia during the entire study period, we developed a specific protocol to work from a distance on the original dataset (the census Law prevents original census data from being shared outside the National Statistical Service). I first devised and tested statistical routines based on the 10% sample of the census. These routines were necessary in order to prepare new datasets of the sibling population and then to analyze variations in son preference and in sex ratio at birth.[14] These routines were then implemented on the entire census dataset by the NSS and results were subsequently sent to me for in-depth analysis.

Some aspects of our analysis require a longer description. First, we devised a synthetic indicator of socioeconomic status. It is based on household variables related to household goods (from car to TV) and housing amenities (from construction materials to heating systems). We conducted a factor analysis based on this set of 14 household-level variables. The method used was the multi-correspondence analysis in order to be able to use categorical variables.[15] The SES index constructed by this factor analysis can be used to rank households by socioeconomic level. We further derived socioeconomic quintile groups from this variable.

Second, we have also used individual data on age and position in the household to reconstruct household structures. The methodology of family reconstruction is based on the idea that the presence of "children" within the household can lead to the reconstruction of past fertility and birth masculinity levels. More concretely, we identify in each household mothers and their children. When the mother is head of household (or wife of the head), the situation is easy as children are simply classified as "children of the household head". In other cases, especially when children are classified as "grandchildren", great care should be taken to identify their mother and not to confuse them with other grandchildren–such as their grandchildren born to other married children of the household head. When mothers are more distant relatives in the household–such as sisters of the household head–, it is usually not possible to identify their children in the household in a non-ambiguous way and these children cannot be incorporated in our new dataset.

Once family nucleuses with mother and children are properly identified, we can rank children (siblings) by decreasing age and use this information as a proxy for successive births. It is also possible

[14] A 10% sample of the 2001 census is also available from the IPUMS database.

[15] We use the first factor that accounts for 80% of the variance of the original 14 household-level variables. They all correspond to better housing amenities and household goods.

to create variables reflecting the previous sex composition (presence of an elder brother) and the presence of a younger sibling to compute parity progression ratios.

This rank of children in the family is almost equivalent to the birth parity (birth order) usually used for SRB computations. One difference of the census-based child rank with birth parity is that it doesn't take into account deceased siblings, but only live children. In a way, child order is even better than parity since the rank of a child based on the actual family composition reflects better fertility strategies of the parents than exhaustive birth histories–that also include deceased children.[16] Another issue with using child rank relates to the necessarily truncated information derived from the census: for instance, older siblings may have left the family, resulting in a systematic under-estimation of the actual child rank. In case of divorce, children may also be split across families. Therefore, we have decided to limit the use of this data to children born during the last ten years preceding the census in order to minimize the risk linked to siblings missing due to union disruption or migration.

Third, we will use two indicators to investigate sex selection and son preference. The *sex ratio at birth* is a straightforward indicator of sex imbalances and ultimately of prenatal sex selection. We will concentrate on the SRB by birth parity, but family reconstruction also allows us to compute the SRB by sex composition of older siblings and by various indicators related to the children's mother and household. The measurement of birth masculinity is, however, especially vulnerable to random fluctuations associated with small samples.[17] Trends in SRB levels calculated on a limited number of births are therefore often influenced by random variations of no statistical significance. In some cases, it is not feasible to statistically confirm the significance of observed departures from the average SRB level.

The second indicator is the *parity progression ratio* (PPR), which captures the probability of having an additional birth at different parity levels. The PPR is a typical indicator used to describe the mechanisms of family building and it is closely related to the average fertility level.[18] We will only use period-based PPR since our data comes from the census records.[19] But in our study, we will only use PPR estimates at various parity levels according to the presence or absence of previous male children in the family. The ratio of PPRs with and without a previous boy will serve as an indirect indicator of the son preference in fertility behaviour. For instance, these two PPRs (with or without previous male birth) should be identical in the absence of gender preference. The corresponding ratio should be close to 100%. But in case of son preference, the probability to have an additional child is higher among families with only girls. The PPR ratio may be of 150% when the probability to have an additional child is 50% higher among parents without a previous son.

Both PPR ratios and SRBs can be computed for different child ranks and family compositions, regions and year of birth. They can also be successfully related to other characteristics of the child, the mother (her age etc.), the household head (sex, age, education, etc.) or the entire household

[16] We may also add that child mortality is moderate in Armenia and unlikely to severely disturb the ranking based on children alive. Under-five mortality was about 27 per 1000 prior to the 2001 census according to the latest 2010 DHS survey.

[17] For instance, the 5% confidence interval for a sex ratio at birth of 105 ranges from 103 to 107 when computed over 45,000 births—a number that corresponds to the average number of annual births in Armenia in 1990-2010.

[18] A higher probability of parity progression corresponds to higher fertility levels.

[19] The census conducted in a given year does not provide the exact probability of having a younger sibling later, but only the probability observed from the date of birth till the census. Our truncated PPRs are therefore lower than actual PPRs and this measure is in part affected by the average intergenesic interval. Yet, since higher PPRs also correspond to shorter intergenesic intervals, this shortcoming does not introduce any bias in the estimation of the *relative* value of the PPRs. Our main measure being the *ratio* of these PPRs among families with and without boys, this ratio should not be affected by the truncated measurement.

(household structure, socioeconomic status, etc.). These two indicators (PPR and SRB) based on the population distribution in 2001 will be used respectively for the analysis of son preference and birth masculinity in this report for the period before 2001. A similar analysis for the next decade could be replicated for the population born after 2001 once the disaggregated data from the 2011 data becomes available.

2.2.2 Birth registration data

Vital statistics usually provide the most reliable source for monitoring changes in birth masculinity levels. This is especially true of countries where vital statistics are based on a reliable and exhaustive birth registration system. Registered births have the additional advantage of being available for sub-regional units, such as individual *marzes* or for rural vs. urban areas. In the case of Armenia, data is regularly published and we therefore have a series of birth by sex since 1980 for administrative units (marzes and individual towns). Some data has been also tabulated by birth parity.

More importantly, we have also been granted access by the NSS to an anonymized copy of more than 300,000 birth records. This dataset consists of all individual births registered over a ten-year period (2001-2010). Apart from years of birth, sex, parity and location, this data includes other variables such as stillbirths, multiple births, characteristics of the mother and father (age, ethnicity, education, occupation, and marriage date) and details of the registration itself. Some of these variables are, however, of uncertain quality. This is especially true of the information related to the father: for almost 37% of the births, information on the father is missing from the records. The occupational structure is also rather simple and does not allow for fine sociological analysis. Moreover, changes during the 2000 decade in the nomenclature of some variables such as ethnicity and occupation make comparisons across years difficult without careful reclassification. As a result, we will be able only to make use of a limited number of variables available in the original birth dataset prepared by the NSS.

However, another issue relates to the unknown quality of these birth records. Birth registration is usually done by the father at the civil registration office (ZAKS/ЗАГС) using the birth certificate issued by the hospital and in the rare cases of home deliveries the certificate prepared by the doctor. Data is then collated at the subregional ZAKS office at the *rayon* level and then goes to the NSS for coding and processing. Some births are registered late.[20] It is considered that the registration system had collapsed in Armenia after independence because of the weakening administrative control over the population (Duthé et al. 2010). The situation has improved over the years as centralized registration at the ZAKS *rayon* office used to be difficult to obtain for many parents for reasons of distance and transportation facilities. A decree from 1999 introduced a social allowance for women giving birth to a live child. The latest 2010 DHS round reports a birth registration rate of 99.6% in the population.[21]

Using census data for the years prior to 2001, we specifically will compare the number of births with the corresponding census population and the sex distribution of births according to these two sources. Several inconsistencies emerge and point to the limitations of these sources. The evaluation of the quality of the birth registration data is beyond the scope of this study, but several studies on mortality statistics have already emphasized how the deep transformations undergone by the statistical system following independence negatively affected civil registration in Armenia.

[20] 0.5% of births from the 2001-2010 dataset were not registered on the year of birth.

[21] The birth registration rate is marginally lower for female births at 99.1%

2.2.3 Other documentary and survey sources

We should begin by pointing out the serious lack in documentary sources on gender and family systems in Armenia.[22] Sex selection derives from gender inequity and the fact that families in Armenia tend to insist on the birth of a son, an attitude that ultimately results in a strong preference for male over female births. However, there is almost no study on the gender aspect of family systems in Armenia. While we know that the traditional family in Armenia tends to be both patrilineal and patrilocal, we have no contemporary description of the working of kinship systems in the country and their evolution since the dissolution of the Soviet Union. No major anthropological works have been published on these aspects. We also have no qualitative study on the mechanisms of sex selection, and especially on sex selective abortions. Incidentally, the situation for other Caucasian countries is scarcely better and the absence of qualitative and ethnographical studies is also glaring. Consequently, our work for this study has focused on survey data, with a limited attempt at the interpretation of sex imbalances within the broader framework of gender inequity in Armenia.

Several demographic and socioeconomic surveys have been conducted in Armenia during the last 20 years. They often complement the imperfect knowledge that regular census and registration statistics provide on the rapid pace of social and demographic change in the countries. The only surveys that directly cover demographic issues are the Demographic and Health Surveys held in 2000, 2005 and 2010.[23] The DHS is often used as the primary source for analyzing reproductive behavior, owing to its extremely rich questionnaire on fertility behaviour and attitudes. In 2010, it covered no less than 8,000 households. DHS surveys provide important information on fertility attitudes and behavior, and ultimately on the presence of prenatal sex selection. We will use some of their statistics to estimate specific aspects of the reproductive behaviour in Armenia –the ideal number of children or recourse to prenatal ultrasonography.

A potential indicator from the DHS data that is more directly related to this study is the sex ratio at birth. Table 2 displays the available information collected on births by sex during the 2010 DHS round. We may observe that the sex ratio at birth during the last 20 years was indeed skewed and it reached an average value of 112.6 among the entire sample of 7,850 births. Such a level corresponds to the SRB independently estimated by the vital statistics and we can see that the SRB seems almost normal before 1991 as data from vital registration also suggests.

Yet, whatever the plausibility of this SRB estimate, the number of births used is limited to less than 8,000. Over the period following independence, the average sex ratio at birth is of 115, a value significantly above 105 using a 5% confidence interval and close to the figure based on the vital registration records. But when we use shorter time intervals, the data reveals some discrepancies, such as the plunge from 119 from 2001-2005 down to 110 from 2006-2010. The sex ratio at birth for individual five-year periods is no more statistically distinguishable from 105. In fact, most of the variations observed may be random and caused by small sample fluctuations. For that reason, we will rely in this report almost exclusively on census figures and vital statistics that provide larger samples that can be used for disaggregated analysis.

[22] I thank Laura Rahm for her efforts in this connection.

[23] The regular Integrated Living Conditions Surveys cannot be used for demographic analysis.

TABLE 2

Sex ratio at birth in Armenia at different periods, 2010 DHS survey

Period	Births	SRB
2006-2010	1,408	109.8
2001-2005	1,312	119.1
1996-2000	1,374	113.9
1991-1995	1,542	117.3
<1991	2,214	106.8

An additional survey of great interest to us is the survey on sex-selective abortions (UNFPA Yerevan 2012). The survey was conducted in mid-2011 and involved both individual data collection in 2,830 households and focus groups among men and women. Pregnant women were also surveyed. The study is the first of its kind in its endeavor to describe the sources of son preference as well as the mechanisms of prenatal sex selection (prenatal diagnosis, abortion, etc.). It is the only study in the region that confirms that prenatal sex selection is closely related to the observed sex imbalances at birth.[24]

[24] The role and even the existence of selective abortions can rarely be demonstrated by survey data on abortion. Reliable data on abortion are especially rare everywhere, and information on the causes for abortion or on the sex of aborted fetuses is non-existent.

CHAPTER 3

GENDER AND SEX PREFERENCES

The gender system in a given cultural and social setting is certainly at the root of inequality between the sexes. Yet, this report cannot adequately discuss the gender context in Armenia in relation to demographic sex discrimination for lack of existing studies. We will therefore limit ourselves to a few general considerations in this section, in particular stressing the transformations associated with changes in the political and social system after 1991. However, we will systematically examine the existing evidence on son preference, using mortality and fertility indicators to establish the presence of a strong bias towards male children and to measure its intensity.

3.1 Gender in Armenia

Son preference is, of course, but one manifestation of a much broader system of prevailing gender inequalities.[25] Other manifestations correspond particularly to the domains of education, labor, family and politics, where women's status is by and large inferior to that of men. Gender inequalities and the preference for male children are often subsumed under the sociologically vague notion of "Armenian mentality", which seems to justify the somewhat marginal position of women in the country.[26] But, we need to go beyond stereotypes in order to review the main features of the evolution of the gender situation in Armenia and its potential linkages with the bias for sons that our demographic analysis will reveal.

The current situation may appear to stand in contradiction with the historical progresses in gender equity associated with the Soviet regime. During this period, access to education and employment was granted to women. This system was based on women's emancipation through labor and wider participation in social life. The socialist regime attempted to challenge all traditional beliefs and gender attitudes, including the sway exerted by traditional institutions such as the family and the patrilineal clan. At the same time, public health infrastructures and even abortion facilities changed the life of prospective mothers during the Soviet period. Divorce was introduced and arranged marriages were discouraged. In fact, as a testimony to the progresses recorded during the socialist period, there are today very few institutional or legal barriers to gender equality in the country. Nevertheless, discrimination continues through as a set of attitudes and roles expected of women, enforced by a system of unwritten rules and norms that define the local gender order and have to a large extent survived the seventy years of socialist rule.

There are many illustrations of gender inequity in contemporary Armenian society from labor market discrimination to income gaps and the feminization of poverty. Gender-based violence is a case in point, since its prevalence of intra-domestic violence is quite common among Armenian families illustrating a high level of societal tolerance associated with stigma or shame among the victims. Similarly, the relative absence of women in the public sphere is exemplified by their low visibility in the political apparatus in spite of women representing the majority of voters in the country. A milder version of these discriminations is the double burden system facing working women when they

[25] This section draws from Ishkanian (2003) and Dudwick (1997). See also USAID (2010) and Ohanyan (2009).

[26] This notion of "Armenian mentality" was often offered as a blanket explanation for all aspects of prevailing gender inequality. It is also mentioned in the UNFPA survey (UNFPA Armenia 2012: 31). In different contexts, I have often heard in the past of the notions of "Albanian mentality" or the "Chinese mindset", similar euphemisms supposed to tacitly recap all discriminatory features of local patriarchal systems.

want to start a family and bear children. We could multiply instances of tacit discrimination faced by women on a daily basis that irreversibly shape their lives by limiting their access to social resources.

At the core of this inequity between men and women lies a patriarchal culture based on a patrilineal kinship system. In patrilineal (and patrilocal) systems, families revolve around the male line, headed by the elder and constituted by married sons. The extended family (*gerdastan*) is at the core of this kinship system based on exogamous clans. An anthropologist put it to me as, "The family fire may go out without sons". After marriage, daughters cease to belong to their native family and they join the household of their husband as a new permanent member. In a country where multigenerational cohabitation is common, it is one of the married sons who is expected to reside with their parents and take care of them in their old age. Men rarely join their wives' family after marriage, as this is a source of dishonor or ridicule labeled as a *tanpesa* (house groom).

As a result, girls and young women are not fully incorporated in their native family since they are expected to leave it immediately after marriage. In many Asian countries, girls are even perceived as a drain on the family resources because of the cost incurred in their education. This is a typical feature of patrilineal family systems. In Armenia, it may result in a lower appreciation towards women as compared to men, who are seen as permanent pillars of the (patrilineal) family. This asymmetrical kinship system clearly places women at a disadvantage. Women are, for instance, commonly excluded from the family inheritance–in spite of existing laws on gender equality–as they are deemed to belong to their husband's family after marriage.[27] Without sons, the family property would end up in another family, a tragedy in the eyes of elders. The unequal kinship system is also strengthened by a set of norms and stereotypes that clearly divides the world of men from that of women. For example, people used to express their condolences at the birth of a girl. Girls are socialized very differently from boys and they are expected to be virgins at marriage as exemplified by the Red Apple tradition.[28] In fact, premarital sex appears rather uncommon today: men may often resort to sex workers for their first sexual experience and hymen restoration is available in some private clinics. As men are expected to be breadwinners and decision-makers, women are expected to chiefly be homemakers and to be fully responsible for child care. Even access to paid employment does not free them from their numerous home duties. In such a system, domestic violence or anti-women stereotypes are simply tools used to implement patriarchal values and to subordinate women.

But, apart from limited access to resources, women have also suffered from a very unequal power situation. Masculine value norms have somehow aggravated their vulnerable position. The open conflict over Nagorno-Karabakh and the prevailing tension with Azerbaijan have reinforced the preeminence of virile and martial values. Because of rising nationalism, there is often a publicly expressed need for men as soldiers in a country militarily threatened by its neighbor. The argument about the need for men in the military, with regular discussion of the number of (male) casualties along the border and the tension over Nagorno-Karabakh, it is very common to justify the preference for sons.[29] This has even given credence to the incorrect notion that conflict periods give rise to a spontaneous biological increase in the number of male conceptions and that the rise in male proportions is only a "natural" consequence of years of war conditions.[30] Similarly, international labor migration is often seen as an ex-

[27] Equal inheritance is more common in cities, with the emergence of disputes between brothers and sisters over the distribution of family assets.

[28] According to this traditional custom, a tray of red apples was offered to the parents of the newly married bride if blood was found on the bed-sheet after the wedding night (Poghosyan 2011).

[29] The conscription is for two years in Armenia, but does not include women.

[30] A few cases of short-term changes in birth masculinity during war periods have been documented. But they are neither systematic nor of long duration or high intensity. Biological changes in the sex ratio at birth cannot therefore account for the magnitude and long duration of SRB imbalances in Armenia since the 1990s.

clusively male behavior. This has reinforced the perceived need for sons as future international migrant workers. The actual contribution of women to labor migration is often downplayed.

The transitional period in Armenia as in other former socialist countries has been characterized by a slow "return to patriarchy" (Kaser 2008). This resurgence of home-grown patriarchal values has been facilitated by the rapid withdrawal of the state from many of its traditional domains such as employment, public health, education, and social security. The waning of government-run institutions created a vast gap that surviving traditional institutions, like the patriarchal family, had to fill in the absence of alternative well-developed market institutions. Along with the church, the family may represent, to the eyes of many in the population, the ultimate institution behind ethnic survival as it has resisted centuries of foreign occupation and cultural suppression. At the same time, this revival of patriarchal institutions has probably been more significant in rural areas as the development of market institutions in cities has led to a society more often stratified along socioeconomic lines than organized around clan-based organizations.

The transition years have, in this way, been marked by a gradual return of pre-socialists arrangements and traditional institutions while society and the economy were undergoing a process of "demodernization" linked to the collapse of the integrated socialist system. Therefore, gender inequity was reborn from within thanks to the resilience of the traditional family and the value systems that the socialist regime had attempted to suppress. The family also proved to be a solid social institution that could offer formidable resources in the 1990s, at a time when the state was gradually withdrawing from direct intervention and when the economy was in disarray. The patriarchal family as a solidarity and networking mechanism became the most reliable form of social insurance against political, employment and other economic risks.

Current efforts to reverse the deterioration in women's status since 1991 have been confronted with some indifference. They have often been fueled by the efforts of external donor countries and they represent more of an imposed conditionality than a spontaneous perceived need for deep change in gender relations (Osipov 2012; Ishkanian 2008). The issue of sex selection may represent yet another case of exogenous concern for gender inequity and human rights violations unless Armenian civil society and government organizations express a stronger commitment to combat prenatal gender bias. Nevertheless, change from within is also possible and during discussion in Yerevan several colleagues have emphasized the germs of daughter preference in sections of Armenian society. This change in attitudes derives from the recognition of the care-giver role of women in society, but also on the risks associated with male progeny (absence due to migration, drug use, conscription, etc.). We will see from our results that in some specific family configurations, that the presence of traces of active preference for daughters–coexisting with more widespread son preference–cannot be entirely ruled out.

3.2 Sex differentials in infant and child mortality

Son preference is a major trait of many family systems and manifests itself through a large number of attitudes and behaviors that are often difficult to synthetize. We will use several indicators, ranging from mortality differentials, to opinions on the ideal number of sons and daughters and to fertility behavior according to the sex composition of previous children.

Excess mortality is often the crudest expression of gender preferences, reflecting various forms of discrimination against girls and women. Countries in East and South Asia, where prenatal sex se-

lection emerged in the late 1980s, were indeed characterized in the past century and earlier by pronounced excess mortality among girls. These sex differentials in mortality were, at times, linked to the practice of sex selective infanticide. More common today across East and South Asia is the passive discrimination related to the neglect of young daughters–sometimes expressed though inadequate health care and alimentation. Such discriminatory behavior leads to higher than expected female mortality for girls under the age of five: very often, female mortality proves higher than male mortality among young children, whereas in other places in the world male mortality tends to be about 15-25% higher than female mortality immediately after birth

In Armenia, female mortality seems to never have been higher than male mortality. This is illustrated by the estimated level of life expectancy at birth since the 1950s, which has consistently been higher for women by 4 to 7 years than for men. Mortality differentials among children according to civil registration figures also suggest that both child and infant mortality is higher among boys by 20-30%.

Here we use the three recent DHS data to take a closer look at the sex differentials in child mortality (Table 3). As expected, neonatal mortality is usually higher among boys. This is unsurprising as mortality during the first month of life is firstly determined by congenital factors or birth accidents, and is seldom affected by sex discrimination as long as selective infanticide does not exist. Yet, the DHS data points to some more intriguing results: during the three surveys, postneonatal mortality occurring after 28 days appears to be consistently higher among girls in Armenia. Even mortality under five as a whole is marginally higher for girls than for boys according to the latest 2010 survey.

TABLE 3

Infant and child mortality by sex, recent surveys in Armenia, Azerbaijan and Georgia

Country	Survey	Neonatal mortality		Postneonatal mortality		Infant mortality		Child mortality		Under-5 mortality	
		M	F	M	F	M	F	M	F	M	F
Armenia	2010 DHS	9	**10**	8	**11**	17	**20**	4	2	21	**22**
Armenia	2005 DHS	21	16	8	**10**	29	26	8	3	37	29
Armenia	2000 DHS	29	23	17	**19**	46	42	5	3	51	45
Azerbaijan	2001 RHS	46	30	38	**48**	84	78	11	**14**	94	91
Azerbaijan	2006 DHS	37	19	18	**24**	55	43	11	8	65	50
Georgia	1999-2000 RHS	29	18	17	13	46	31	7	5	53	36
Georgia	2005 RHS	24	13	9	**11**	33	24	4	4	37	28

1. Mortality rates in per 1000 population (higher female mortality rates shown in **bold**)
2. Neonatal mortality = during the first month; Postneonatal mortality=1st to 11th month; Infant mortality=first year; Child mortality=1st to 4th year.

Since the DHS data is based on a limited number of neonatal deaths (about 70 deaths by survey), it may be difficult to draw firm conclusions regarding the presence of discrimination toward newborn girls. Yet, the presence of excess postneonatal mortality among girls in the three successive surveys should draw the attention of researchers. Interestingly, we can identify the same patterns in other countries of the South Caucasus that have been added to the table. As Table 3 indicates, six out of the seven surveys conducted in the region point to higher female postnatal mortality.

This higher-than-expected mortality levels among girls aged 1-11 months may not be a random feature, but a characteristic of the local mortality regime that reflect some amount of gender preference. However, further research should be conducted in order to confirm the presence of excess infant mortality among girls by examining mortality statistics or whether the phenomenon observed in the previous table is a statistical artifact due to the small DHS samples.

3.3 Gender preference in surveys

We now move to prenatal indicators of gender bias and examine sex preferences stated in various surveys. One recent source is the Caucasus Barometer conducted in the three countries of the South Caucasus.[31] A basic question on gender preference for a child was introduced in its 2010 round. The exact question was: What would be the preferred gender of the child if a family has one child?

Armenia emerged as the country with the largest respondents declaring to prefer a boy (54%) against a girl (11%), with 35% professing indifference. The ratio of son preference to daughter preference is five for Armenia as in Georgia, and only three in Azerbaijan. According to the 2012 UNFPA survey in Armenia, the bias towards boys is apparently less pronounced: 23% express a preference for girls as against 65% for boys. However, the UNFPA survey covers only women while the Caucasus Barometer includes men, who often have a strong preference for sons. In fact, when asked about the gender preference in their family and external environment in the UNFPA survey, women report a frequency of son preference that is six to ten times greater for sons than for daughters.

Further analysis of this admittedly small sample (1,920 respondents in the 2010 Caucasus Barometer) indicate no real difference across generations in Armenia, but the highest intensity of stated son preference is related to rural residence, male respondents, respondents who declare to trust the clergy and lower average education. While these figures have serious limitations due to the nature of this opinion poll, they do indirectly reflect the magnitude of sex bias across the population. The same survey has an additional set of questions about dos and don'ts for women, these indicate the strength of gender norms on matters as various as drinking strong alcohol, smoking, having sex outside marriage or even going for university studies.

Coming back to sex preference *per se*, a standard question used in surveys is the ideal sex composition of the ideal family. This is the approach followed by DHS surveys, using the question on the ideal sex composition of the family (Fuse 2010). This approach is imperfect, because of a strong normative pressure existing in opinion surveys–which encourages people to profess legitimate, authorized opinions on the number of children they want. These declarations may not reflect their actual attitudes. This is the case for parents who often opt for a balanced and neutral preference of one boy and one girl.

According to the latest 2010 DHS survey, the ideal number of children in Armenia is two children for 50% of parents, with a mean of 2.5 children. No data has been published for the breakdown by boys and girls, but special tabulations from the original dataset indicate that only 20% of respondents declared an ideal number of sons greater than the ideal number of daughters–such as two sons and one daughter. This percentage varies from 12% among the population below 20 to 24% among older women aged 40 and up. In fact, 14 % prefer more girls. Based on this data, the difference between son preference and daughter preference would therefore appear almost marginal in Armenia contrary to the cruder results reported in the 2010 Caucasus Barometer.

[31] Percentages given here are based on unweighted totals. Data is consultable and downloadable from the Caucasus Research Resources Centers : http://www.crrccenters.org/

Yet, a more sensitive test in such circumstances would be to test the fertility preference of parents only after the first live births. We notice that 73% of all parents want another child after the birth of a girl as against 64% after the birth of a boy. After the birth of two children, 14% of parents with at least one boy want to have another child, as against 52% after two daughters. In other words, the desire for another child after two births is three times higher in the absence of a male birth. This ratio is even higher after three female births.

These figures give a clearer picture of the direction of gender preference in Armenia. However, these estimates provide no exact measurement of the actual intensity of son preference. In addition, not only are samples quite small when restricted to women with a particular number of births, but the information canvassed in the DHS surveys reflect opinions, i.e. statements on the fertility intentions which may not translate into actual behavior. In the next section, we will focus on the observed fertility of parents to see if preferences stated in surveys convert into a real gender bias in fertility behavior.

3.4 Gender preference and fertility behaviour measured during the census

A different approach consists in measuring the actual reproductive behaviour of people in specific circumstances rather than asking for opinions about the desire for additional children or about the ideal number and sex of children. The measured fertility behaviour therefore becomes a more accurate indicator of "revealed preferences", reflecting genuine family priorities rather than opinions.

The basic question can therefore be reframed thus: does the gender composition of the family influence the probability of additional births or not? There are three typical situations:

1. In gender-indifferent families, the presence of boys vs. girls among the first children has no impact on later fertility.
2. In the case of "family-balancing", parents with two or more children of the same sex have a higher probability of having an additional child.
3. In the case of son preference, the absence of a previous male birth tends to increase the probability of having another child.

The first situation is the most common across the world. The second situation can be observed only for third or later births. To some extent, this is found in industrial countries among people keen to ensure the birth of both a son and a daughter. The third situation is typical of countries like Armenia where fertility is partly determined by gender considerations. Families in need of a son will follow specific "stopping rules"–such as stopping child-bearing after the birth of a son. To do that, we can compare the probability of having another child–measured by demographers as the parity progression ratio (PPR)–in various family situations. We will compute the ratio of the PPR without son to the ratio with at least one son at various parity levels. When people are sex-indifferent, both PPRs should be similar and the PPR ratio is close to one. But when people prefer sons, this ratio may for instance rise to 1.8 (or 180%), when women without a son are 80% more likely to have an additional child than those with a previously born son.

It may also be observed that when fertility is high, the measurement cannot be done after one or two births, since most parents desire additional births–irrespective of the sex composition of the family. As indicated previously, the proportion of parents without a son tends to diminish fast in the absence of deliberate sex selection when the average family size increases: 24% of mothers of two children will have no son, 12% with three children and a mere 6% after four births. As a result,

variations in son preference in fertility behavior are strongly affected by the average fertility level. Son preference is likely to be undetectable in high fertility regimes, but becomes acute when fertility reaches replacement level.

3.4.1 Son preference and family composition

What follows are the results of the in-depth analysis of the census using the family reconstruction technique presented previously. Let us first examine in detail the data in Table 4 before moving on to a more systematic examination of our results. This table describes the existing variations in the probability of having an additional child (PPR) according to the size and gender composition of the family. Among the 176,420 parents with one child (first line), we can see that the probability of having another child after the previous birth of a daughter is 64% against 63% of parents with a son. This demonstrates that there is no difference in fertility progression at this parity between mothers of sons or daughters. The ratio of these two PPR is 102% and almost identical to one demonstrating that the progression to parity 2 is almost unaffected by the outcome of a first birth.

TABLE 4

Parity progression ratio by parity and presence of a previous son, 2001 census

Family size	Sex composition			PPR Ratio	Observations
	Without a son	With a son	Total		
1	64%	63%	63%	102%	176420
2	37%	19%	23%	197%	164487
3	35%	11%	14%	312%	81232
4+	38%	15%	17%	256%	30288
Total	54%	30%	37%	182%	452427
PPR ratio= PPR without a son/PPR with a son					

The result cannot be more different for parents with two children: only 19% of those with at least one son will have an additional third child as opposed to 37% of those with no son. The son preference level measured though the PPR ratio of 197%. In other words, the probability of having an additional child is twice as high among parents of two daughters. Table 4 shows that it is precisely after the second birth that fertility behaviour in Armenia becomes totally determined by the sex composition of the family. For the higher parities 3 and 4+, the PPR of sonless families becomes more than three times higher than that of families with son. Sample sizes are large enough for this kind of computation.

More than anything that can be written on gender attitudes in Armenia, these findings give a clear idea not only of the *presence* of a very strong son preference in the country, but also of its actual *intensity*. We learn beyond a doubt that the need for a son resulted in fertility levels that in the 1990s were twice or three times higher at birth order 3+ than among families with a son. This suggests that the preference for sons and the associated fertility behavior constituted a distinct factor of high fertility in that period.[32] At this juncture, we also need to remind readers that sex-biased fertility behavior has no impact whatsoever on the distribution of births by sex. Unless there is active prenatal sex selection, the sex ratio at birth remains strictly determined by biological random factors and distorted PPRs have no effect on the actual sex of the newborns.

[32] This bidirectional relationship between fertility and sex selection is complex. On the one hand, prenatal sex selection has contributed to fertility decline by allowing parents to abort unwanted female pregnancies, but on the other hand, fertility decline has compounded sex selection by reducing the expected number of births.

In Table 5, we will examine fertility variations according to the *number* (rather than the presence) of sons parents have. The table shows the PPR for each situation. For example, we can see that among families with two children, parents with one and two sons have the same probability to have another child (19%). Computations on families with more than three children show no significant differences according to the number of sons. There is a slight increase in the PPR when parents do not have a daughter–such as at parity 3 for parents with no daughters (13%). The same result is found for parity 4+, as parents with no daughter have a slightly higher PPR (20%) than parents with one or two daughters (18% and 15%). While the difference is modest–and obviously almost negligible compared with the effect of the absence of a boy that doubles or triples the probability to have another child–, it suggests that parents without a daughter were slightly more fertile than parents who had at least one female birth.

TABLE 5

Parity progression ratio by parity and number of previous sons, 2001 census

Family size	Number of male children					
	0	1	2	3	4	Total
1	64%	63%	.	.	.	64%
2	37%	19%	19%			23%
3	35%	11%	11%	13%		14%
4+	38%	11%	15%	18%	20%	37%
Total	53%	36%	17%	14%	21%	18%

These results are significant for two reasons. First, they show that one boy among two children is enough to fulfill one's fertility intentions. The need for one son in Armenia is stronger than the aversion for girls that is observed in Indian regions in relation with the cost of dowry payment. Second, there may be specific fertility strategies to ensure the birth of one girl. This is probably a minor component of the family-building processes in Armenia, but the previous shows traces of higher PPR levels among parents who have only boys.

3.4.2 Regional and socioeconomic characteristics of son preference

We will now examine in detail some of the main regional and socioeconomic correlates of this intense gender preference. Table 6 examines the difference between rural and urban areas of the country. As the average PPRs indicate, parity progression is lower in cities and towns, which is directly related to lower fertility level in urban areas. However, there is evidence of a slight difference between urban and rural areas in terms of gender preference. The impact of the absence of a boy is more pronounced in villages as the PPR ratio increases from 174% in urban areas to 195% in rural areas. A more detailed analysis by number of children (not shown here) indicates that the increase in PPR is similar at parity 2, but becomes significantly higher in rural areas at parity 3 or higher. For instance, having three daughters increase parity progression by 160% in cities and towns, but by 250% in villages.

TABLE 6

Parity progression ratio by presence of a previous son, urban and rural areas, 2001 census

	Without a son	With a son	Total	PPR ratio	Observations
Urban	47%	27%	34%	174%	261475
Rural	63%	32%	41%	195%	190952
Total	54%	30%	37%	182%	452427
PPR ratio= PPR without a son/PPR with a son					

The difference among Armenians from urban and rural areas in terms of gender preference and fertility behaviour was perceptible during the 1990s. It is probably related to the population engaged in agriculture, but lack of detailed occupational data precludes any further analysis on the linkage between the labor sector and gender preferences.[33] The most recent UNFPA study also confirms the higher prevalence of son preference in the countryside (UNFPA Armenia 2012).

The same exercise can be repeated for regions (*marzes*) and is shown in Table 7. There were only limited differences in PPR levels across regions during the 1990s. Yerevan emerges unsurprisingly as the province with the lowest PPR level because of its overall low fertility level. Variations in terms of son preference are moderate, since the overall ratio for all parities ranges only from 166% (Syunik) to 201% (Aragatsotn). We can, however, oppose provinces such as Yerevan or Syunik to the South with the lowest son preference, to provinces such as Aragatsotn or Gegharkunik where it is significantly higher. These differences across provinces in son preference are even more pronounced at parity 3, with Aragatsotn, Gegharkunik, and Kotayk provinces displaying a son preference of almost twice as high as in Yerevan, Lori and Tavush provinces (results not shown here). It may be noted that these regional variations concur to some extent with the data collected by the UNFPA survey (UNFPA Armenia 2012: 29) on son preference. The gaps between the two sources may relate to estimation issues.

TABLE 7

Parity progression ratio by presence of a previous son and marz, 2001 census

Marz	Without a son	With a son	Total	PPR ratio	Observations
Yerevan	45%	26%	32%	170%	130894
Aragatsotn	63%	31%	41%	201%	22738
Ararat	59%	32%	39%	184%	42292
Armavir	60%	31%	39%	193%	43192
Gegharkunik	65%	33%	42%	200%	41347
Lori	53%	29%	36%	181%	40338
Kotayk	55%	28%	36%	193%	37826
Shirak	57%	31%	39%	186%	43968
Syunik	52%	32%	38%	166%	21351
Vayots Dzor	57%	31%	39%	183%	8623
Tavush	56%	32%	39%	175%	19858
Total	54%	30%	37%	182%	452427
PPR ratio= PPR without a son/PPR with a son					

[33] An indirect confirmation from this hypothesis from available data relates to the very high son preference found in families (household head and mothers) reportedly working "at their own residence", a category that includes peasant families.

In theory, these variations in birth masculinity across provinces may stem from variations in the average regional fertility levels. High fertility may reduce the apparent level of gender bias since, in most cases, large families end up having at least one male child. Yet fertility variations across provinces were not considerable in the 1990s in Armenia and we do not see any clear link between lower fertility and son preference. While son preference seems prevalent everywhere, there may be a distinct spatial patterning of son preference in the country. We will see later in this study that the geography of these variations remains almost identical when we measured regional levels of birth masculinity, the ultimate outcome of son preference.

Another distinct picture of variations in son preference emerges when considering the socioeconomic status of the population (see Table 8). Here we use the division into socioeconomic quintiles to identify variations in son preference. These quintiles have been devised by a factor analysis of all household-level socioeconomic variables described in the methodology section above.

TABLE 8

Parity progression ratio by presence of a previous son and socioeconomic quintile, 2001 census

Quintiles	Without a son	With a son	Total	PPR ratio	Observations
Richest	43%	26%	31%	169%	68,274
Rich	46%	26%	32%	175%	73,219
Medium	51%	28%	35%	182%	84,021
Poor	59%	31%	39%	191%	104,587
Poorest	64%	34%	42%	190%	113,432
Total	54%	30%	37%	182%	443,533
PPR ratio= PPR without a son/PPR with a son					

As expected, the overall PPR decreases among the richest categories in relation to lower fertility levels. However, we also see that higher quintiles appear to display lower levels of son preference in fertility: in fact, the ratio of PPR with and without a son decreases from 190% to 169% as one climbs the socioeconomic ladder. The differences may not be considerable, but they are regular and even more important when expressed in absolute differences between PPRs: among the poorest, the absence of a son increases the PPR by 30% (from 34% to 64%), but only by 18% among the most affluent. In other words, the absence of a son appears to have a more pronounced effect on subsequent fertility behavior among the lower socioeconomic categories, which suggests a stronger need for male progeny.

We have replicated these computations of son preference by socioeconomic status for different parity levels to account for the possible effects of variations in fertility levels. The gap between the poor and the rich becomes even more marked. For instance, at parity 2, the absence of a son increases in absolute terms the probability of having an additional child by 10% in the highest quintile, but by 25% among the poorest. Obviously, the poor are more likely to have an additional birth in order to ensure the birth of a son. These results suggest a link among the higher quintiles between fertility decline and son preference in fertility progression. But, another hypothesis that we will explore further below is that the more privileged sections gave up on repeated pregnancies as a way to ensure the birth of son and opted for a selective abortions to overcome their gender predicament.

Another powerful indicator of social disparities is education. It was classified in Armenia in non-standard categories, including several confusing categories distinguished between professional and general education. We have been able to identify a clear negative linear relationship between the educational level of the household head and son preference: the absence of a boy decreases the PPR ratio from 190% among the least educated to about 160% among university graduates.

A few other variables point to significant differences in son preference in fertility behaviour. For instance, households that include political or environmental refugees were less likely to have another child in the absence of a son. Another counterintuitive result is that households reporting international migrants do not display significantly higher levels of son preference in fertility behavior. A pronounced variation is, however, visible among households classified by family structure: nuclear families with only parents and unmarried children that represent about 60% of our sample exhibit a distinctly lower son preference than complex families with three generations or more than one married couple. Similarly, households headed by women or by an unmarried person have slightly lower son preference. We distinguish here the effects of the traditional family system, often characterized by multigenerational cohabitation, in which son preference appears more common. On the contrary, alternative family arrangements reflected in households headed by a woman and even in households following the nuclear pattern are associated with lower pressure to bear a son.

CHAPTER 4

BIRTH MASCULINITY AND PRENATAL SEX SELECTION

We have previously underlined that PPRs do not *per se* in any way affect the distribution of births by sex. Although, with the introduction of new reproductive technologies during the 1990s, Armenian parents were finally given the ability to manipulate the sex of their children, chiefly by avoiding births of the unwanted sex. This, as we will see in this section, will be clearly reflected in growing distortions in the sex ratio at birth.

4.1 Trends in the sex ratio at birth

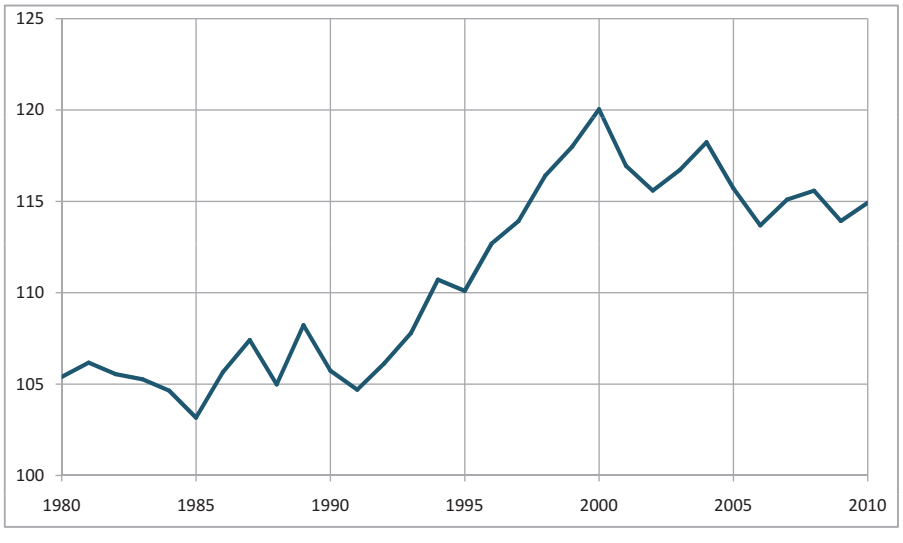
The statistics from the civil registration data provides the first evidence of the rise of the sex ratio at birth in Armenia during the 1990s. As we know, the sex distribution of births tends to be stable in the world in the absence of social intervention or of specific underenumeration. The resulting sex ratio at birth is of 105 male births per 100 female births, a level observed in industrialized countries with a reliable statistical apparatus from North America and Western Europe to Japan and Russia.

4.1.1 Annual series from the birth registration data

We compute SRB levels by year based on the annual series of registered birth starting from the 1980s up to today. Results are shown in Figure 3. SRB trends up to 1991 conform to the normal pattern of SRB oscillating around 105. The fluctuations observed after 1985—such as the increase to 108 in 1989—may be attributed to random variations or to the effects of the events affecting the country, like the Spitak Earthquake, on the quality of data. On the whole, the average SRB during this decade (105.6) is perfectly in line with the biological distribution of births recorded elsewhere.

FIGURE 3

Sex ratio at birth, vital statistics, 1980-2010



It is only after 1991 that a steady rise in the proportion of male births becomes noticeable. The annual SRB figures cross 110 in 1994, 115 in 1998 and finally 120 in 2000. In retrospect, this increase by 15 per 100 in ten years has been nothing short of spectacular. In China and South Korea, the sustained growth in birth masculinity up to the mid-1990s has been twice as slow as in Armenia and it took more than a decade for their respective SRB levels to cross the 115 line. This period has also been associated with the plummeting number of annual births recorded in Armenia: the number of births dropped dramatically from 70,000-80,000 per year during the Soviet period to 60,000 in 1993, 50,000 in 1995, 40,000 in 1998 and finally reached a plateau of 32,000 in 2001. This massive fall is the consequence of a parallel decrease in fertility rates, from 2.5 children per woman in 1990 to 1.7 ten years later. The fertility rate continued to remain below replacement-level after 2000 and it was estimated at 1.7 children in the latest 2010 DHS. The rapid diminution of births since 2000 was compounded by important changes in Armenia's age structures during that period.[34] Massive emigration of young adults was an additional factor in the reduction of the population of childbearing age.

After the exceptional level of 120 was reached in 2000, the sex ratio at birth has, however, registered a slight decrease in Armenia, moving from 116.6 in 2001-2005 to 114.6 in 2006-2010. Simultaneously, the number of births stabilized after 2000. It even slowly increased to reach 45,000 at the end of the decade. Because of year-to-year fluctuations, it is not clear if we can detect a sustained reduction in the SRB level after 2000 in the country. Whatever the case, the apparent pace of SRB decline is rather slow at -2 per 100 in five years. At this rate, it would take another 25 years for the SRB in Armenia to return to normalcy.

The examination of the birth registration series suggests the existence of distinct phases, starting with a first pre-independence period during which birth masculinity was apparently at a normal level. The second phase of the sex ratio transition took place during the 1990s. It was marked by a dramatic increase in the proportion of male births and the sex ratio at birth reached in 2000, one of the highest level ever observed in the world at 120 male births per 100 female births. In comparison, it took China about 20 years to reach a somewhat similar level of 120 in 2000 as against less than a decade in Armenia. No other country in South or East Asia has ever reached 120 and neighboring countries in the South Caucasus region have reported SRB peaks at 115-118. The third phase corresponds to an apparent stabilization after 2000, and possibly a slight decrease in birth masculinity. The sex ratio at birth has levels below 115 for the most recent years and there may have been a slow downward trend over the last ten years.

4.1.2 The increase in birth masculinity as seen from the 2001 census data

Other sources utilized to study trends in birth masculinity are usually limited to demographic surveys. In particular, for Armenia this corresponds to the three successive DHS surveys from 2000 to 2010. Yet, these surveys record no more than 300-400 births per year, preventing any reliable measurement of the distribution by sex. For instance, the first DHS survey in 2000 has estimated the sex ratio at birth to have jumped from 102 in 1991-2005 to 134 in 1996-2000. While the existence of this upward trend is not in doubt, the overall SRB levels reported by the survey for these successive five-year periods are unlikely to be reliable and the high value estimated in 1996-2000 has obviously been caused by random sample fluctuations.

In comparison, census data offers far larger samples since the census is expected to be an exhaustive count of the population. It can be compared only to birth registration in terms of birth cohorts. We

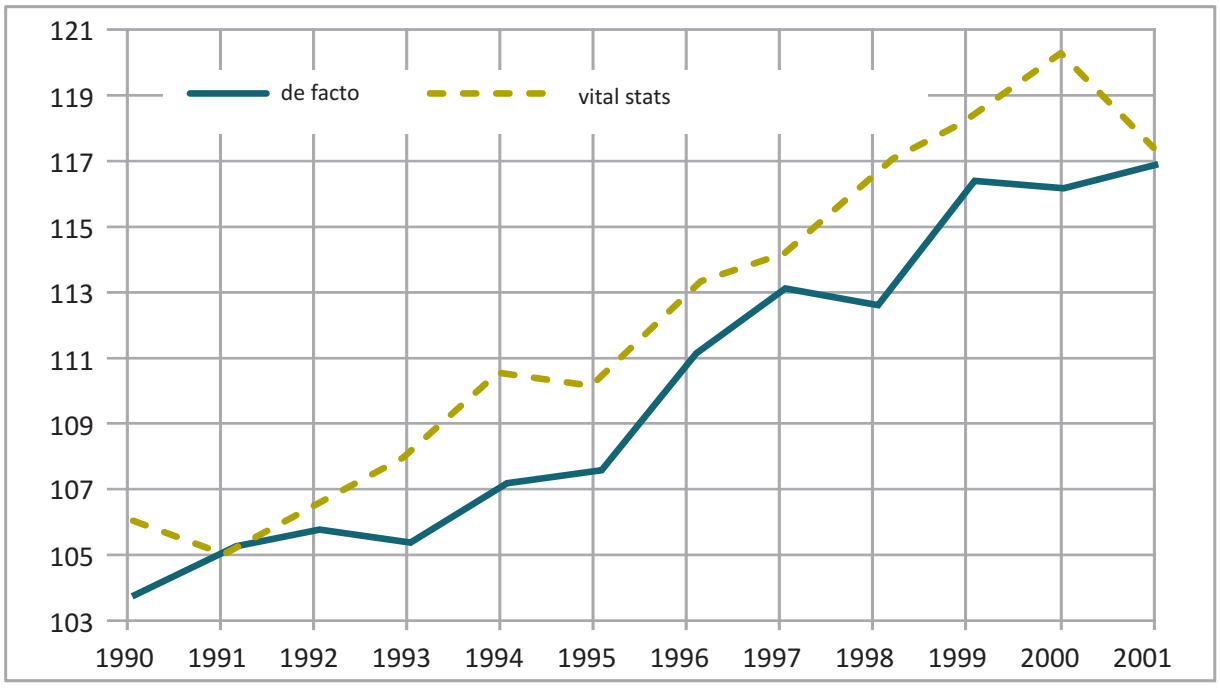
[34] The smaller birth cohorts, dating from the previous phase of fertility decline of 1960-1980, became adults during this period and this automatically reduced the average number of births

will start with the age and sex distribution of the population: such data provides a reliable picture of the SRB in the years prior to the census. Below the age of 15, the sex ratio of the population is only affected by mortality differentials: slightly higher infant and child mortality among boys may inflate the proportion of girls among children (the older the children, the higher male excess mortality and the proportion of girls among children). The excess mortality among boys remains modest, as the sex ratio of the survival rates is above 99% up to age 15.[35] This mortality gap has been incorporated in our computation to correct for the effect of higher male mortality. Migration plays almost no significant role in the sex distribution of children aged less than 15.

Figure 4 displays the estimated SRB by year of birth according to the census population aged less than 11 years after correction for mortality differentials.[36] We have added the SRB derived from birth registration. The data from the census point to a later and slower rise in birth masculinity: later because the rise is visible only after 1993, and slower because the census-based SRB remains during the entire period 2-3 per 100 below the civil registration SRB. Another difference is that, instead of peaking in 2000, the census-based SRB was still on the increase in 2001. It ends up at an almost identical level in 2001 (117) compared to the civil registration figures. In fact, the 2000 peak suggested by the birth registration data is not at all reflected in the age and sex distribution from the 2001 census.

FIGURE 4

Child sex ratio and sex ratio at birth, de facto 2001 census population after mortality correction and vital statistics, 1990-2001



These differences between the two curves from 1993 to 2000 are not negligible, particularly in view of the fact that the census population made of children aged less than five should closely correspond to the total of births recorded in the country from 1996-2001. Differences between the two sources are also observed in the size of the birth cohorts as shown in Figure 5. The estimated size of annual birth cohorts tends to be slightly larger according to the census than according to civil registration:

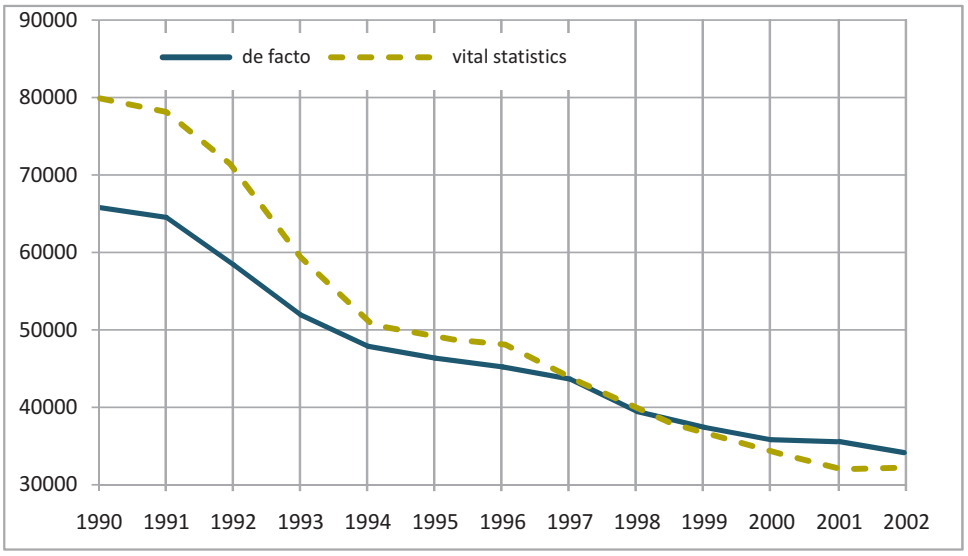
[35] This means that the survival rates of boys is only 1% lower than that of girls. The values used here are derived from the WHO life tables for Armenia in 1999.

[36] Here we use the age and sex distribution of the de facto census population.

the census population born between 1997-2001 is 192,000 (after correction for mortality) as opposed to 186,000 births recorded during the same period. During the earlier period, the gap between the curves may be influenced by outmigration since many young children may have left with their parents, artificially depressing the de facto census population recorded in 2001 in Armenia.

FIGURE 5

Size of birth cohorts, 2001 census and vital statistics, 1990-2001



While there are clear parallels in both series, since they depict a rise in the sex ratio at birth immediately after independence, birth masculinity levels are different and tend to be higher according to birth registration data than in the census. There is no easy explanation for this since these young age groups are not known to have been subjected to selective underestimation or selective migration.

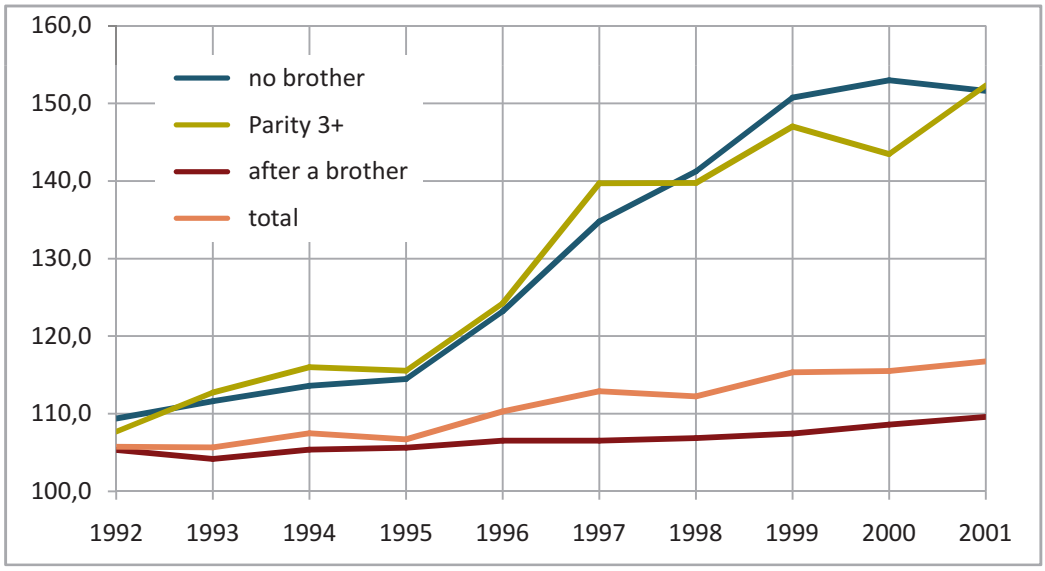
Another indirect method provides more evidence regarding the timing of the rise in birth masculinity. The idea of this method is to restrict our analysis to children most vulnerable to sex selection, i.e. children born after successive female births or children of parity 3+. To examine these variations, we have created new subsamples: the first series is restricted to the population of children born after one or more daughters and without an elder brother, while the second series is made up of children of higher birth rank (three and above). The third series, introduced for comparison purposes, is composed of children born after the birth of a brother. In theory, it is among this population that sex-selective behavior should be the least frequent. We also show data for the entire child population (Figure 6)

The series included in Figure 6 show that the sex ratio at birth of children born after a brother is the lowest. This corresponds to the population among which the son preference should be almost absent. It remained close to 105 up to 1995 and only slowly increased to 110 in 2001. It is distinctly lower than the annual SRB average which reached 117 in 2001. If we now consider the two categories at higher risk of prenatal sex selection ("no brother" for sonless families and "parity 3+" for higher parity births), we see a parallel rise from the beginning of our study period.[37]

[37] We have excluded children born before the 1991 census from our analysis, as they may be too old for accurate family reconstruction.

FIGURE 6

Sex ratio of children by year of birth, gender composition and parity, 1992-2001



The sex ratio at birth of children with no brother and of parity 3+ was already above 110 in 1993, and increased extremely quickly from 115 in 1995 to 150 in the years preceding the census. These two series follow identical trends. In particular, we observe that the SRB of these two subpopulations was already slightly above the normal level in 1992. The overall increase in birth masculinity in Armenia was then moderate since it was restricted to the most vulnerable births, which accounted for less than 20% of all births. The impact on the average sex ratio of children was hardly visible according to census data before 1995 while civil registration data suggests that the SRB was already on the rise in 1992.

There was a distinct wave of a more rapid increase in SRB after 1995. The sex ratio at birth among vulnerable groups then jumped from 115 to 140 from 1995-1998 and reached 150 in 2001. This spectacular rise lasted a few years. It had a sizeable impact on the average census-based sex ratio at birth–which increased from 107 to 117 during this period. The vital registration data also depicts a clear rise after 1995, with the overall SRB increasing from 110 to 114. But, a gap of about 2-3 male births per 100 female births subsisted according to vital statistics, which remained distinctly higher than census estimates up to 2000. No clear reason for the gap observed between both sources can be offered, except for the possibility of differentials in underreporting of births by sex during a period of complete administrative reorganization.

4.2 Differentials in sex ratio at birth during the late 1990s

Census data allows for a more disaggregated approach of skewed sex ratio at birth than published vital statistics. However, in view of the rapid change in the sex ratio distribution by year, census data will be used here only to examine the recent gaps in birth masculinity. Therefore, we will restrict our analysis to 237,774 children aged 0 to 5 years since the sex distribution of the older population born before 1995 is far less distinctly biased towards boys.[38]

[38] The total population of children below six years in our 2001 census dataset is 252,649. But, the population of children we use here is restricted to families for which we could reconstruct the birth history (93% of the total sample).

4.2.1 Parity and birth masculinity

We start with the SRB analysis by rank of the child in the family acting as proxy for birth parity. The results of this analysis are shown in Table 9. As expected, the sex ratio rises by parity, moving from a somewhat normal level for the first birth order to 150 for children ranked 4+. The sex ratio for the first two parities is close to the normal 105 level. Yet, we notice that it is 107.5 among first children, a ratio significantly above the biological standard and above the sex ratio of second births (see also the gap between these two SRB by parity on the trends depicted in Figure 7). The fact that the sex ratio remains somewhat normal for the first two births suggests that child-bearing was not affected or only marginally affected by gender considerations before the third birth. In a lower-fertility regime, like in China, the sex ratio at birth jumps immediately after the first birth.

TABLE 9

Sex ratio of children by rank in the family (parity), reconstructed child population, 1992-2001

Parity	Sex ratio	Children
1	107.5	91939
2	104.3	85398
3	135.6	42595
4+	149.7	17836
Total	113.6	237774

Among third and later births, the sex ratio is obviously (and significantly) above the 105 level. It jumps to 136 for third births and 150 for higher-order births. This latter value corresponds to approximately 45 male births in excess per 100 female births. In other words, on average, 43 female births are missing when 100 are born: 30% of the expected births of parity 4+ were not born. These are indeed very high values. Parity-wise SRB levels do not usually reach high levels. In many countries like Albania or Viet Nam, it tends to level off at 125. But, the most surprising feature of this high level is that prenatal sex selection was a very recent phenomenon in Armenia in the late 1990s.

A further examination of children by rank and year of birth is shown in Figure 7. It demonstrates that the sex ratio of the high-parity births shot up immediately after 1991, reaching 130 in 1995 and almost 160 in 1997. At the end of the decade, the sex ratio among third and higher-rank children converged towards a level fluctuating around 150. The birth masculinity of children of parity 4+ demonstrates that technology to identify and terminate female pregnancies must have been already available at the beginning of the 1990s in Armenia, since the increase is regular from 2002 onwards.

FIGURE 7

Sex ratio of children by rank in the family (parity) and year of birth, reconstructed child population, 1992-2001.

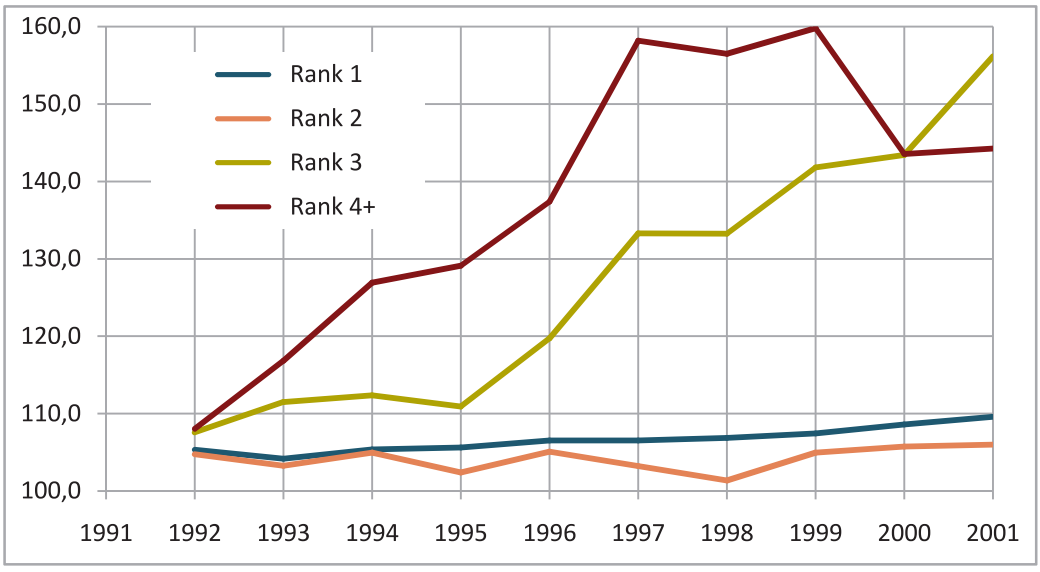


Table 10 derives from a more in-depth analysis of family composition by parity level. Among children born after 1995, we can distinguish on the one hand children with at least one older brother and on the other hand, children with only older sisters at time of their birth. Among children born after a previous brother, the overall sex ratio remains almost normal at 103.3, even the sex ratio for parity 2 seems rather low (99.9). In the absence of a brother, second children display a modest increase in their sex ratio at 109.

TABLE 10

Sex ratio of children by rank in the family (parity) and presence of an older brother, reconstructed child population, 1992-2001

Parity	Without brother	With brother	Total	Children
1	-	-	107.5	91939
2	109.1	99.9	104.3	85398
3	223.4	104.4	135.6	42595
4+	303.6	113.7	149.7	17836
Total	140.4	103.3	113.6	237774

The jump is impressive for third births since the sex ratio of children born after two successive girls is 223 and after three girls soars to 304. These two sex ratio levels are computed respectively on 15,000 and 5,000 children for all Armenian children born from 1995-2001 and the results are therefore statistically significant. The share of missing girls among expected female births is a staggering 52% for third children and 65% for higher-order births in the absence of previous male progeny.[39] This data, along with previous data by child rank, dispels the notion that the sex ratio at birth could be significantly affected by biological or any other non-social factors since no biological factor could account for the difference according to the previous siblings that is shown here. In the 1990s, gender considerations became the foremost determinant of fertility progression and birth masculinity in Armenia.

[39] As done previously, the number of expected female births is computed from the observed number of male births.

The examination of PPR in the previous section demonstrated the presence of a well-entrenched son preference in the population leading many parents to have additional children in order to have a son. Third and later births obviously provide the possibility for parents to correct the perceived gender gap, i.e. the absence of a male child. However, the present analysis of children's sex ratio now confirms the highly skewed sex distribution of children. Prenatal sex selection has become the primary tool to beat the biological odds by avoiding unwanted female births. Even if no birth statistics will ever tell us what has actually happened to unborn girls, there is no missing the fact that their disappearance most probably occurred during pregnancy since no pre-conception sex-selective methods were available during the 1990s.

We have also examined in detail the effect of the sex composition of offspring on the sex of the younger child. The effect of son preference has been shown to be considerable in determining the sex ratio at birth of births of high parity in 1990s. We have also seen that the absence of a girl has no notable impact on the sex ratio of younger children with an average sex ratio of 103.3 following the birth of a son. Yet, we have noticed a sex ratio below 100 among second children born after a boy and among third children after two boys. With respect to the sample size, this is a level significantly below 105, pointing to potential selection possibly targeting male births. Further research would be needed to establish if the need for a girl is strong enough in some cases to encourage prenatal sex selection of male fetuses. We can also see that the desire for boys may persist after the birth of one: thus, among parents who had one boy out of the two first children, the sex ratio of third child is slightly skewed (109 for 18,000 children), even if this is obviously far less obvious than among those with two girls (223). This echoes the results obtained from our earlier PPR computations suggesting the presence of fertility strategies among some Armenian families to ensure the birth of a girl. Similarly, the sex ratio for parity 4+ is 129 for the 5,200 children born after one boy. This suggests that son preference may persist among a smaller minority even after giving birth to one boy and that it may lead to active sex selection to ensure the birth of a second son in the family.

4.2.2 Social and economic differentials

In a previous section, we spotted variations across the country in terms of son preference and fertility behavior. We will now examine if they have translated into sex selection. For instance, the overall sex ratio of the child population from 1996-2001 is indeed noticeably higher in rural areas (116) than in urban areas (108) as shown in Table 11. The difference is significant in view of the large number of children involved.

TABLE 11

Sex ratio of children by rural-urban areas and presence of an older brother, reconstructed child population, 1992-2001

	Without brother	With brother	Total	Children
Urban	138.4	99.8	108.3	138439
Rural	142.9	107.5	115.7	99335
Total	140.4	103.3	113.6	237774

However, this difference decreases when we restrict our sample to children born without elder brothers. The sex ratio at birth of children born after girls is 138 and 143 for urban and rural areas

respectively.[40] A disaggregated analysis or rural-urban differentials at various parities indicates that the birth masculinity increases in both towns and villages almost at the same rate in the absence of a prior male birth and appears to be even higher in urban areas.

To recap this relatively complex situation observed in the late 1990s, we can say that the higher son preference previously observed in rural areas based on childbearing does not convert into equally higher SRB levels. In fact, city-dwellers seem to be more systematic or effective than the rural population when it comes to choosing the sex of their children and parity-wise sex ratio at birth tend to be higher in cities than in villages. This higher level of birth masculinity by parity and sex composition suggests that the urban population had earlier access to modern technological facilities, most notably ultrasonography used for prenatal diagnosis. Since people from the countryside have less fertility constraints, they do not hesitate to have more children than in urban areas in order to accomplish their gender goals through repeated pregnancies.

A further analysis of regional differences has been conducted based on marz divisions and is displayed in Table 12. The overall sex ratio of children varies significantly from 108 (Syunik) to 120 (Aragatsotn). However, restricting our samples to children born after girls leads to more pronounced regional differentials. Variations across marz units now range from 115 to 160. As was the case with son preference in fertility progression, no region seems to be exempt of sex imbalances at birth. We also clearly distinguish two regions (Aragatsotn and Armavir) with highly skewed sex ratios in families with only girls since the birth masculinity level is 50% above normal. On the contrary, the child sex ratio is comparatively moderate around 115 in three regions, i.e. Lori, Syunik and Tavush.

TABLE 12

Sex ratio at birth by presence of a previous son and marz, reconstructed child population, 1992-2001

Marz	Without brother	With brother	Total	Children
Yerevan	139.8	96.5	109.0	70740
Aragatsotn	159.7	111.3	120.5	11830
Ararat	143.7	102.5	113.8	21518
Armavir	159.2	104.3	118.0	22529
Gegharkunik	147.8	106.8	117.1	21938
Lori	115.1	106.4	110.3	20503
Kotayk	148.0	106.0	114.7	19583
Shirak	146.6	106.0	115.4	22051
Syunik	114.3	104.6	108.0	11802
Vayots Dzor	151.2	103.7	116.9	4538
Tavush	119.1	108.8	109.2	10742
Total	140.4	103.3	113.6	237774

These variations directly correspond to rural-urban differences as many rural provinces display high or low sex ratio levels with Yerevan as the most urbanized area in the country with an average sex ratio. However, we have distinguished one distinct cluster of high masculinity composed of a broad central strip extending from Shirak to Vayots Dzor, with all the seven provinces (viz. Aragatsotn, Ararat, Arma-

[40] There is also an unusually low SRB value (99.8) among urban families with one son. Low SRB values are replicated for Yerevan and the highest socioeconomic quintile as shown in the next tables. This phenomenon, pointing to potential daughter preference, would require an additional statistical analysis to be better understood.

vir, Gegharkunik, Kotayk, Shirak, and Vayots Dzor) with above-average sex ratio levels. On the contrary, several regions that are more distant from the historical plains such as Lori, Tavush or Syunik display the lowest sex ratios. To some extent, this corresponds to the differentials in son preference in fertility behavior observed earlier (see Table 7). Yet, the variations now measured in birth masculinity are more pronounced, suggesting that access to technology in more centrally located areas may have played an important role during the 1990s in helping parents fulfill their gender objectives.

We have also used household socioeconomic status to explore variations by income group (Table 13). The poorest seem to have higher sex ratios, a feature somewhat unexpected since access to newly available reproductive technology must have been easier for the richest urban households during the 1990s. In fact, when controlled by sex composition, the gap between quintiles is no more significant, as all groups have almost similar sex ratio levels close to the national average. Yet again, Table 13 conceals the existence of a complex sex selection and fertility strategy that varies according to socioeconomic status: the rich implement a stricter and earlier version of prenatal sex selection for the first two or three births, but the poor resort more frequently to a fertility-based strategy allowing them to have additional children and practice sex selection among these later pregnancies.

TABLE 13

Sex ratio at birth by presence of a previous son and socioeconomic quintile, reconstructed child population, 1992-2001

Quintiles	Without brother	With brother	Total	Children
Richest	136.6	96.8	107.2	37,361
Rich	139.5	98.2	112.3	38,748
Medium	142.6	101.5	113.7	44,249
Poor	144.9	104.9	115.0	54,421
Poorest	137.5	108.8	115.1	59,238
Total	140.4	103.3	113.6	237,774

The analysis has been repeated using educational background of the household head and of the mother, as well as of the adult household population. The sex ratio of children born after one or more girls tends to be higher among parents with a higher educational level, often rising above 150-160 for the mothers or household heads with university or higher professional education and lower than 140 among the population with below-average educational backgrounds.

We also investigated the correlation of various variables related to the household, its head or the mother of the children in comparison to the average value of 140 after only female births. Very few of these variables proved significantly associated with birth masculinity. Yet, we identified the presence of some environmental or political refugee in the household, and the nuclear family pattern as a correlate of lower child sex ratio (133 and 135 respectively). Conversely, a higher than average level of birth masculinity was observed when the household head was working from his (her) residence or receiving income from ownership as well as among the population that are not ethnic Armenians (minority). The most pronounced differentials probably relate to the age of the parents as the sex ratio of children regularly increases as parents grow older, reaching values above 190 for mothers aged 35-39 years and household head aged 40-44 years. This result partly proceeds the parity effect on the sex ratio of children following successive female births. Age obviously adds an additional urgency factor, as parents are afraid this may be their last opportunity for child-bearing.

4.2.3 A synthetic analysis of the determinants of higher birth masculinity

For a more global perspective on the determinants of the sex ratio at birth, we have performed a regression analysis of the determinants of birth masculinity. The analytical strategy is based on a simple multinomial logit analysis of the probability of having a male child. It is restricted to births which took place during the six years preceding the 2001 census, as the sex ratio was almost normal before that period. Here we use a logit model in which we have initially incorporated all household, individual and geographical variables used in the previous analysis. The multinomial approach ensures that redundant factors are eliminated from our regression results and we get results after controlling for the largest possible number of covariates.

This analysis remains limited by available census variables, which tend to be far less comprehensive and detailed than survey variables. Preliminary analysis based on a series of step-wise regressions has led us to discard many variables unrelated to the sex ratio of children. Coefficients of variables retained in Table 14 below are statistically significant (levels vary from 5% to 0.1%). Negative coefficients correspond to an association with low sex ratio. The first regression analysis was based on children of rank 2 or higher born from 1996-2001: first births were excluded since their sex ratio is almost identical to the normal biological level.

TABLE 14

Logistic regression of the probability of a male child for birth rank greater than 1, reconstructed 1996-2001 child population

Male birth	Coefficient	Significance	
Older brother	-0.3600218	***	0.000
Child rank	0.2358861	***	0.000
Age of the head	0.0025182	***	0.000
Aragatsotn	0.0938828	**	0.001
Armavir	0.0790246	***	0.000
Lori	-0.0518634	*	0.017
Kotayk	0.044454	*	0.036
Shirak	0.053103	**	0.010
Syunik	-0.079043	**	0.003
Nuclear pattern	-0.0872677	***	0.000
Higher SES Quintile	-0.0326402	*	0.032
Phone	0.0722425	***	0.000
Education (household)	0.0185557	***	0.000
International migrant	-0.0475803	**	0.010
Armenian	-0.0859885	*	0.013
Constant	-0.1452579	*	0.046
N= 136,681 ; Chi²= 0.00 ; Log likelihood= -93,343 Levels of statistical significance: *: 5%; **: 1%; ***: .1%			

Many coefficients turned out to be significantly associated with birth masculinity, starting with the positive effects of child rank (parity) and the negative effect of a previous male birth. Unsurprisingly, these are by far the strongest predictors of birth masculinity. Age of the household head is another demographic factor that increases the sex ratio, independent of parity and sex composition.

There are no significant rural-urban differentials, but we observed sizeable regional variations. With Yerevan used as reference for the regional analysis, Aragatsotn, Armavir, along with Kotayk and Shirak, emerge as provinces with significantly higher sex ratios. On the contrary, birth masculinity is lower than expected in Lori and Syunik, even after accounting for other social and demographic factors. This confirms the regional analysis conducted previously and demonstrates the presence of a distinct spatial patterning of sex discrimination within Armenia.

At the household level, the regression results indicate that a nuclear family pattern (families composed only of parents and children) significantly reduces the sex ratio, which is also true to a lesser extent of higher socioeconomic status. On the contrary, the presence of a phone in the dwelling strongly increases the probability of having a male birth and so does education, here measured as the highest instruction level among all adult household members. Two less obvious factors emerge from this multinomial analysis and tend to decrease the proportion of male births: Armenian ethnicity and the presence of an international migrant in the household. These two indicators are associated with less skewed sex ratio levels. These correlations by no means prove causal relationship, but they demonstrate the strength of the association between adverse birth masculinity levels and these social and economic attributes.

A new regression analysis has been restricted to children of higher rank (rank 3+) with no older brother. This corresponds to the most vulnerable population according to our previous estimates, with an average sex ratio at birth close to the record level of 250. Results of this second analysis are displayed in Table 15.

Child rank remains the strongest predictor, even among high order births. The age of the household head still plays an aggravating role, but the sex ratio at birth is lower when the household head is a woman, a feature related to the positive effect of a non-traditional household structure.

The set of regions with distinct sex ratio remains almost the same as in the previous regression, but the opposition between Armavir (high sex ratio) and the peripheral provinces of Lori, Syunik, Vayots Dzor and Tavush (lower sex ratio) is more pronounced. Rural-urban differentials remain invisible once other variables are factored in this regression model.

Other variables do not play the same role as previously seen, which suggests that parity levels influence the association between birth masculinity and social and economic variables. For instance, higher socioeconomic status measured by the socioeconomic index or the presence of a phone in the household is now associated with higher sex ratio at birth among children of higher order. The effect is reinforced by the household education level, a variable that also tends to raise the proportion of male children. Birth masculinity is also higher when the head of a household is Armenian. Regarding migration, the sex ratio tends to be distinctly lower when there is a refugee in the household, or when the household head is a migrant.

This multivariate analysis confirms the association of most variables already identified as potential predictors of birth masculinity. As expected, parity and sex composition are the most decisive variables. The impact of the socioeconomic quintiles is slightly inconclusive, but overall, socioeconomic status and higher education are linked to higher levels of birth masculinity when other variables are taken into account.

TABLE 15

Logistic regression of the probability of a male child for birth rank greater than 2 and in the absence of an older brother, reconstructed 1996-2001 child population

Male birth	Coefficient	Std.	Significance	
Child rank	0.3704945	0.0386392	***	0.000
Age of the head	0.0070176	0.002038	**	0.001
Female head	-0.100657	0.0426929	*	0.018
Armavir	0.1992202	0.0564425	***	0.000
Lori	-0.4315022	0.054468	***	0.000
Syunik	-0.7150506	0.0723173	***	0.000
Vayots Dzor	-0.2384527	0.1105936	*	0.031
Tavush	-0.4158585	0.0740643	***	0.000
Higher SES index	0.1015061	0.0212638	***	0.000
Phone	0.0909268	0.0377588	*	0.016
Education (household)	0.0816516	0.0105088	***	0.000
Armenian head	0.6173463	0.2782831	*	0.027
Refugee in the household	-0.1228222	0.0572377	*	0.032
Head is a migrant	-0.0939161	0.0366987	**	0.010
N= 19,549 ; Chi^2=0.00 ; Log likelihood=-11,556 Levels of statistical significance: *: 5%; **: 1%; ***: .1%				

The fact that rural-urban differences have disappeared from our regression analysis suggests the paramount role played by the geographical patterning of the country around Yerevan. A cluster of central provinces exhibit higher birth masculinity levels irrespective of the effects of other social and demographic variables. These provinces are in the middle of the country and benefit from the best transportation network. Distance and terrain probably explains why sex ratios may be higher in these provinces: their inhabitants might have pioneered the use of the new reproductive technology. On the contrary, more distant, peripheral provinces are characterized by lower incidence of prenatal sex selection and it may be due to the lack of local modern healthcare facilities during the 1990s and the distance to Yerevan.

4.3 The sex ratio at birth in 2001–2010

As seen before (Figure 3), the trend in the sex ratio at birth in Armenia seems to have been slightly on the decline according to vital statistics. Down from a peak of 120 in 2000–a figure that might have been exaggerated by the birth registration system–, the sex ratio at birth decreased to levels closer to 115 by 2010. There are, however, annual fluctuations in the sex ratio at birth. At the same time, the number of annual births registered in the country has risen regularly since 2002 by almost 40%.

4.3.1 Trends in sex ratio at birth and parity

The following analysis is based on the dataset prepared for us by the National Statistical Services, corresponding to the 388,187 births registered in the country during 2001-2010. The overall sex

ratio at birth during this period was 115.5. This is lower than estimates available for the period centered on 2000, but this remains one of the highest levels in the world, well above national average estimates available for South Asia or Southeast Europe. It is only comparable to values estimated for China, Northwest India or neighboring Caucasian countries. If we set the normal sex ratio at birth at 105 in the absence of sex selection, the excess number of male births during this decade can be estimated at 18,920 births, about 9.1% of the total number of male births in Armenia.

TTable 16, derived from this dataset, relates to the parity-wise SRB variations. We also added the data derived from the previous census analysis for the late 1990s. We recognize some of the familiar traits of sex selection seen from previous census data. The sex ratio at birth literally shoots up from the third births onwards to record levels above 160. These are levels greater than what we had estimated in the past.

TABLE 16

Sex ratio at birth by parity, 2001-2010 births and 2001 census.

Parity	Children born 1996-2001		Births 2001-2010	
	Children	Sex ratio	Births	SRB
1	91,939	107.5	197,961	106.7
2	85,398	104.3	132,579	110.3
3	42,595	135.6	44,010	172.8
4+	17,836	149.7	13,637	163.7
Total	237,774	113.6	388,187	115.5

The detailed comparison with data for the period 1996-2001 is illuminating. First, we can note that higher-parity births are now a much smaller proportion than in the past. We see a rapidly declining distribution of births by parity, falling from 197,000 first births to 133,000 second births, and finally plunging to 44,000 for third births and 14,000 for higher-order births. The share of third and later births is now much smaller in Armenia than 10 years ago. The sustained increase in the annual number of births from 2001-2010 that we mentioned earlier has mostly concerned first and second births. This new parity distribution also explains why the spectacular SRB for high parity births observed from 2001-2010 has a limited impact on the overall sex ratio at birth in Armenia. However, we may observe that the SRB level above 160 among third and higher order births is probably the highest ever reported in the world. It is greater than the sex ratio for parity 3 observed in China (156 in 2005), or in South Korea during the peak period (142 in 2000). However, Armenia's SRB level seems on par with the sex ratio at birth of third births estimated in Georgia during the last decade.[41]

Second, as already mentioned, we notice that birth masculinity has increased even among the higher-parity births. In other words, couples are having less and less third and higher-order births, but among them, the sex selection has clearly intensified. 63% third births are now male births. The size of the deficit in female births represents no less than 64% of observed female births.[42] For three girls born at this parity, two more are missing. This intensification in prenatal sex discrimination suggests

[41] Data communicated by Irina Badurashvili. No data is currently available to describe the parity differentials in birth masculinity in Azerbaijan.

[42] We compare the observed number of females to the expected number of female births. The latter figure is deduced from the number of observed male births for parity 3 by using 105 as the sex ratio at birth.

that most parents appear to have given up on the idea of having three or more children, except when they do not have already a boy. Birth registration statistics do not allow us to examine the sex composition of previous birth, but parity data and the previous census analysis suggest that a vast majority of parents going for high-order birth are parents who failed to have a male child.

Finally, we also notice a sizeable increase in the sex ratio at birth of second births, from 104.3 to 110.3.[43] While modest (+6 per 100), this increase has some real impact, as the share of these births is more considerable than higher-order births. In fact, the 2001 census data indicated that first and second births represented less than 9% of the extra male births from 1996-2001. This modest share has now increased to 26.1% of all extra male births from 2001-2010. In spite of the somewhat astronomic SRB levels at higher parity, sex selection among the first and second births is now a major contributor to the overall deficit in female births observed in Armenia.

However, in-depth analysis of the dataset of births registered from 2001-2010 does not point to a further deterioration of the sex ratio at birth among first and second parities. What it shows is, on the contrary, a moderate decrease in the sex ratio at birth among higher parities: SRB levels peaked at about 180 in 2006 among third and later births in Armenia, but it has since then gradually decreased to levels closer to 160 in 2010.

4.3.2 Regional differentials

Differences across rural and urban areas were already discussed based on 2001 data. Table 17 below shows that the sex ratio at birth continues to be higher in the countryside than in towns and cities. The difference (119 vs. 114) is statistically significant. When birth masculinity is decomposed by birth order, the differences remain visible only for third and fourth births. Discrimination against female births is slightly stronger in rural areas at high parity (3+). It may be added that the proportion of these births is significantly higher in the countryside than in towns (20% vs. 11%), which affects the overall gap between rural and urban sex ratio at birth. We may also observe that the sex ratio of second births is comparatively higher in rural areas. But, a more comprehensive analysis below will show that urban-rural differentials in SRB *per se* tend to disappear when more social and geographical variables are taken into account.

TABLE 17

Sex ratio at birth by parity and rural-urban, 2001-2010 births

	Urban	Rural	Total
1	107.3	105.4	106.7
2	110.3	110.3	110.3
3	167.8	178.6	172.8
+	152.7	172.7	163.7
Total	113.8	118.6	115.5

This set of 388,000 births from 2001-2010 is also large enough for regional decomposition. Figure 8 below uses both the overall sex ratio at birth and the SRB for parity higher than 2. On the whole, SRB differences between provinces have remained present in Armenia. The sex ratio at birth during the last decade ranges from 111 to 124. Therefore, on one side we have provinces like Syunik where

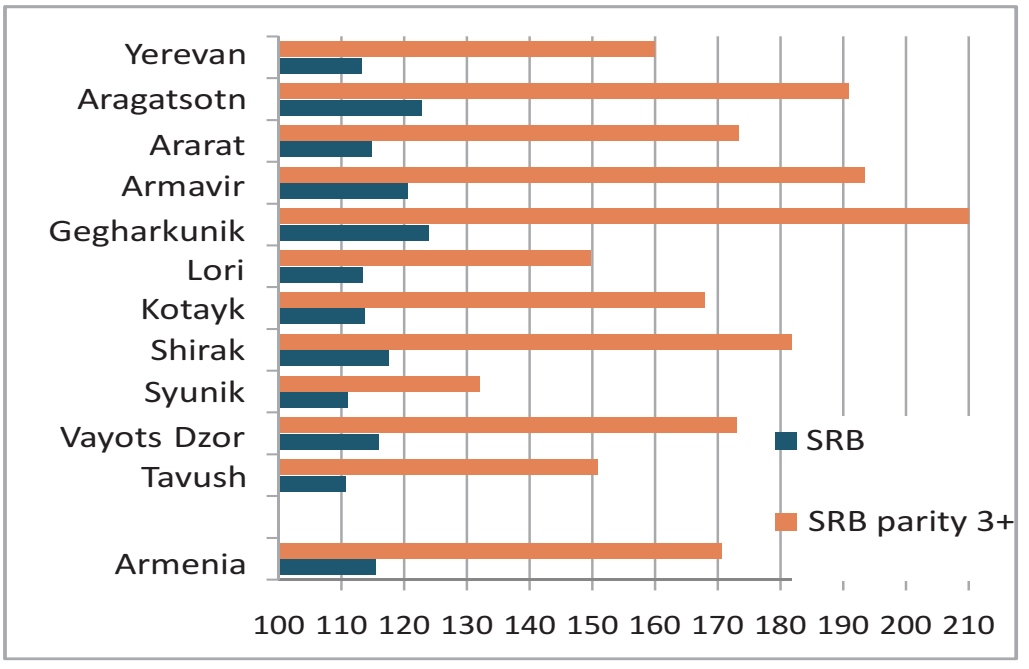
[43] The difference in birth masculinity among first births is not significant.

sex discrimination remains moderate and on the other side provinces like Gegharkunik where birth masculinity is higher today than in China.

These variations across regions in Armenia appear even wider when we restrict our focus to births of higher birth order as the corresponding sex ratio at birth now ranges from 132 to 212 across Armenia. Syunik, to the extreme South, once again records the lowest SRB level, with other Northern peripheral provinces such as Lori or Tavush also characterized by distinctly lower birth masculinity levels. While the SRB of third and higher-order births is at its peak at 213 in Gegharkunik, several other provinces such as Armavir or Aragatsotn record SRB values close to 200. The figure among parents with only previous female births–accounting probably for a majority of parents going for a third or higher-order births– would likely be even higher than 200 in these regions.

FIGURE 8

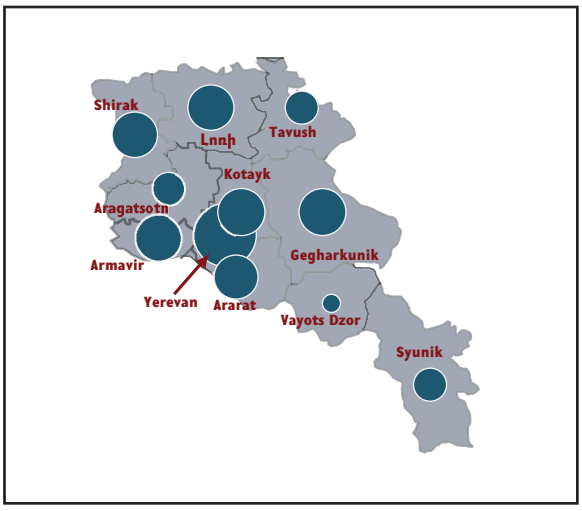
Sex ratio at birth by marz and parity, vital statistics, 2001-2010



We have compared these values with estimates previously derived from the 2001 census and obtained very strong correlation coefficients (r^2) of about .75 between SRB estimates for these two different periods. This validates our estimation procedures and, above all, demonstrates the strength of the spatial patterning of sex distribution in the country. The geography of the sex imbalances at birth observed in the 1990s has more or less remained unchanged in spite of recent improvements in communication and health infrastructures during the last decade, a period almost exempt of conflicts and serious internal tension compared to the 1990s. While the entire country is affected by prenatal discrimination, a core area of high sex ratio at birth emerges in the centre of the country, made up of Armavir, Aragatsotn, Gegharkunik and Shirak in particular. Outlying provinces to the South and to the North are, on the contrary, characterized by distinctly lower levels of birth masculinity.

FIGURE 9

Births and sex ratio at birth by marz, vital statistics, 2001-10

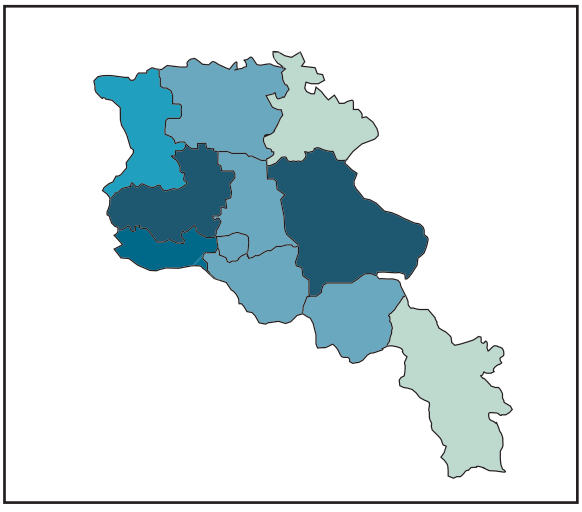


Total number of birthsin 2001 - 2010

50000

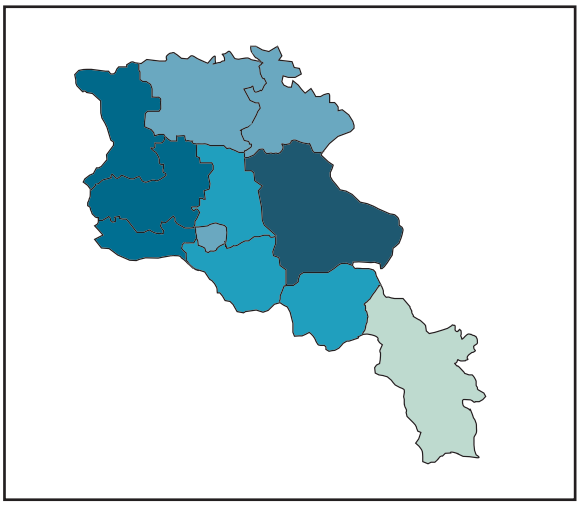
25000

5000



Sex ratio at birth (all births)

- 122 to 124 (2)
- 119 to 122 (1)
- 116 to 119 (1)
- 113 to 116 (5)
- 110 to 113 (2)



Sex ratio at birth (third and higher order births)

- 196 to 213 (1)
- 180 to 196 (3)
- 164 to 180 (3)
- 148 to 164 (3)
- 132 to 148 (1)

Yerevan, in spite of being in the middle of the hot spot of birth masculinity, retains average values. Yerevan's case is interesting due to several factors such as easy access to modern reproductive technology, lower birth rates and the higher socioeconomic status of its inhabitants would admittedly cause more frequent prenatal sex selection than anywhere else in Armenia. Since this is not case, we are led to believe that the missing factor in the capital region is likely to be a moderate level of son preference compared to the rest of the country. While we have no definite proof of this hypothesized lower need for sons in Yerevan, we have seen some previous indicators pointing to regional differences in gender preferences and fertility behavior across the country (see PPR values by marz in Table 7). Yerevan, along with Syunik, emerged as the provinces where the absence of a son generates the lowest level of fertility adjustment, as if a significant part of metropolitan population of Yerevan was gender indifferent when it comes to childbearing choices.

Marz-level statistics allow for a more detailed analysis of parity-wise variations (figures not shown here). While it is at birth orders 3 and 4+ that sex discrimination is at its strongest, there are also small trends visible among lower order births. Yet, among first births, regional variations appear modest-ranging from 102 to 108–and uncorrelated to other SRB variations across provinces. We can deduce from this observation that first births are rarely subjected to sex selection in the country. But regional variations among second births seem more common in Armenia, ranging from 105 in Tavush to 115 in Armavir. This pattern reproduces the now familiar geography of sex selection in Armenia also shown on our maps. The correlation coefficient between marz-level SRB estimates at parities 2 and 3 is quite strong (r^2= .59). This demonstrates that the high value of the sex ratio at birth of second births that has emerged during the last decade is not a random variation linked to limited birth samples, but corresponds to a clear manifestation of prenatal sex selection. It points to the early implementation of gender objectives by a growing number of couples who resort to sex selection immediately after a first (presumably female) birth. Yet, contrary to what we see in China or Viet Nam, sex selection during the first pregnancy remains nonexistent in Armenia.

4.3.3 Other demographic and socioeconomic differentials

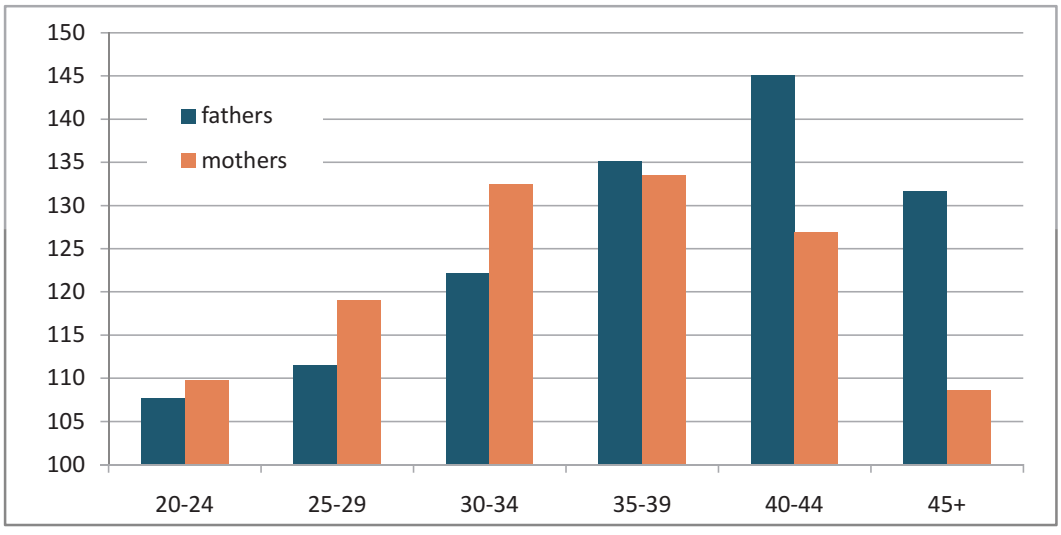
The vital statistics records include a number of other pieces of information collected during the declaration of births. While far less detailed than census variables, some of the information from birth registration on the mother and father may also be used for examining existing differentials in birth masculinity.

Figure 10 clearly demonstrates that birth masculinity is almost normal among younger parents, but tends to increase very quickly with age. The peak above 130 is reached for fathers aged over 35. For mothers, the age is no longer a real factor after 40, but this is largely due to the limited number of births at this age.

The age of parents corresponds to higher parity and the increase is not entirely unexpected. Among older couples, there is also a growing urgency to ensure the birth of a son in order to complete the process of family building. A further analysis by parity indicates that the rise in the proportion of male births with age is also visible among first births, whereas birth masculinity tends to be usually flat at this parity. Among later-in-life fathers and mothers who have their first child after 35 years of age, the sex ratio at birth increases to levels ranging from 110 to 114, a visible increment compared to the average SRB of 107.

FIGURE 10

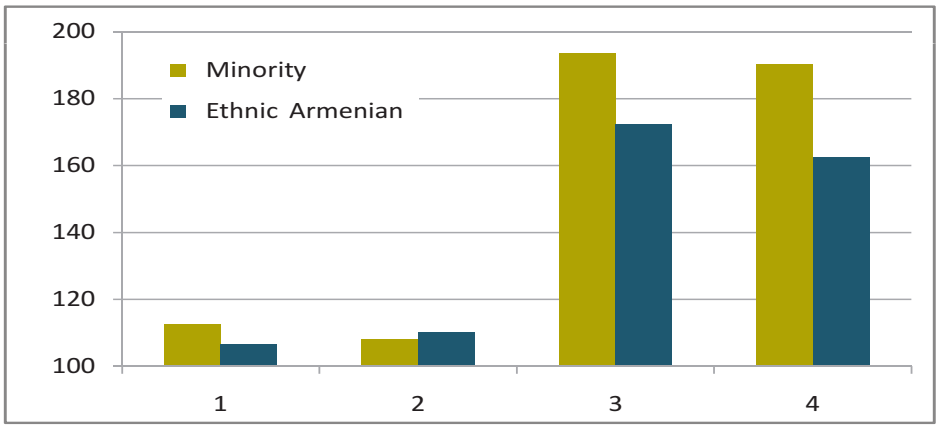
Sex ratio at birth by age of parents, vital statistics, 2001-2010



Another distinguishing factor that was flagged in the course of our census analysis was the impact of ethnicity on sex preferences. Birth registration data also recorded the ethnicity of parents and in this figure we will use the ethnic group of the mother (see Figure 11). We simply distinguish between ethnic Armenians and minorities, as minorities themselves constitute a rather small proportion of the population, and, therefore, of births (less than 2% of the total). [44]

FIGURE 11

Sex ratio at birth by ethnicity of the mother, vital statistics, 2001-2010



The overall SRB among minorities is 128 male births per 100 female births, against 115.3 for Armenian mothers. While we would be inclined to dismiss this gap as the consequence of small sample variations, a further decomposition by parity suggests the difference is real. In fact, we see that birth masculinity tends to be higher for minority mothers at different birth order, especially for parities 2 and higher. The higher birth masculinity level among minorities is therefore a distinct feature of the situation confirmed by census and civil registration data, even if this has little bearing on the overall

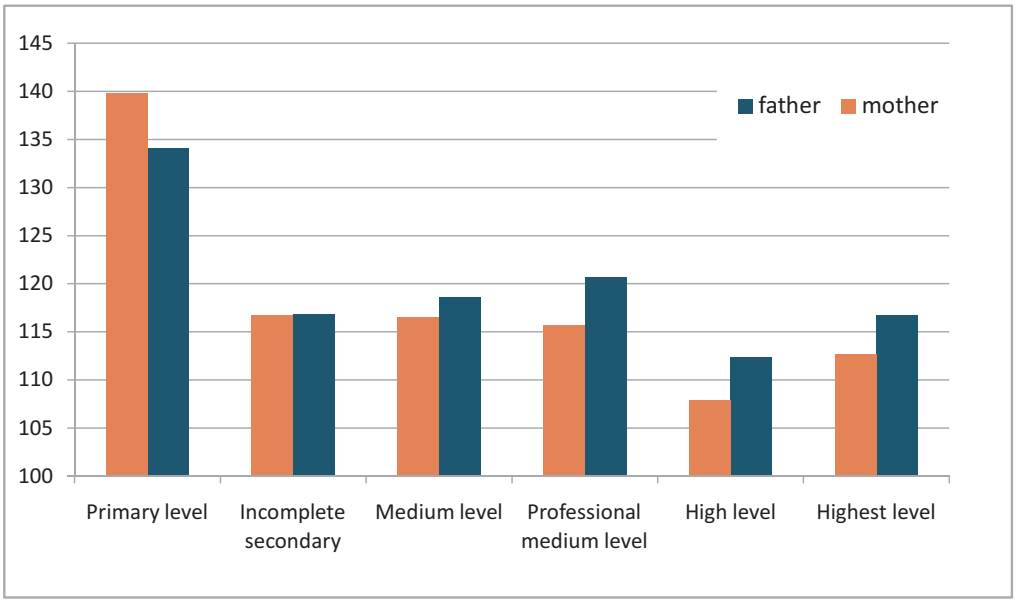
[44] In Armenia, minorities constitute a rather heterogeneous group, made up mainly of Yazidis (mostly Kurds) and Russians.

birth masculinity in view of the small size of the concerned population in Armenia. The same analysis by confession or religious denomination is not possible due to a lack of appropriate data.

Education is another variable known to be associated with birth masculinity. In our sample of birth records, we used the education levels of both mother and father. The only limitation is that this particular information is of much poorer quality for fathers, as it is often missing from the records. Data shown in Figure 12 suggests a link between lower educational level and higher sex imbalances at birth. By using information on both mothers and fathers, we see the average SRB reducing from levels above 130 among the least educated sections down to levels around 110 among parents reporting the highest educational background. Yet, the gap is most pronounced between the lowest education category and the rest of the population. It is also visible at different parity levels (figures not shown). To some extent, these findings contradict the results of the 2011 survey (UNFPA Armenia 2012).

FIGURE 12

Sex ratio at birth by education level of parents, vital statistics, 2001-2010



No variable directly reflects the socioeconomic standing of parents exactly. Education shown previously is only a proxy. We also examined the occupation of parents, a rather poorly specified variable with only a few categories in 2001, but no interesting feature has emerged from our analysis.[45]

Two less common variables stand out as having a significant contribution to low birth masculinity. One is related to the rare occurrence of multiple births such as twins or triplets (less than 2% of all births). Interestingly, the sex ratio of multiple births at 104.7 turns out to be identical to the normal biological level. This suggests that parents facing a multiple pregnancy tend to abandon the idea of selective abortion for health reasons, or maybe that the chances of male births are simply higher in similar cases.

Another atypical variable relates to the identity of the person registering the birth. It is usually the father of the baby. But, 12% of births are registered by the mother, often because she is not married and the birth is not recognized by the putative father. Sometimes, it can also be a strategic choice

[45] The occupational nomenclature has changed during the decade under examination, this leads to risks of misclassification.

by parents guided by family considerations. It is interesting to observe that, in this case, the sex ratio is 106.3, a level barely distinguishable from the normal sex ratio at birth. In other cases, when the notification is made by the father, the sex ratio at birth is 116.8, a level slightly higher than the national average.

Interpreting this feature requires a better understanding of the link between union, birth and women's agency. This normal sex distribution of births observed in cases of a birth declaration made by the mother may first be a *consequence* of non-traditional family arrangements (e.g. unmarried mothers), which are directly associated with weaker patriarchal norms. Women without a husband may be more autonomous and therefore less influenced by traditional values favoring sons over daughters. Inversely, this more balanced sex ratio at birth may also be taken as the *cause* for this situation: fathers may express less interest in recognizing and registering female births or they may even be less willing to marry (or to remain in union with) their partners if they are expecting girls. These remain hypotheses that only a further sociological analysis could appraise. But, whatever the exact nature of the link between birth reporting by mothers and a more balanced SRB, the patriarchal dimension of this strong association is unambiguous.

TABLE 18

Logistic regression of the probability of a male child for birth rank greater than 2, vital statistics, 2001-2010

Male birth	Coefficient	Std.	Significance	
Multiple births	-0.3884156	-9.36	***	0.000
Mother's age	-0.0077643	-4.49	***	0.000
Aragatsotn	0.1973731	5.24	***	0.000
Ararat	0.111196	3.61	***	0.000
Armavir	0.2196419	6.94	***	0.000
Gegharkunik	0.2918601	9.26	***	0.000
Kotayk	0.0679443	2.1	*	0.036
Shirak	0.1369849	4.35	***	0.000
Syunik	-0.190827	-4.8	***	0.000
Minority mother	0.1669855	+3.27	**	0.001
Declaration by mother	-0.2267328	-8.13	***	0.000
Highest education level	0.1126608	3.98	***	0.000
High education level	0.1367691	4.96	***	0.000
Secondary education	-0.1556832	-4.32	***	0.000
Civil servant	0.2251001	2.32	*	0.02
High-level specialist	0.9147379	2.17	*	0.03
Constant	1.237284	14.62	***	0.000

N= 57,636 ; Chi^2=0.00 ; Log likelihood= -37,745
Levels of statistical significance: *: 5%; **: 1%; ***: .1%

As a conclusion to this analysis, we have performed a logistic regression of the determinants of birth masculinity. The analysis is similar to the regressions based on the census data presented earlier. Here, we use all births with available information, but our analysis was restricted to birth order 3+ among which prenatal sex selection in Armenia is mostly concentrated.

The results of this statistical analysis help to identify the correlates of gender discrimination among high-order births in Armenia. For instance, we notice that parity and rural-urban variations play no meaningful role in accounting for SRB variations. But, we distinguish once again the typical geography of son preference and prenatal discrimination in the country, with the usual cluster of provinces (Aragatsotn, Ararat, Armavir, Gegharkunik, Kotayk, and Shirak) with a distinctly higher sex ratio at birth. This regional patterning also corresponds to provinces where outmigration is the most frequent, with Gegharkunik as a typical case with the highest SRB and outmigration levels.

Once all factors are accounted for, the link with social status is now positive as several indicators of higher education and occupation are linked to higher birth masculinity. This suggests that social status plays a different role among higher-order births. Minority women still have a higher SRB than Armenian women. We also observe that the role played by the declaration of births by the mother and multiple births continue to decrease the sex ratio at birth, but the age factor is now negative among higher-order births. Put differently, our model suggests that when other factors are accounted for, younger mothers have more boys than older mothers among third and higher order births.

4.4 The mechanisms of sex imbalances

The convergence of all available statistics on the intensity and duration of the skewed sex ratio at birth in Armenia points to the presence of a systematic mechanism of prenatal sex selection. Census and civil registration data also provide a wealth of information about the correlates of sex imbalances, from parity differentials to regional and socioeconomic variations. Similar sex imbalances at birth in China, South Korea, India and Viet Nam have primarily been caused by sex selective abortions, as qualitative research has shown. But in Armenia's case, we have only limited field surveys to document this practice.

The UNFPA survey conducted in 2011 fills in an important gap. Some of its main findings are directly relevant to our understanding of the mechanisms leading to the distorted sex ratio at birth observed in Armenia. In fact, the survey estimates that 92% of the women had heard of the modern methods of prenatal sex determination. But, the survey also indicates that only 50% of women underwent an ultrasound test during their pregnancy. This seems like a serious underestimate of the frequency of prenatal testing in view of the advance of the reproductive technology available in the country and its low cost. Unfortunately, we do not have alternative data on the use of ultrasound technology in Armenia since the DHS survey did not adequately cover this topic. The DHS rounds estimate that pregnant women had on average from 4 to 6 prenatal visits and ultrasound testing is performed at these visits.

What we do know is that ultrasound technology appeared in Armenia during the 1980s. Conditions then were not favorable to a large-scale spread of the new technology for prenatal sex determination for at least two reasons: the lack of training of local doctors and the quality of the Russian-manufactured equipment which had a very small screen.[46] Newly imported equipment reached Armenia during the 1990s, consisting mostly of American and Japanese brands. Almost all women now want to know the sex of their child and they may visit different clinics in order to get and compare information. Private clinics can offer a "one-day service" to customers, combining prenatal screening and subsequent abortion at limited cost.

[46] This information was collected during a round of meetings with ultrasound specialists at the Institute of Perinatology, Obstetrics and Gynaecology in Yerevan.

Abortion has long been considered an acceptable form of family planning in Armenia and remains very common, while modern contraception is relatively shunned. According to the UNFPA survey, the proportion of pregnancies ending in abortion may be quite high. This proportion increases with parity. The same number of third-order pregnancies will, for instance, result in abortions and deliveries. Abortions are especially frequent for births of higher parities. This corresponds to the decline in the proportion of third births following the reduction in fertility rates. But, it also corresponds to the dramatic increase in birth masculinity observed among third births. However, the number of women who acknowledged having an abortion upon learning the sex of their child is very small and it amounts to less than 1% of all women of child-bearing age. In fact, when converted into SRB, the low proportion of women reporting a sex selective abortion would only raise birth masculinity from 105 to 108 male births per 100 female births.[47] In other words, figures of reported sex selective abortions do not tally with SRB levels observed in Armenia. If prenatal sex selection is, indeed, as we strongly suspect, based primarily on selective abortions, women have probably under-reported these abortions during the survey.

Underreporting is a very common feature of abortion surveys, in which both the frequency of abortions and reasons for aborting are poorly estimated. It may, however, be compounded by the spread of Cytotec (misoprostol), a drug which can easily be purchased from pharmacists and is often used for self-induced abortions. As mentioned earlier, the use of self-administered abortifacient drugs like misoprostol often goes underreported by women. The importance of Cytotec in Armenia as an abortive method and its use for selective abortion are poorly documented. But, its rapid spread in the country in recent years is common knowledge. The local medical community considers that the drug should not be used for late abortions as it can be quite dangerous to the woman's life because of possible complications when used after nine weeks of pregnancy. Yet, it can be used in practice for second-trimester abortions. For instance, the use of misoprostol for late-term abortions is described in standard abortion manuals (WHO 2012: 46). Delayed pregnancy termination is crucial to pregnant women who have to wait to be able to determine the sex of their fetus though ultrasound. When administered late during the pregnancy (after the 12th week), misoprostol can cause bleeding and women ultimately must go to the hospital.

Besides abortifacient medication, it should also be mentioned that the newest reproductive technologies have already reached Armenia, as the number of "genetic clinics" or "fertility centers" that have mushroomed in Yerevan attests. Apparently, some are offering sophisticated services such as preimplantation genetic diagnosis (PGD), which are methods of pre-implantation sex testing. Yet, embryo screening remains a very expensive technology, hardly accessible to the vast majority of the population. We did directly investigate the characteristics of these new private infrastructures during our visit. They are mostly concentrated in the Yerevan metropolitan area, but we have only limited information on the exact range of services offered and their rates. However, these new clinics have been described to us during several meetings with health specialists and their presence on the Internet is conspicuous, with numerous websites offering their services in Armenian, Russian and English.[48] The recent emergence in Armenia of these new reproductive technologies is a reminder of the continuous technological modernization taking place in the country and its potential for the spread of newer methods available to well-off parents for sex-selective reproduction.

[47] Sex-selective abortion is reported in 1.2% of pregnancies: only 5.5% of women reported a selective abortion among the 22% who went for a prenatal test (UNFPA 2012). Assuming that all these prevented births were female, the number of female births would decline by 2.5% and the SRB would only rise by 2.6 male births per 100 female births.

[48] We have identified many fertility clinics in Armenia advertising PGD techniques on their websites.

The UNFPA survey also documents the location where women went for prenatal determination of the sex of the fetus. It shows that, in most cases, the decision to undergo a prenatal diagnosis was taken by the women themselves (70% of cases), while the influence of the husband and his family account for another 22%. When asked about decisions on the number and sex of children, 29% of women stated that it is their husband's decision (and 41% that it is a joint decision). The role of the husband increases to 47% when it comes to the decision to terminate a pregnancy, with another 6% of the decisions taken by the mother-in-law. This data reflects better than any other source the considerable influence exerted by the husband and his family on women's reproductive choices.

The additional group discussions conducted in the course of the UNFPA survey clearly manifest the primary role of men in making decisions affecting the family line. The importance of lineage as the first reason for the need for sons clearly emerges from the survey, followed closely by the transmission of property. For lack of ethnographical material, we have little sociological information on the recent transformations in the kinship system or on the workings of these extended families. The exact role they play in terms of social and economic support to individual family members has not been extensively described. But, the survey suggests that purely economic and military reasons, while common, are far less often mentioned by respondents when asked about the reasons for son preference in their family. Obviously, the sway of traditional family norms is substantial and cannot be reduced to its mere economic functions. In several Asian contexts, as in Viet Nam or India, the preeminence of sons often receives a religious or spiritual sanction since male progeny has important functions after the death of his parents (ancestor worship, funeral rituals, etc.). It is worth stressing that there is almost no direct or indirect religious endorsement of son preference in the Armenian religious tradition. Son preference is a mostly secular "pre-modern" tradition that is based on the strength of the kinship system and on its corresponding mythological and ideological underpinnings. As far as we know, there is no apparent religious connection with son preference in other countries of the South Caucasus where sex selection has been observed.

Group discussions and interviews from the UNFPA survey probably provide the only sources on the attitude and situation of women in relation to son preference. The pressure they feel from their husband's family to bear a son is often mentioned by discussion participants and is especially intense for them after successive births of daughters. An additional factor common to patriarchal settings is the influence of social norms. Men and women without a son are thus routinely lamented, criticized or derided in Armenia. In a society where individuals often have to follow the opinions of larger groups, the influence of the family and social environment can be considerable.

In conclusion, we once again must emphasize the relative gap existing between demographic sources pointing to sex imbalances and the relative paucity of sociological studies of the roots of son preference in Armenia. The technological and infrastructural environment in which modern methods of prenatal sex selection have blossomed is also poorly documented in recent demographic or public health studies. This gap in knowledge is a real impediment to the understanding of the rationale and mechanisms of sex selection in Armenia. Ultimately, it represents a serious obstacle for the development of appropriate policy initiatives to reduce prenatal gender bias.

CHAPTER 5

DEMOGRAPHIC MASCULINIZATION IN THE NEXT DECADES

The first lesson of skewed SRBs in Armenia relates to the low status of women and girls in the society that it reflects. As such, it is more a human rights issue than a demographic question. However, there are also well-known consequences to the current process of masculinization in terms of future demographic implications. Population structures are slow to change and to a large extent, the population of the coming decades is already born and present in Armenia. By using available data and adequate demographic parameters, we can provide a reasonably good picture of the demographic future of the country. To that end, we have run a series of population forecasts for the period of 2010-2060. They outline the influence of current sex imbalances at birth on the age and sex distribution of Armenia's population in the next decades, as well as their interplay with migration trends.

5.1 Population projections under different SRB scenarios

We use the *de jure* age and sex distribution from the latest 2011 census in order to estimate the 2010 figures, which will serve as baseline data for our projections.[49] The estimated population total is 3.0 million inhabitants for 2010, with an overall sex ratio of 92.2 men per 100 women. The projections are further based on a series of demographic parameters, mainly describing mortality and birth rates for the period of 2010-2060. These parameters are borrowed from the latest population projections by the Union Nations Population Division (World Population Prospects, the 2010 revision). In addition, we have also incorporated constant international migration levels for the next decades. The demographic parameters used for our projections are listed in the box below.

Demographic parameters used for population projection.

- Baseline population: 2010 *de jure* population estimated from the 2011 census figures (age and sex distribution by five-year age groups).
- Mortality*: life expectancy at birth will increase regularly for both men and women reaching 76.8 and 82.5 years respectively in 2060.
- Fertility*: fertility will increase slowly from its current level at 1.7 children per woman to 1.85 after 2020.
- Migration*: net international migration slowly decreases from an average of level -12,500 per year to -7,000 from 2020 onwards. Men constitute two thirds of net out-migrants.
- Sex ratio at birth: We use two different scenarios. In the first "Skewed SRB" scenario, birth masculinity remains at 116 for the entire period. In the second "normal SRB" scenario, the sex ratio at birth remains normal during the entire period of 1995-2060 (see text for detail).

*: *United Nations parameters* (United Nations Population Division, 2011).

[49] The *de jure* population is preferable in order to limit the artificial impact of the large-scale emigration on Armenia's population structures. Yet, the effect of past migration is already partly reflected in the census adult population figures.

We have used three different scenarios to depict the possible course of Armenia's population up to 2060. The most crucial parameter used for these simulations is the expected sex ratio at birth. We have envisaged two distinct SRB scenarios. According to the first scenario (*Normal SRB*), SRB levels have stayed constant at 105 male births per 100 female births and will remain so in the future. We use 105 as the standard SRB level corresponding to the situation prevailing in other West European countries. This normal SRB scenario presupposes that present age and sex structures are not distorted by past birth imbalances: we have therefore adjusted the 2010 sex distribution below 15 years to ensure a normal child sex ratio (104 boys per 100 girls). In addition, we are using 105 as the sex ratio at birth for projected births during the next decades. The second scenario (*Skewed SRB*) assumes that the skewed sex ratio at birth will remain at 116 during the next four decades in Armenia. This somewhat pessimistic hypothesis reflects the current situation, as almost no sizeable change in birth masculinity has been observed over the last 10 years.

These two SRB scenarios are somewhat extreme variants and the most likely course of demographic change in Armenia is likely to lie between these two simulations. We have also added a third scenario (*Skewed SRB without migration*) derived from the second scenario of persistent high SRB. In this simulation, we project Armenia's population without future out-migration–unlike for the first two scenarios in which the country loses population every year-, with a majority of men among them. This scenario mainly highlights the demographic implications of migration on sex ratio among adults.

5.2 Population structures in 2010–2060

The impact of birth masculinity on Armenia's demographic trends has been examined through the lens of various indicators: total population, annual number of births and specific effects on the sex ratio of young adults. Table 19 displays the overall demographic trends from 2010 to 2060. Results based on the third scenario are not shown in this table. Since fertility is currently below replacement level and is projected to rise only to 1.85 children per woman, the population of the country is assumed to decline in future, a trend that international migration out of Armenia is likely to exacerbate. This future decline is clearly reflected by the figures of our projections.

TABLE 19

Total and female populations according to two SRB scenarios, Armenia, 2020-2060

	Normal SRB			Skewed SRB			Gender gap
	Population	Women	Sex ratio	Population	Women	Sex ratio	
2010	3,000,095	1,573,966	90.6	3,000,095	1,561,118	92.2	-12848
2020	3,059,086	1,612,297	89.7	3,057,581	1,588,099	92.5	-24198
2030	3,035,670	1,607,579	88.8	3,022,576	1,569,497	92.6	-38082
2040	2,953,801	1,568,725	88.3	2,922,631	1,513,808	93.1	-54917
2050	2,848,264	1,514,401	88.1	2,795,095	1,441,069	94.0	-73332
2060	2,682,531	1,430,959	87.5	2,602,085	1,338,027	94.5	-92932

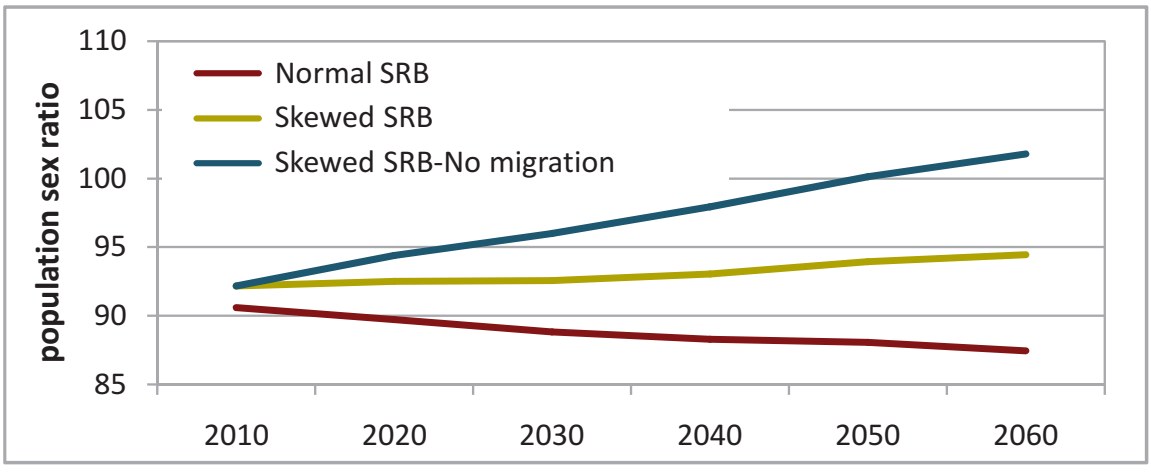
1. Gender gap: difference in the number of estimated female population between the Normal SRB scenario and the Skewed SRB scenario
2. See text for a description of the Normal and Skewed SRB scenarios and other projection parameters

Skewed SRB levels have only limited influence on demographic growth itself as both total population forecasts in 2060 are close to 2.6 million inhabitants. Yet, the lower proportion of girls caused by birth imbalances will reduce the future number of prospective mothers in the population. This, in turn, will cause a decline in the number of births approximately 25 years later. This reduction in the size of the birth cohort is in part a product of the marriage squeeze that will be examined further below. Thus, in 2060, the Skewed SRB hypothesis leads to a population total (2.60 million) with 80,000 less inhabitants than in the normal SRB scenario (2.68 million). This relative reduction of about 3% of the population total during the next 50 years is not considerable compared to the mere effect of the continuous emigration process assumed in our projections–with a cumulated number of net out-migrants close to 500,000 people for the period under study. Yet, this is a significant total as it corresponds to the annual number of births over two years.

The divergence between our different sets of population forecasts is more pronounced in relation to the sex distribution of the population and specific age groups. Figure 13 and Table 19 show the projected change in the overall sex ratio of the population and the distinct effect of birth masculinity in the future. Armenia's population is already feminine because of the departure of thousands of male migrants to foreign countries, with an overall sex ratio of 92 men per 100 women pointing to an 8% deficit of men in 2010. This trend would likely continue if the SRB were to remain at a normal level: international migration, the mortality advantage of women and the process of rapid population aging would combine to reduce the sex ratio of the *de jure* population from 92 men per 100 women today to 87 per 100 in 2060.

FIGURE 13

Population sex ratio according to three demographic scenarios, Armenia, 2010-2060



On the contrary, the Skewed sex ratio hypothesis corresponds to a reduction in the numerical predominance of women in the population. It will lead to an inversion of this downward trend of the sex ratio, with the population sex ratio rising up to 95 at the end of our projection period.

The gender gap (or the number of missing women) can also be computed by comparing the size of the female population according to our two distinct SRB scenarios (Table 19). It corresponds to the cumulative sum of missing female births since the late 1990s. This gender gap will continuously rise over the next decades and will come close to 100,000 women by 2060. This figure represents 6.5% of the projected female population in Armenia and this proportion would remain very high up to the end of the century even if the sex ratio at birth at birth were to finally decline after 2060.

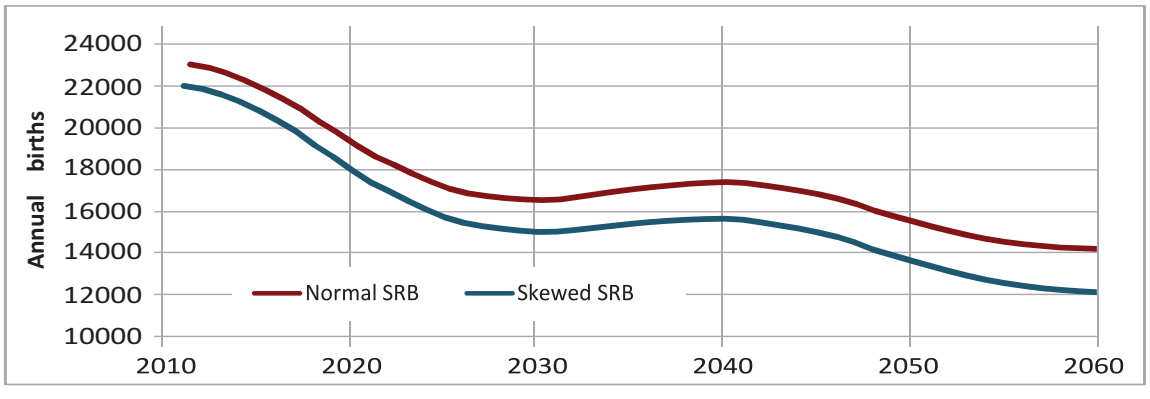
Note that the skewed sex ratio levels will not entirely cancel out the effect of population aging and out-migration on the predominantly female sex distribution. But, without any migration, the process of demographic masculinization as a result of skewed sex ratios at birth would be even more pronounced. This is what Figure 13 shows, where we also added the overall sex ratio estimated according to our third scenario (Skewed SRB without migration). Indeed, current male migrations tend to mitigate the effect of biased SRB levels. In the absence of migration, the population sex ratio would rise faster in Armenia under the cumulative impact of excess male births. The population would become predominantly masculine by 2050 –a rather uncommon demographic phenomenon since populations tend to be more feminine owing to women's mortality advantage.

These population numbers are based on projections beginning in 2010. But, we may examine more closely the gender gap among births starting from the 1990s. Since birth masculinity significantly rose in Armenia during the 1990s, we can compare the observed distribution of births since this period with the theoretical distribution based on a constant SRB level of 105. During the 1990s, there was an average deficit of 1,100 female births per year. But, the sex ratios at birth rose to levels close to 120 male births per 100 female births at the beginning of the 21st century and remain very high today. This corresponds to an estimated deficit of 1,800 female births per year from 2000 to 2010. The age and sex tables from the 2011 census provide us with a more precise estimate of the female deficit: the sex ratio of the census population aged less than 15 years in 2011—the population born since 1996— is of 115 boys per 100 girls instead of 104 as recorded elsewhere in Europe. Male children outnumber female children by almost 39,000. If Armenia's population below 15 years of age was distributed among boys and girls as in other European populations, the difference in numbers between boys and girls would only be 11,000. This anomaly is a clear testimony of the impact of the sex imbalances during the previous fifteen years.

Figure 14 extends this analysis to the future birth imbalances for the period 2010-2060. In this figure, we have plotted the annual number of female births according to the two different SRB scenarios. The third scenario is ignored here, as it leads to significantly larger birth cohorts.

FIGURE 14

Annual number of female births according to two SRB scenarios, Armenia, 2010-2060



As expected, the number of female births with a skewed level of birth masculinity will be significantly lower than if the SRB were to remain at a normal level. This gap would be of about 1,200 female births per year during the first decade after 2010.[50] But, as the figures from our simulation show in

[50] This figure is computed from the population distribution estimated for 2010. Therefore, it is not directly comparable with the figure of female births derived from the civil registration data for the previous decade.

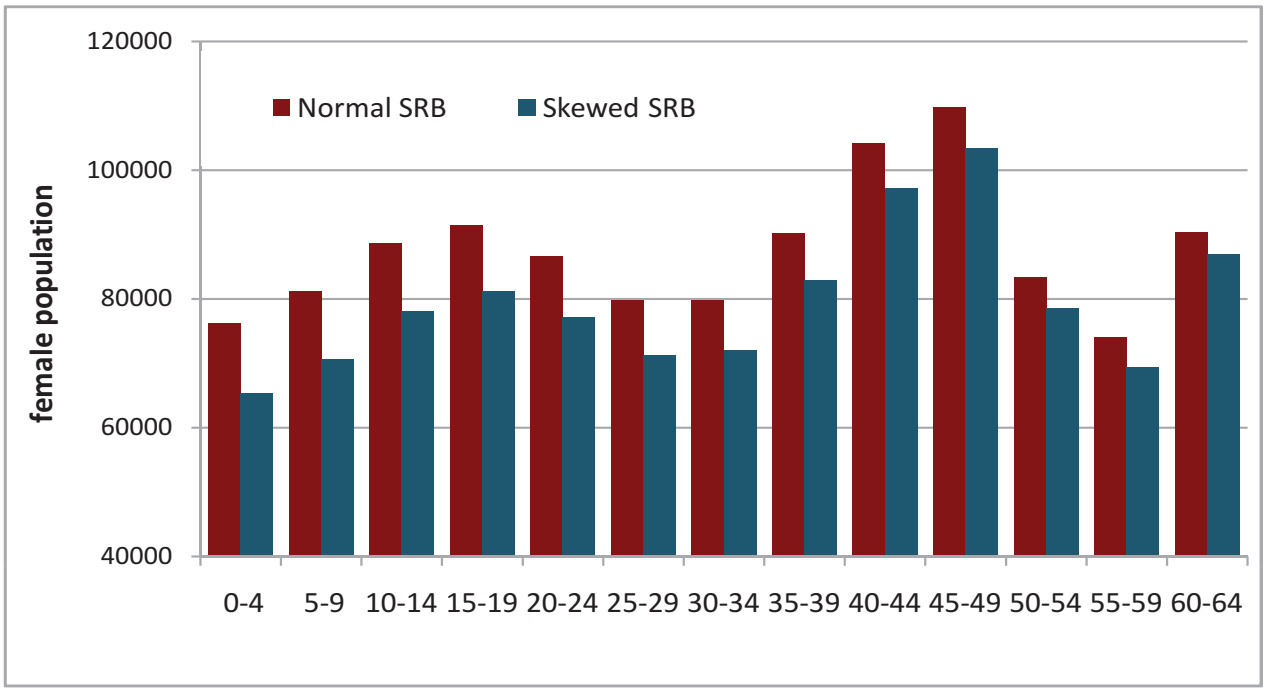
Figure 14, the gap will gradually increase during the next periods owing to the cumulative effects of birth imbalances and the changing sex composition of the population. It will reach 2,000 female births per year after 2050.

5.3 Impact on age and sex structures

This section examines the impact of adverse sex ratio at birth on specific age groups, starting with the age pyramid in 2060. Figure 15 provides an overview of the consequences of distorted birth masculinity levels by plotting the projected female population of Armenia in 2060 according to our two SRB scenarios. The difference between these two series stems from our hypothesis on the birth masculinity level since 1995 since all other demographic parameters are similar.

FIGURE 15

Age distribution of the projected female population in 2060 according to two SRB scenarios, Armenia



As seen in the figure, the gap between the two age distributions after 60 years of prenatal sex selection is glaring and affects all age groups. Among the oldest generations aged 50 years and up, the number of missing women in 2060 is lower and amounts to less than 5,000 women by five-year age group. The impact has been stronger on the younger generations because of the cumulative influence of smaller birth cohorts caused by the decreasing number of people of child-bearing age. The gap between the two age distributions increases among younger adults and reaches 10,000 missing women per five-year age group among the projected female population aged less than 20 years.

We can also focus on specific age groups. High birth masculinity affects the sex composition of the child population and then the school population. Boys will predominate over girls during the decade that follows sex imbalances at birth. However, skewed sex ratios among children and teenagers are

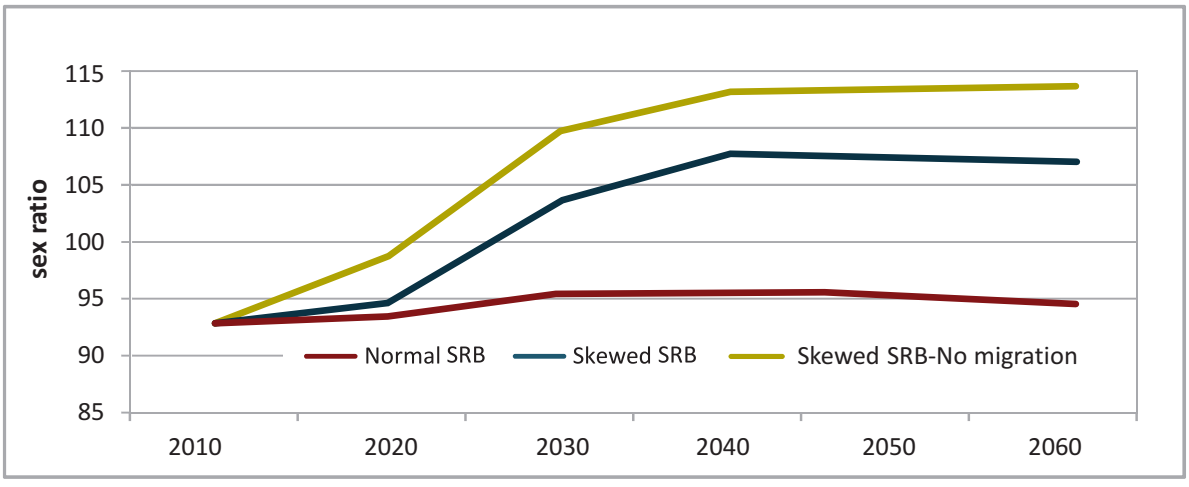
of little known consequence. The sex imbalance will make itself felt among older age groups later and it will spread as a wave along the age pyramid over the next 50 years as Figure 15 shows.

Regarding adults, we will now concentrate on the younger segments aged 20 to 39 years.[51] This population of young adults has not yet been affected by the increase in the proportion of male births since the corresponding population born since the 1990s is aged less than 20 years. But, the change will be remarkable in the near future as Figure 16 demonstrates.

The figure depicts the trajectories of the sex ratio among the 20-39 year-old age group up to 2060. Both scenarios start from an identical sex ratio close to 95. There should be more, rather than less, men among young adults, but international migration by males over the previous decades have reduced their share in this broad age group. However, the sex ratios of this population will soon diverge according to the various scenarios used here.

FIGURE 16

Sex ratio of adults aged 20-39 years according to three demographic scenarios, Armenia, 2010-2060



Under the normal SRB scenario, we see only minor changes in the sex ratio of young adults: a slight decrease of the sex ratio to 97 after fifty years under the continuous impact of migration following our hypotheses. On the contrary, the persistence of sex imbalances at birth in the other scenario (Skewed SRB) will cause a regular increase in the sex ratio among young adults. After 30 years, the sex ratio will reach a plateau of 108 in 2040.

As elsewhere in this section, we have incorporated male outmigration in the projections. Without migration, the sex ratio among young adults would in fact increase to levels closer to 115 as the third curve in Figure 16 demonstrates. In the absence of migration, high SRB levels cause the young adult population to become more masculine every year until the sex ratio reaches almost the same level as the sex ratio at birth.

Figure 17 shows the numerical gaps among young adults in Armenia according to these different demographic scenarios in more detail. This figure exhibits the gaps between male and female populations aged 20-39 years in the future, highlighting a potential excess or deficit in the number of young men. In blue, we see the continuous increase of the male adult population under the effect of a skewed sex ratio at birth: while in a minority at the beginning of our projection period, young men will ultimately exceed women by about 25,000 from 2040 onwards. As our results shown the chart

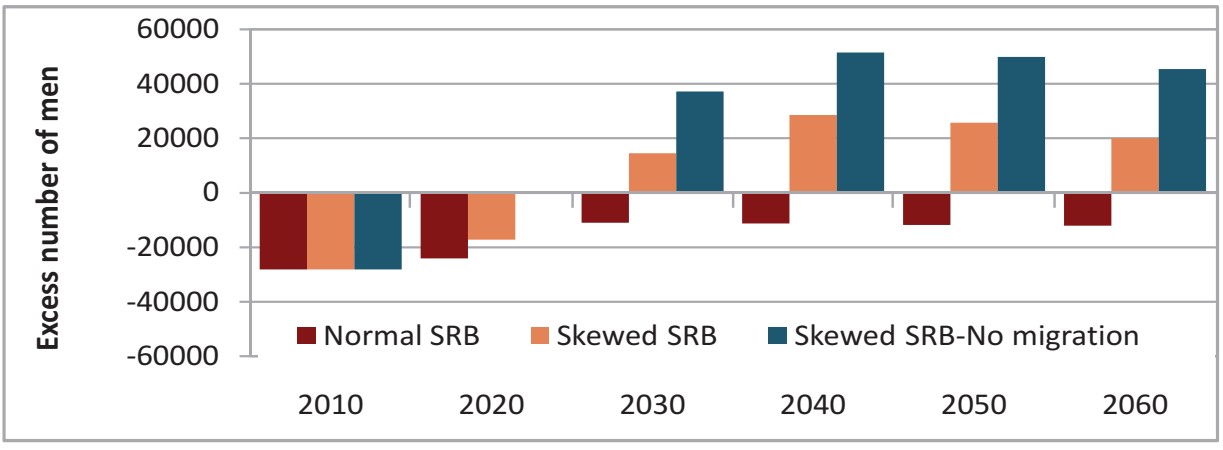
[51] Older adults and the elderly population will be affected only later in the century.

indicate, the gender gap would be even twice as large if we posit an end to male out-migrations as in our third scenario (Skewed SRB without migration).

On the contrary, normal SRB level combined with migration would lead to a continuous deficit of 10,000 men from 2030 onwards. Current trends in SRB will clearly determine the balance of the sexes in this age group over the next decades, with a looming male surplus among young adults caused by the emergence of prenatal sex selection during the 1990s.

FIGURE 17

Gender gap among the population aged 20-39 years according to three demographic scenarios, Armenia, 2010-2060



This age segment of 20-39 years of age has been singled out as it represents key phases in the transition towards adulthood and in family-building: end of schooling, first job, military service, marriage, foundation of a new household, spatial and labor mobility, child-bearing, etc. The exact repercussions of skewed sex ratios are still poorly known, as countries like China or India–where birth masculinity started to increase earlier than in Armenia–are only starting to experience the full brunt of past sex imbalances at birth. What has been described in these countries is a severe competition among men to enter into marriage as their surplus situation has forced many of them to delay this step in life. We also know that an increasing share of these Asian men will have to renounce marriage and that most of those who cannot marry will belong to the underprivileged sections of society, such as the poorest and the least educated. The consequences of the shortage of women of marriageable age on sex work and women's trafficking are real and they have been reported from a number of regional settings in Asia where birth imbalances have been observed for more than two decades.

Armenia stands apart for two reasons: its small population size and the importance of migration in its population dynamics. Our different scenarios have pointed to a relative male deficit (in case of continued migration) or relative male excess if the SRB remains biased. For these reasons, the experience of countries such as China and India are not directly applicable to Armenia since international migrations in these giant countries are unlikely to cancel out the effect of sex imbalances at birth. Yet, the figures shown above clearly point to an inversion in the sex composition of the adult population, in spite of migration trends incorporated into our projections. In addition to lowering the number of future births, one more obvious consequence of the imbalances among adults will be on the marriage market in which the male surplus may have significant consequences.

Today, men in Armenia marry, on average, at 28.5 years of age, while women marry, on average, four years earlier. It is to be expected that men will have to delay marriage in the future because of the

shrinking number of women of corresponding age. This may also be cause for further out-migration and encourage marriage to foreign women. For the remaining men unable to marry, in part because of their lack of social or economic resources, their prospects of family-building may dim in view of the unfavorable sex imbalances.

What a long-term adverse SRB level and the ensuing mounting proportion of men among adults would exactly entail for the traditional Armenian family system remains unclear. Forced singlehood would no doubt lead to major changes in marriage arrangements and in the process of family formation in the country. The consequences on the labor force, apart from an increased incitement to migration, are also uncertain, as this situation has no exact equivalent in recent history. But, what is obvious is that the current active avoidance of female births is not only testimony to the strength of gender discrimination in the country, but it also heralds a deep and lasting change in the demographic structures of Armenian societies for the next decades.

CONCLUSIONS AND RECOMMENDATIONS

Over the last twenty years, research on countries with high sex ratio at birth has demonstrated the primary role of prenatal sex selection in this phenomenon, but it is only recently that attention has started to focus on Eastern Europe. The demographic situation in the South Caucasus is especially disturbing, as the gender gap among births has been growing since the 1990s. In Armenia, the sex ratio at birth has risen since independence and it is estimated at 114 male births per 100 female births in 2011. This corresponds to one of the highest levels of birth masculinity observed anywhere in the world, surpassed only by China (118) and Azerbaijan (116). The three preconditions of prenatal sex selection are met in Armenia: the patriarchal structures of Armenian society that tend to favor boys over girls, easy access to prenatal technology which, combined with abortion, allows couples to avoid unwanted female births and the pressure of low fertility levels on the reproductive strategies of the couples. Yet, in spite of all these traces of active prenatal sex discrimination, knowledge and awareness of sex imbalances at birth have remained nonexistent in Armenia as in many European countries. Unsurprisingly, these issues do not feature in the political agenda of any concerned country. For instance, the demographic policy document which accompanied the recently ratified Decree N27 on the "Strategy of the Demographic Policy of the Republic of Armenia" of 2009 holds no mention of sex imbalances at birth as a distinct feature of gender discrimination. But recently, there has been a rapid evolution in terms of awareness and commitment due to several recent events.

In September 2011, the Parliamentary Assembly of the Council of Europe (PACE) issued a report on the prevalence of prenatal sex selection in Europe, both among Diaspora populations and in two clusters of countries in Southeastern Europe and the South Caucasus (Stump 2011). The report, based on fragmentary statistical sources, underscores the presence of sex selection, a trend ignored for almost two decades in Europe in spite of the publicity generated by similar sex imbalances in South and East Asia. In particular, the report calls for increasing investment in preliminary demographic and qualitative research and it urges national authorities to step up their efforts to ensure gender equity and non-discrimination.[52] Two months after the report was issued, a seminar held in Paris brought together a range of demographers and anthropologists currently working on these issues along with Doris Stump, the author of the PACE report, and Kiran Bhatia, the UNFPA gender specialist at the forefront of the mobilization against prenatal sex selection. Simultaneously, a pioneer survey on sex selection was conducted in Armenia in 2011 and its findings were widely circulated. Later in August 2012, a special panel was organized by the UNFPA during a population conference held in Bangkok, during which scholars working in Europe were able to present their findings and methods with Chinese and Indian scholars working on prenatal sex selection. In 2012, studies have been initiated on the specific situation of various European countries following the PACE report in collaboration with local statistical offices. This report on Armenia is a distinct illustration of these new efforts.

In a year's time, the situation has visibly and rapidly changed in several ways. Researchers are increasingly sharing results and methodologies in order to overcome the specific challenges in studying birth masculinity in Europe. In several countries, they have been able to work in collaboration

[52] The Gender Assessment of Armenia prepared by the USAID had also earlier mentioned sex-selective abortions in its list of recommendations (USAID 2010).

with national statistical agencies, a cooperation which is indispensable in view of the unusual nature of the issue of skewed sex ratios at birth. The PACE report has also signified a call to arms for many governments after a long period of inaction due to lack of both scientific evidence and public interest. To the writer of this report, this is nothing but a complete reversal of a situation long characterized by indifference and inaction. It is also the first and indispensable step towards more effective policy responses to the many of the challenges posed by prenatal sex selection. For more than a decade, ignorance and indifference towards sex imbalances at birth plagued all efforts in countries like China and India to consider the problem and to address its current and long-term implications. As a result, for more than two decades birth cohorts were allowed to be skewed towards boys, and demographic surpluses of several million men are now looming in these countries, with poorly known consequences on family systems and concerned societies. In other cases, countries such as South Korea or, more recently, Viet Nam have reacted much faster to the threat of systematic gender discrimination and future demographic imbalances.

In Armenia, the results of the first study conducted by a consortium of organizations in 2011 (UNFPA Yerevan 2012) have been widely circulated in the local media and beyond. These efforts have now given publicity to the issue of sex selection. Various representatives of civil society have begun to publicly reflect on the nature of sex discrimination in the country.[53] The results presented in this report aim to nurture this debate by presenting an almost exhaustive review of available statistical evidence on sex imbalances at birth. In particular, we have used the exhaustive records of the 2001 census and the database of 386,000 individual births from 2001-2010 to explore the extent and contours of son preference and sex imbalances at birth in Armenia.

The report first describes the intensity of son preference, expressed in stated opinions on the ideal family composition and reproductive behavior, as fertility often seems dictated by gender considerations and even mortality differentials. Specifically, it shows that higher order births were determined by the absence of a son in the family, leading parents to have additional children in order to ensure a male birth. Several regional and social correlates of higher son preference have been highlighted in the in-depth analysis of the census data. Our analysis then focuses on prenatal sex selection, the ultimate effect of gender preference on family strategy. There was a rapid rise in sex ratio at birth during the 1990s. Birth masculinity has only modestly declined to 114-115 male births per 100 female births since then. In view of the spread of the sex selection technology across the country and the extremely low birth rates during the last decade, birth masculinity has probably stabilized. A downturn in birth masculinity may even be possible in the future. This would correspond to a sustained decline in the SRB level caused by a decrease in the intensity of son preference in Armenia.

The study also details several individual and household characteristics that appear closely related to higher or lower than average levels of birth masculinity. Family composition is the first factor affecting the sex of the births in Armenia and the sex ratio of third births has, for instance, reached a record level of 173 from 2001-2010, with no recorded equivalent of similarly high SRB in other countries. It is with irony that, during my visit to Yerevan in June 2012, I learnt of the plan to increase the allowance to families for third and fourth births to 3,600 USD, since it is at this parity that sex selection is the most intense in Armenia. In other words, this allowance would primarily reward male births born to parents who had only girls before. Other factors associated with higher sex ratio at birth include the regional patterning of high birth masculinity in Central Armenia and the role played by socioeconomic status, education, family type or characteristics of the household head. The report also documents the demographic consequences of high sex ratio at birth in the future since today's

[53] See also the document on Armenia recently prepared by Rahm (2012).

babies will be tomorrow's workers and spouses. Massive male out-migration may be the only factor likely to alleviate the sex imbalance among adults and the looming marriage squeeze as young men will soon outnumber women of the corresponding age. Nevertheless, the departure of thousands of young men out of the country is not the most desirable demographic scenario for Armenia.

Our findings could not be systematically corroborated by corresponding qualitative evidence due to a lack of field surveys and other research on related topics such as abortion, supply of sex selection, gender preferences and contemporary family constraints. These aspects require additional research to bolster future advocacy activities and to design policy responses appropriate in the Armenian context. In fact, several intermediary steps are necessary before exploring potential policy instruments needed to address sex imbalances at birth: legal regulations on sex selection and other discriminatory practices, campaigns to both raise awareness and change biased gender attitudes, mobilization of the medical community and direct support extended to families with girls. There is a need to recognize that beneath the policy debates on the possible responses to sex selection lie cultural forces which are symptoms of ingrained gender inequity and legislation is not going to eradicate these symptoms overnight.

Based on the work conducted in the preparation of this report and on meetings held in Yerevan, I would therefore like to offer recommendations adapted to the specific phase of mobilization appropriate for Armenia.

Recommendations:

The list of recommendations starts with the efforts necessary to strengthen our knowledge base on the social and demographic determinants and mechanisms of prenatal sex selection:

1. Continue the regular monitoring of the SRB trends in the country based on the vital registration system.
2. Support in-depth statistical analysis of the original 2011 census records (replication of the present 2001 census analysis).
3. Conduct in-depth demographic analysis of sex differentials in infant mortality based on survey data (DHS) as well as exhaustive mortality data collected by the civil registration system.
4. Encourage qualitative surveys of son preference and family settings, as well as its links with the pension system, the labor market, migrations and inheritance practices.
5. Support analyses of existing studies on family, kinship and gender systems in Armenia based on existing literature in Armenian, Russian and other languages.

The recommendations also concern the supply side of sex selection and involve health practitioners and the medical community.

6. Investigate the market of sex selective technology, including the supply of the newest pre-implantation technologies.
7. Survey the use of misoprostol and similar medical drugs in sex selective abortions and explore the need to make it a drug available only on prescription.
8. Consult health practitioners to develop guidelines on sex selection and develop an ethical code of good practices to address the misuse of technology.
9. Investigate the institutional capacity of health authorities to register sex selection equipment and regulate its access.

The issue of sex selection also requires the active institutional engagement with various stakeholders, including at the regional level and the urgency to initiate a larger policy dialogue.

10. Strengthen institutional capacity in collecting and analyzing data on son preference and prenatal sex selection.
11. Encourage wider regional cooperation on research and policy intervention across countries in Eastern Europe which have been similarly affected by sex selection since the 1990s.
12. Initiate the policy dialogue with all concerned ministry departments and involve NGOs in the process.
13. Integrate sex selection as a distinct gender component in national population policies.

The last component refers to the need to raise consciousness in future media campaigns.

14. Share the results of statistical and qualitative studies on son preference and sex imbalances at birth widely through the media.
15. Contemplate the future contents of public awareness campaigns. Their main objectives should be to fill in the knowledge gap on the intensity of sex selection and its consequences, and to challenge the gender bias underlying son preference.
16. Target campaigns specifically towards couples, youth and the medical community.
17. Involve public figures (politicians, religious leaders, entertainers, etc.) in media events.

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GLOSSARY

Abortifacient drug	substance inducing abortion
Birth masculinity	preponderance of male births among all births
Child Sex Ratio	sex ratio computed over child populations (rather than over births)
Demographic masculinization	gradual increase in the proportion of males in a population
Excess Female Mortality	higher than expected female mortality (compared to male mortality)
Fertility behavior	fertility choices and strategies by couples
Gender bias	differences in attitudes and behaviors related to gender preference
Gender discrimination	attitudes and behaviors biased towards a specific gender
Gender gap	gap between men and women caused by gender bias (here used for gaps between male and female populations)
Gender inequity	social, economic and political inequality based on gender
Gender preference	preference expressed by parents towards children of a specific gender
Gender valuation system	determination of the social or economic value of individuals on the basis of their gender
Induced abortion	deliberate termination of pregnancy
Infanticide	deliberate killing of infants after birth
In-vitro fertilization (IVF)	fertilization of an egg performed outside the body
Logistic regression	regression performed on a binary dependent variable (such as sex)
Marriage squeeze	demographic imbalance between unmarried men and women at marriage age
Parity progression ratio	probability of having an additional child at various birth order

Pre-implantation genetic diagnosis (PGD)	procedures performed prior to implantation or fertilization to test for specific conditions, including sex of the embryo
Prenatal sex selection	deliberate avoidance of births of a particular sex before and during pregnancy
Replacement level	fertility level of 2.1 children per woman corresponding to population stabilization
Sex Imbalance	demographic gap between men and women
Sex ratio at birth (SRB)	number of male births per 100 female births
Sex ratio by birth order	sex ratio of births classified by birth order (parity)
Sex selective abortion	abortion determined on the basis of the sex of the fetus
Skewed sex ratio at birth	SRB level significantly different from biological levels
Socioeconomic quintile	division of households into five socioeconomic categories classified by increasing socioeconomic status (SES)
Son preference	see Gender preference
Sperm sorting	technique to choose the type of sperm cell used for egg fertilization
Vital registration	registration of demographic events (births, deaths marriages)