Masculinization of Old Age in South Asia

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Abstract

This paper shows that the universal female survival advantage evades all countries in South Asia, except Sri Lanka. Consequently, contrary to the global trend, afflicted countries in the region exhibit more elderly men than elderly women in their populations. While substantial academic evidence attempts to explain the persistence and geographical distribution of a female deficit (i.e. missing women) in younger age categories (e.g. before/at birth, during childhood), an examination of this phenomenon in old age (i.e. 60+ population) is deficient. This paper attempts to fill this gap by first developing a theoretical model, within the life course framework, that explains the persistence of the (elderly) missing women phenomenon, and subsequently applying the model to South Asian countries by using data from the United Nations (with the inclusion and exclusion of immigrants) and the world as a reference standard. The results allow for the classification of the elderly missing women phenomenon as a life course effect (e.g. India), a cohort effect (e.g. Iran) or a combination of the two (e.g. Pakistan) and the subsequent discussion addresses the possible causes, consequences and remedial measure behind the phenomenon.

Keywords: Missing women, ageing, sex ratio, life course effect, cohort effect

Introduction

The female survival advantage, as measured by higher female *vis-a-vis* male life expectancy persists across all countries worldwide (Barford *et al.* 2006). The higher life expectancy of women would suggest that the number of women exceeds the number of men (Hazzard and Bowden 1990). Population estimates from the United Nations Department of Economic and Social Affairs (UNDESA 2017) provide evidence of this fact. Using these estimates, Table 1 calculates sex ratios (male/female) for the world and different regions therein to show that regardless of the level of development, the number of women exceeds the number of men in the 60+ population in all regions of the world and this excess of women becomes more pronounced as the population ages (i.e. from 60+ to 80+).

Table 1: Sex ratios (male/female) for world regions in 2015

Region/country	60+	80+
World	0.86	0.63
More developed regions	0.77	0.55
Less developed regions	0.90	0.71
Least developed regions	0.88	0.81

Source: United Nations Department of Economic and Social Affairs (2017), own calculations.

The ratios in Table 1 translate into women accounting for 54% of the world population aged 60+ and 61% of the population aged 80+ in 2015 (UNDESAa 2015). By 2050, the comparative estimates are projected to be 53% and 58% (UNDESAa 2015) respectively with the lower percentages resulting from male gains in life expectancy in developed countries (UNDESAa 2015). Nevertheless, the female advantage at older ages till 2050 is substantial enough for some authors to dub it as the feminization of later age at the global level (e.g. Davidson DiGiacomo and McGrath 2011), both in developed countries (e.g. Peace *et al.* 2007) and in developing countries (e.g. UN-INSTRAW 1999).

However, this seemingly universal phenomenon appears to evade some countries, i.e. in some countries the number of elderly men exceeds the number of elderly women despite the female advantage in life expectancy, creating a contradiction between life expectancy and female preponderance in old age. Using the same data from UNDESA (2017), Table 2 explores this contradiction for South Asian countries.

Table 2: Sex ratios (male/female) and life expectancy (female-male)
for South Asian countries in 2015

Region/country	L.E. gap	S.R. 60+	S.R. 80+
World	4.56	0.86	0.63
Asia	3.84	0.95	0.70
South Asia	2.85	0.97	0.86
Afghanistan	2.47	0.92	0.77
Bangladesh	3.13	1.02	0.93
Bhutan	0.27	1.21	1.11
India	2.85	0.95	0.82
Iran	2.24	1.04	1.10
Maldives	2.06	1.07	1.35
Nepal	3.04	0.88	0.75
Pakistan	1.85	1.04	1.10
Sri Lanka	6.79	0.80	0.67

Source: United Nations Department of Economic and Social Affairs (2017), own calculations.

Table 2 illustrates the gender gap in life expectancy (female – male) and the sex ratio (male/female) in the 60+ and 80+ age categories for South Asian countries. With the exception of Sri Lanka, it is immediately evident that despite the female advantage in life expectancy in all countries, the preponderance of women observed in Table 1 is either non-existent or less noticeable. In Bhutan, Iran, Maldives and Pakistan, it is clear that the pattern is reversed for both elderly categories: Not only is there a preponderance of men in the elderly population but also this preponderance increases as the population ages (i.e. from 60+ to 80+). In Bangladesh, the number of elderly men exceeds the number of elderly women in the 60+ category, with the trend reversing in the 80+ category while still remaining well above the world average. In Afghanistan, India and Nepal (to a lesser extent) this general trend of a reduction in the share of men with the ageing of the population is evident, however, the proportion of women in the elderly population is far below the world or less developed country average. This contradiction between the gender gap in life expectancy and female deficit in old age (i.e. elderly missing women) entreats an explanation.

Over two decades ago Amartya Sen (1990; 1992) introduced the term Missing Women to refer to the number of women who should be alive at a given point of observation but are not. He estimated that, in the 1990's, over a 100 million women were missing in parts of Asia and Africa (Sen 1990). Since then several authors have attempted to refine the methodology used to calculate the number of missing women (e.g. Coale 1991; Klasen 1994), update the number of missing women (e.g. Klasen and Wink 2003, Bongaarts and Guilmoto 2015), identify the causes (e.g. Park and Cho 1995, Das Gupta and Shuzhuo 1999) and consequences (e.g. Hudson and Den Boer 2005, Ebenstein and Sharygin 2009) of missing women, outline future policy implications that might overcome the problem of missing women (e.g. Chung and Das Gupta 2007) and even calculate the expected number of missing women in the future (e.g. Attané 2006). However, the majority of studies that attempt to explain the phenomenon do so at the time of birth and early childhood with a few recent studies addressing the phenomenon in adulthood. These studies concentrate on Asia (e.g. Guilmoto 2009) and Africa (Bongaarts and Guilmoto 2015) at a broader regional level or emphasize specific countries in East and Southeast Asia (e.g. China; Zhu *et al.* 2009) and India (e.g. Das Gupta and Mari Bhat 1997). There are only four papers to date that address the existence of the phenomenon in the elderly (60+) population. The first paper, Anderson and Ray (2010) restricts its analysis of the missing women phenomenon by age group to three regions: China India and Sub-Saharan Africa while the second paper, Anderson and Ray (2012), addresses the age distribution of the female deficit across the different states in India. The third paper, Bongaarts and Guilmoto (2015), shows the persistence of missing women in the elderly population at the global level. The final paper, Ezdi and Künemund (2019) shows that the brunt of the missing women phenomenon is moving from younger to older age categories in the Middle Eastern countries of Asia and East and Southeast Asia, and is more heavily concentrated in the former rather than latter set of countries.

In light of Sen's writings, subsequent literature and the relatively recent demographic transformation of South Asian countries (Veron *et al*. 2008), the deficit of women in old age (as presented in table 2) should come as no surprise as it is continuous and contingent upon a lifetime of cumulative disadvantages and would be (and to some extent has already been) revealed by a comparative analysis of younger and middle aged men and women (Gibson 1996). Furthermore, the disadvantaged position of elderly women in society is well established. For example, Bennett and Zaidi (2016) show that in low income countries women face vulnerabilities across multiple life domains (e.g. education, family care obligations) that accumulate into severe disadvantages in old age and result in women spending a greater proportion of their increased longevity in poorer health. Davidson, DiGiacomo and McGrath (2011) argue that despite the increased longevity of women, their challenging socio-economic position exposes them to several vulnerabilities in old age – poverty, widowhood, financial instability – that generally translate into poor health outcomes for women and can be ameliorated by addressing the needs of women in a time appropriate manner.

The discussion to this point makes it evident that while literature documents the persistence of a missing and elderly missing women in specific countries across Asia and exposes female vulnerability in old age, it largely fails to address the elderly missing women phenomenon in countries across South Asia (with the possible exception of India). This paper attempts to fill this gap in literature by first providing a theoretical foundation for the persistence of the (elderly) missing women phenomenon and then using data from the United Nations Department of Social and Economic Affairs (UNDESA 2017) to depict the practical applicability of this theoretical framework. It is organized as follows: Section 2 provides the theoretical foundation;

Section 3 discusses the data and methodology; Section 4 depicts the results; Section 5 provides an analysis and discussion of the results; Section 6 concludes.

Theoretical foundation

The missing women phenomenon is based on three theoretical premises: First, being female generates inequalities at each life stage that either lead to premature mortality at that life stage or cumulate into a higher mortality risk for women at subsequent life stages (Ferraro and Shippee 2009). Second, the inequalities (and cumulative disadvantage) faced by women may differ by birth cohort (Ryder 1965) or by cohort and/or period effects (Mayer 2004). Third, the inequalities/cumulative disadvantage faced by women and birth cohorts may vary at the cross-national level (Settersten and Mayer 1997; Mayer 2004). Figure 1 depicts how these premises amalgamate within the life-course framework to precipitate the (elderly) missing women phenomenon at each life stage and in the population as a whole (Ezdi 2017).

The analysis starts at the micro level, i.e. the level of the individual. The individual life course can be divided into five distinct stages (before/at birth, childhood, young adulthood, adulthood and old age) and these stages are tied together by the principle of life course effects (Komp and Johansson 2016; Ezdi 2017). The principle of life course effect implies that what happens to individuals at an earlier point in life affects them at a later point in life (Komp and Johansson 2016). At the macro level, the individual life course is embedded in and governed by the social context (Elder Jr. 1994). The social context entails a geographical and temporal element so that individuals and birth cohorts born at different times and places in different life stages and locations may be exposed to different varieties of disadvantages (Ryder 1965; Mayer 2004). The social context at the macro level differentiates the life courses of men and women by conceptualizing factors and intermediary forces in the individual life courses of women. Factors are causal determinants of female mortality that either lead to missing women at the given life stage or create a female survival disadvantage at a subsequent life stage that precipitates premature mortality. Factors are assumed to be the result of predominantly social and behavioural differences in the treatment of men and women in society. Intermediary forces are elements that influence the effect of factors across the life course (e.g. education, income, social change) and thereby serve to exacerbate or depress the effect of the factors on the (elderly) missing women phenomenon (Ezdi 2017). Figure 2 provides an overview of potential factors at each life stage and their possible interaction with intermediary forces, with a consequent impact on the (elderly) missing women phenomenon.
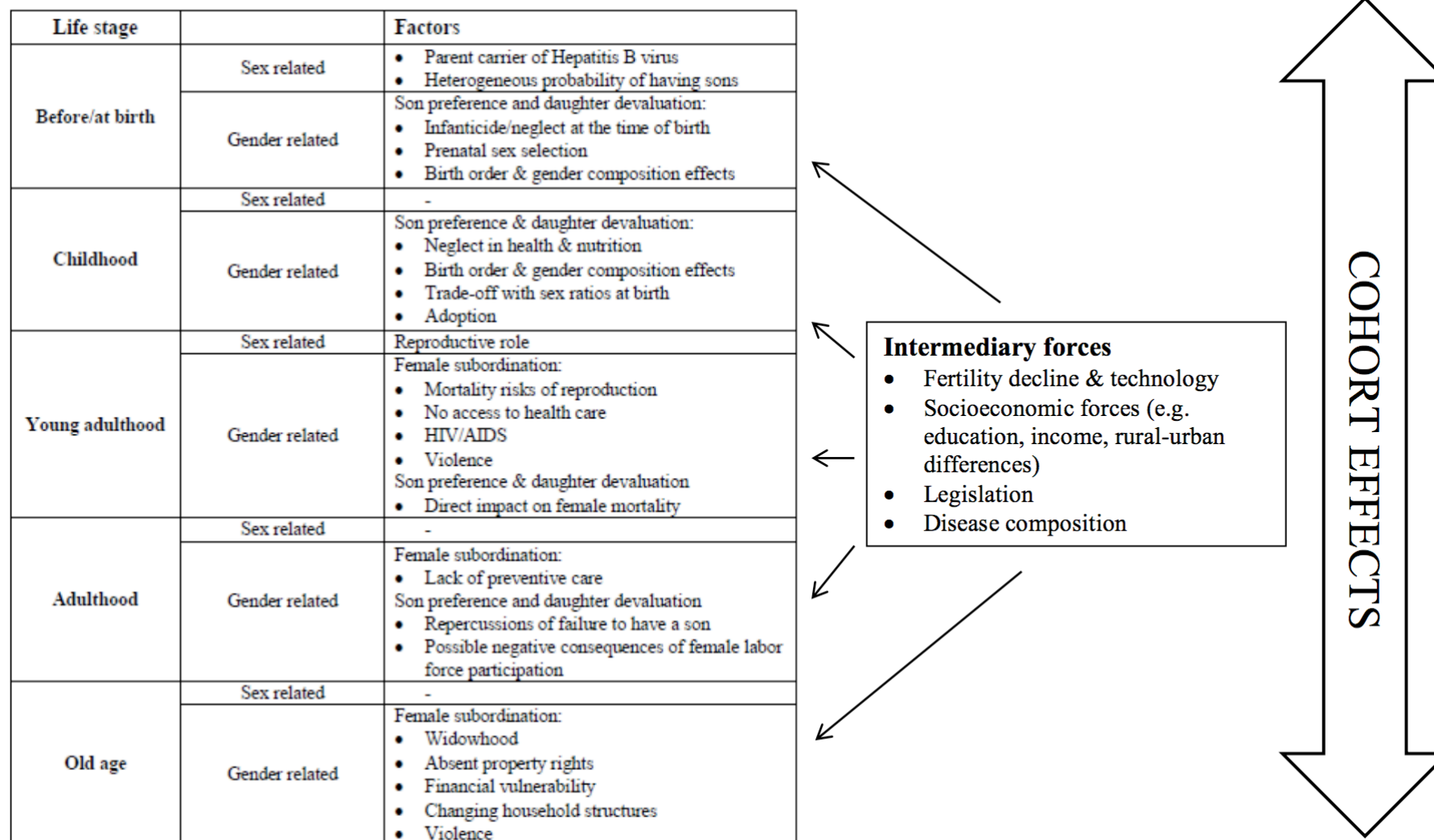
As shown in Figure 1, the cumulative impact of factors and intermediary forces has the potential to lead to premature mortality of the female birth cohort at each life stage so that by the time this birth cohort reaches the elderly life stage a significant fraction of the female cohort has eroded thereby creating a female deficit in the elderly population (Dannefer 2003; Ferraro and Shippee 2009). This deficit may be aggregated at each life stage by birth cohort to present the missing women phenomenon at that life stage (Coleman 1986). The elderly life stage presents the culmination of the female deficit for a given birth cohort (Coleman 1986). The summation of the missing women phenomenon across all life stages would then present the missing women phenomenon in the total population (Ezdi 2017). Since, the individual life course is a function of the society/country in which an individual belongs (i.e. social context) and is not indelible across time or geography (Mayer 2004) the factors and intermediary forces that affect individuals and, in their aggregate, the birth cohort at each life stage may vary across countries (Ezdi 2017). As a result, the cumulative disadvantage that

Figure 1: The Elderly Missing Women Phenomenon within the life-course framework
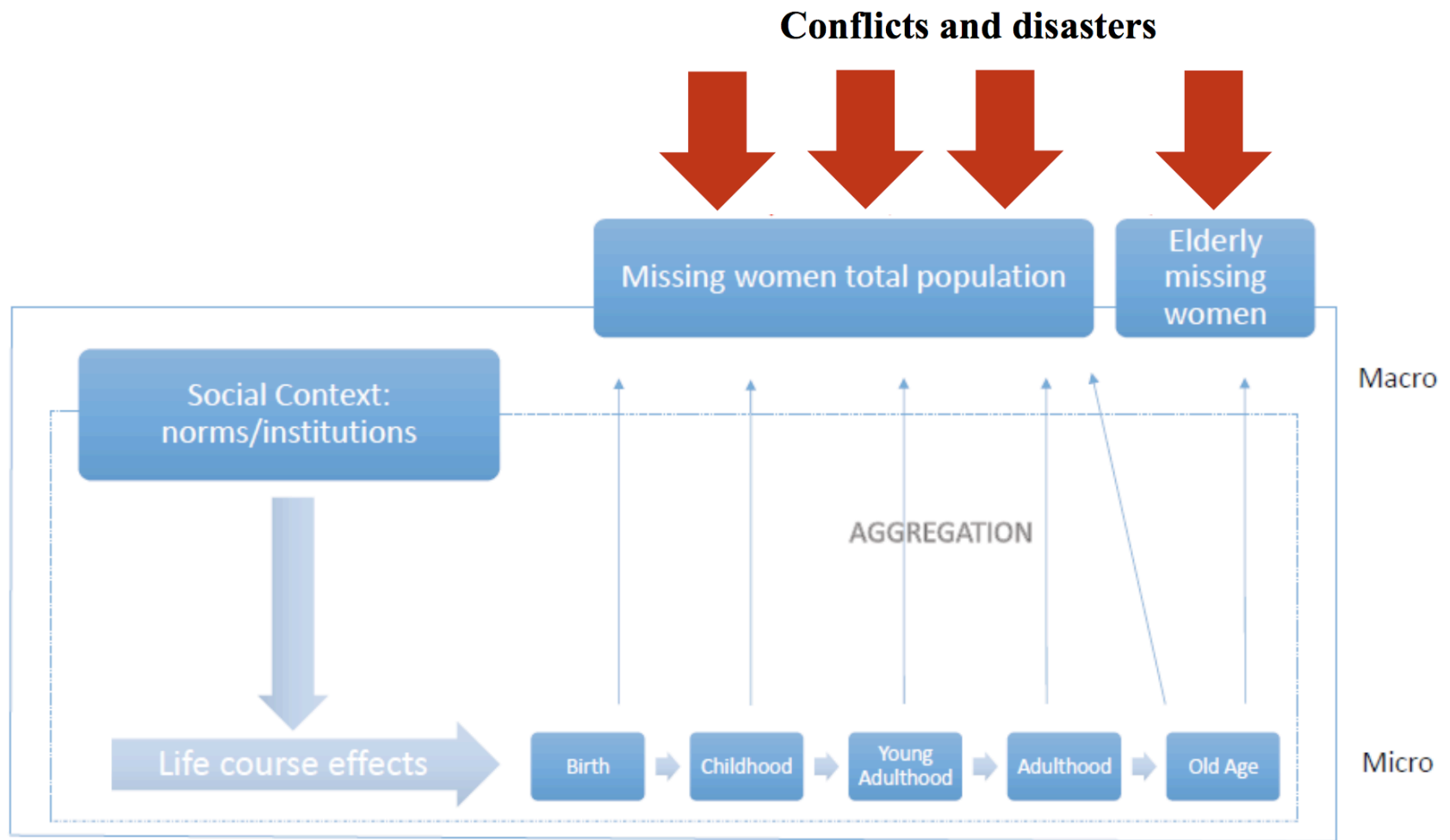
Own systematization.

Figure 2: Factors and intermediary forces responsible for missing women by life stage

Life stage		Factors
Before/at birth	Sex related	• Parent carrier of Hepatitis B virus • Heterogeneous probability of having sons
	Gender related	Son preference and daughter devaluation: • Infanticide/neglect at the time of birth • Prenatal sex selection • Birth order & gender composition effects
Childhood	Sex related	-
	Gender related	Son preference & daughter devaluation: • Neglect in health & nutrition • Birth order & gender composition effects • Trade-off with sex ratios at birth • Adoption
Young adulthood	Sex related	Reproductive role
	Gender related	Female subordination: • Mortality risks of reproduction • No access to health care • HIV/AIDS • Violence Son preference & daughter devaluation • Direct impact on female mortality
Adulthood	Sex related	-
	Gender related	Female subordination: • Lack of preventive care Son preference and daughter devaluation • Repercussions of failure to have a son • Possible negative consequences of female labor force participation
Old age	Sex related	-
	Gender related	Female subordination: • Widowhood • Absent property rights • Financial vulnerability • Changing household structures • Violence

Intermediary forces
- Fertility decline & technology
- Socioeconomic forces (e.g. education, income, rural-urban differences)
- Legislation
- Disease composition

COHORT EFFECTS

Own systematization.

accrues to each birth cohort at each life stage, the resulting cumulative disadvantage in old age and the consequent impact on female deficit in old age may also vary across countries (O'Rand 1996).

Independent of this endogenous mechanism, exogenous shocks in the form of conflicts and natural disasters (Figure 1) may create or exacerbate the missing women phenomenon at each life stage or in the total population (Ezdi 2017). Cross-national studies provide evidence that in the case of civil conflicts, women and children are the most common long term victims (morbidity and mortality) and in all types of conflicts long-term female mortality is at least as high as male mortality (Ghobarah Huth and Russett 2003; Li and Wen 2005). Empirical evidence also suggests that civil wars decrease the gender gap in life expectancy (Plümper and Neumayer 2006). Similarly, with the exception of famines, natural disasters reduce the gender gap in life expectancy (Neumayer and Plümper 2007). Hence, conflicts and natural disasters are seen as discrete historical events that, by creating a system upheaval, may channel lives into a new direction by possibly altering patterns of continuity and creating change for specific groups of the population and therefore affect existing configurations of social inequalities (Neugartan and Datan 1973; Mayer *et al.* 2006).

The theoretical foundation of the (elderly) missing women phenomenon makes two things evident. First, the (elderly) missing women phenomenon is the result of two groups of potential effects: factors across the life course and intermediary forces, and/or cohort effects in the form of conflicts and natural disasters. Second, the reason behind the (elderly) missing women phenomenon in different countries varies as factors, intermediary forces and conflicts and natural disasters are distinct at the cross national level. Hence, the female deficit in old age displayed by the countries across South Asia may not only have distinct causative mechanisms but also have accumulated across different stages of the life course.

Data and method

Data

Data from the United Nations Department of Economic and Social Affairs (UNDESA 2017) for the year 2015 is used for two types of analyses: First, to estimate the existence and magnitude of the elderly missing women phenomenon in the total, 60+, 75+ population across countries in South Asia, with the inclusion and exclusion of immigrants. Second, to analyse the sex ratio (male/female) trajectory (by five-year age groups) of countries across South Asia that exhibit an (elderly) missing women phenomenon from the first exercise. These analyses are intended to complement each other, with the objective being to not only identify the existence of the deficit but also confirm their life course or cohort effect interpretation and the likelihood of their persistence in future generations of the elderly population of affected countries.

The UNDESA follows a four step procedure to construct its yearly population estimates. First, it collects data from census surveys, vital and population registers and other national surveys. Second, it corrects the accuracy of the statistics collected by using post enumeration surveys and demographic adjustment techniques. Areas that require specific attention are under enumeration and age heaping for children under five and mortality rate adjustment of older populations (e.g. above age 85). Using these adjusted figures, the UNDESA uses projection equations for its yearly population estimates. Third, it checks whether the estimates are consistent with each other and with the statistics corrected in the second step. This is achieved by using a balancing

equation that ensures that fertility, mortality and migration estimates balance each other out and population estimates between population surveys correspond to original estimates from surveys. Finally, since the UNDESA is producing estimates for countries all over the world, it crosschecks the consistency and balances the population estimates at the regional and world levels (UNDESAb 2015).

The population estimates and projections of the United Nations are based on the de facto population in a given country (UNDESAb 2015). According to the OECD (2006), the de facto population can be defined as "a concept under which individuals (or vital events) are recorded (or are attributed) to the geographical area where they are present (or occurred) at a specified time." Therefore, estimates of net migration (immigrants – emigrants) need to be subtracted from the population estimates to obtain an accurate demographic profile of the nationals of any given country. Such an exercise would require flow data by gender and age on South Asian countries. Although flow estimates for the population as a whole may be available for some South Asian countries [1], they are estimates for the population as a whole and not disaggregated by gender and age and therefore cannot be used for the purposes of this paper (i.e. for the calculation of sex ratios by age). The best alternative, especially for South Asian countries, is the gender and age distribution of the international migrant stock provided by the UNDESA (Fargues 2006; Cainkar 2013). The United Nations defines the international migrant stock as "the number of people born in a country other than that in which they live, including refugees" (UNESCO, 2010). Therefore, the UNDESA data on migrant stock is used to analyse sex ratios with the exclusion of immigrants.

Methodology

The primary methodological consideration in calculating the number of missing women in any age group is the identification of the hypothetical number of women that should be alive in the given age group in the absence of missing women. This requires the identification of an ideal sex ratio (male/female) that would prevail in the absence of missing women. In this paper the ideal sex ratio (male/female) is assumed to be the sex ratio prevailing at the world level i.e. the sex ratios in the total population, 60+ and 75+ populations, and in each five-year age category for each country must be less than or equal to the respective world sex ratio. Any sex ratio higher than the world sex ratio would indicate a female deficit and hence the presence of missing women in the respective population of the given country.

Using the world sex ratio as the hypothetical standard does not overestimate the extent of the missing women phenomenon. Rather, it provides a conservative measure as not only are South Asian countries with their relatively large populations included in this world average but also are other countries like China and Middle Eastern countries of Asia (proven to have large female deficits in their total and elderly populations; Ezdi 2017; Ezdi and Künemund 2019), thereby masculinizing the world sex ratio and preventing an overestimation of the missing women phenomenon.

For the first analysis, sex ratios (male/female) of each South Asian country are subtracted from world sex ratios for the specific age category and the total population (the latter for comparative purposes, discussed in detail in the results section). A

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[1] Abel and Sander (2014) convert migrant stock data provided by the United Nations Population Division into flow data thereby providing flow estimates for 196 countries in the world. The United Nations Population Division provides flow estimates for 43 countries worldwide most of which are in Europe and North America. However, the data provided by Abel and Sander (2014) is not disaggregated by age or gender and therefore cannot be used for the purpose of this paper.

negative number indicates an elderly missing women phenomenon in the given age category and country (as the ratio of men/women of that country is higher than the ratio of men/women for the world) and a zero or positive number indicates no elderly missing women phenomenon in the given age group and country, compared to the world average. This analysis is conducted including and excluding the immigrant stock for each country, as it will become evident in the subsequent discussion, age and gender specific immigration patterns in some countries may distort the findings.

In the second analysis, the sex ratio trajectory by five-year age groups for countries identified as presenting an elderly missing women phenomenon in the first analysis is examined with respect to the world sex ratio (male/female) trajectory by five-year age groups, and the differences with the inclusion and exclusion of immigrant stock are evaluated. As mentioned earlier, the purpose of the second analysis is an assessment of the age distribution of missing women to check the age at which the female deficit is concentrated and confirm whether or not the deficit in the elderly population is large enough to create a female deficit in the total population.

Results

Sex ratios (male/female) by broad age categories

Figure 3 presents the results for the sex ratios (male/female) for the total, 60+ and 75+ populations in South Asian countries as deviations from the world average. Columns below the mean indicate a female deficit in the respective age category for a given country.

**Figure 3: Sex ratios (male/female) for South Asia in 2015
as deviations from the world average, including immigrants**
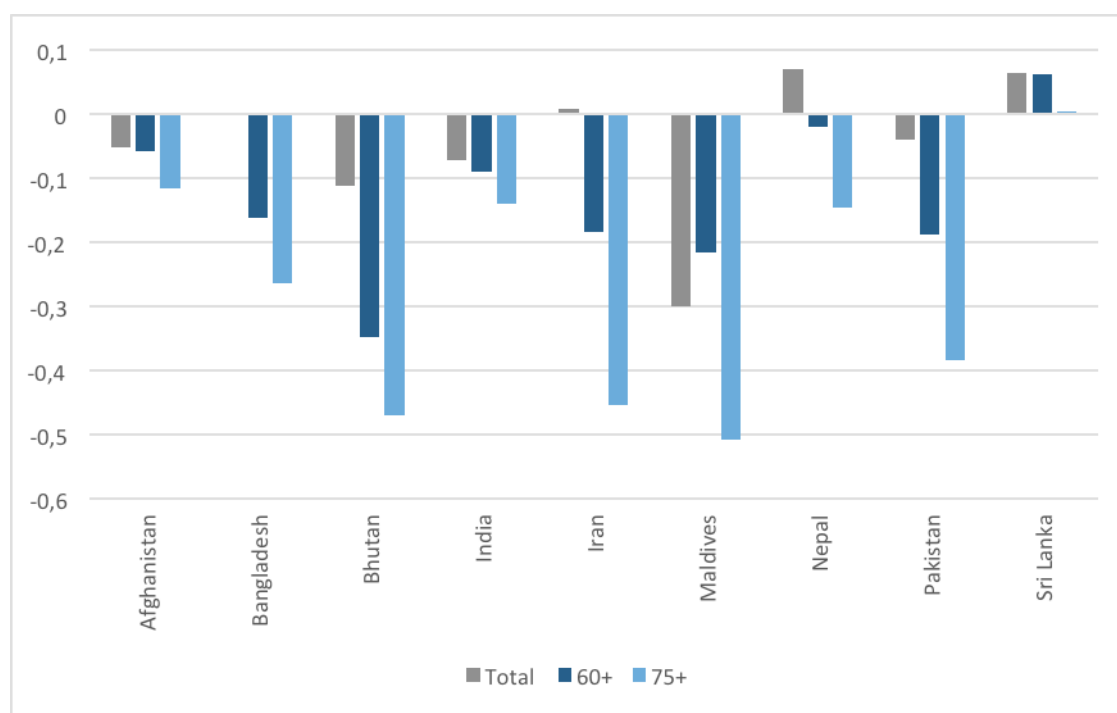
Source: United Nations Department of Economic and Social Affairs (2017), own calculations.

Figure 3 shows that, with the exception of Sri Lanka, all countries in South Asia exhibit an elderly missing women phenomenon due to a female deficit in both their 60+ and

75+ age categories. The most dramatic deviations from the world average, seem to exist in Bhutan for the 60+ population and in Maldives, Bhutan and Pakistan for the 75+ population. At a first glance Sri Lanka appears to be an outlier in the opposite direction for the 60+ population, perhaps indicating higher male mortality in the past. However, this may also reflect the standard of comparison, the world average, which includes all countries. If the standard of comparison were the industrialized countries of Western Europe perhaps even Sri Lanka would display a female deficit in the 60+ population.

A comparison of the female deficit for the selected countries by age groups with the result for total population may provide hints on a cohort effect, i.e. if the female deficit appears only in older age categories and not in the total population then the population formulating the respective elderly (60+) age category today may have suffered from conflicts or natural disasters in younger age groups that led to the creation or precipitation of this female deficit. This appears to be the case for Iran and Nepal as deficits in the elderly population (60+ and 75+) are accompanied by a surplus in the total population (albeit small in the case of Iran). This finding is reinforced by the observation that the difference between the female surplus in the total population and female deficits in the elderly population, in both countries, is substantial enough to consider that an exogenous force may have at least precipitated the predominance of the missing women phenomenon in the elderly category.

For the six remaining countries that display the elderly missing women phenomenon, i.e. Afghanistan, Bangladesh, Bhutan, India, Pakistan and Maldives, the female deficit in old age is accompanied by a female deficit in the total population. For the first five countries, the female deficit in the elderly population (60+, 75+) exceeds the female deficit in the total population. This could indicate the increased vulnerability of women in old age either due to an exacerbation of gender inequalities in old age or the accumulation of a life time of female disadvantages. It could also indicate a trend over time. Maldives is the only country where the female deficit in the total population exceeds the female deficit in the 60+ population. However, as the population ages, i.e. from 60+ to 75+, the female deficit in the elderly population exceeds that of the total population. This may be indicative of male dominated immigration in Maldives (UNESCAPS, 2010). Sex ratios may become less masculinized in the 60+ population as labour immigrants leave the country upon the end of their working years and more masculinized in the 75+ population as the gender inequalities faced by the local population in old age surface.

To control for the potential distortion caused by immigration (even if it is expected to significantly alter sex ratios in Maldives only), Figure 4 recalculates the preceding estimates by excluding immigrants in South Asian countries. The revised estimates show essentially the same patterns as with the inclusion of immigrants for Afghanistan, Bhutan, India, Iran, Nepal, Pakistan and Sri Lanka. However, the elderly missing women phenomenon in Bangladesh now appears to be a cohort effect. This change indicates a slight masculinization of immigration in Bangladesh as the female deficit in the total population with the inclusion of immigrants is imperceptible (Figure 3) and the female surplus with the exclusion of immigrants is relatively small (Figure 4). The exclusion of immigrants also alters the results for Maldives. Not only is there a substantial reduction in the female deficit in the total population but also the elderly missing women phenomenon in the country is now concentrated in the 75+ population only, and continues to follow a life-course explanation. This may point to the presence of a female surplus as a cohort effect in the young old of the country (aged 60-75 years). Without historical cohort specific data, the existence of age specific discrimination of old women cannot be completely ruled out (as would be the result,

just to provide a drastic example, of the ritual burning of widows). Therefore, the hypothesis of female discrimination occurring in the past and accumulating into older age groups today is much more plausible.

**Figure 4: Sex ratios (male/female) for South Asia in 2015
as deviations from the world average, excluding immigrants**
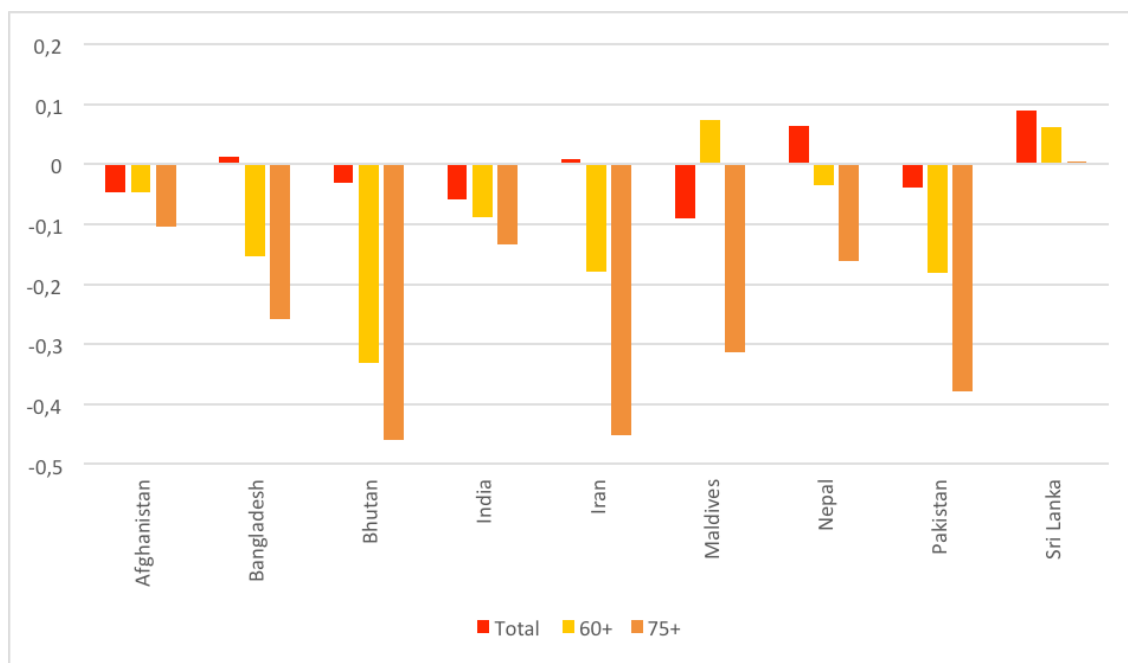
Source: United Nations Department of Economic and Social Affairs (2017), own calculations.

Sex ratio trajectory by five-year age groups

To verify these previous findings, Figures 5 to 12 trace the sex ratio (male/female) trajectories by 5-year age groups for countries in South Asia that exhibited a female deficit. The figures include the trajectory with the inclusion and exclusion of immigrants, and the world sex ratio trajectory for comparative purposes.

Figures 5, 6, 7 and 8 show that the sex ratio trajectories with the inclusion and exclusion of immigrants for Afghanistan, India, Iran and Pakistan are not only identical but also overlap. This shows that either there is no immigration in these countries or that immigration is not distorted in favour of either gender. The age distribution of a female deficit in India clearly reveals the persistence of a female deficit in each 5-year age category, starting from birth and continuing into old age. This points to the persistence of a female survival disadvantage across the life course, thereby supporting the previous results. In Afghanistan and Pakistan, the female deficit appears after a specific age category (20+ in Afghanistan and 45+ in the latter two countries) and, on average, continuously worsens in each subsequent age category. This allows for both a life-course explanation and cohort effect explanation for the female deficit, especially for Pakistan where this effect is more pronounced. On the one hand the 20+ population in Afghanistan and the 45+ population in Pakistan may have been exposed to specific events (conflicts and/or natural disasters) that led to excess female mortality in these countries. On the other hand, the female survival disadvantage may be most pronounced at the aggregate level within these age categories and continuously accumulate well into old age. A joint explanation is also likely. As discussed in section hereafter, conflicts and natural disasters have been shown to exacerbate existing gender inequalities and worsen the life expectancy and

survival advantage/disadvantage of women especially in the long run Plümper and Neumayer 2006; Neumayer and Plümper 2007). Given the different possibilities for the elderly missing phenomenon, the results for Afghanistan and Pakistan concord with those previously found. The sex ratio trajectory of Iran is highly erratic, displaying female deficits in some age categories and female surpluses in other age categories. However, the magnitude of the deficit in the elderly categories *vis-à-vis* the surplus and deficits in other younger age categories would support a cohort effect interpretation of the country, thereby supporting the previous results. At the same time, Figure 8 portends that selected younger age categories (e.g. ages 40-54) in the country that display a female deficit in 2015 will create an elderly missing women phenomenon in the future as they enter the elderly (60+) category.

Figure 5: Afghanistan, sex ratio (male/female) trajectory by 5-year age groups, 2015
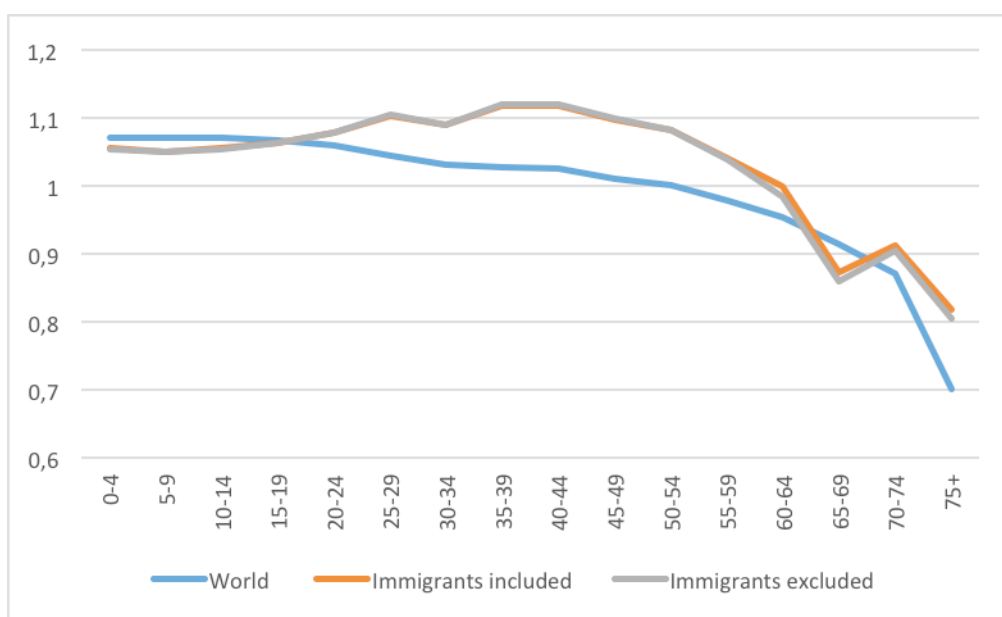
Source: United Nations Department of Economic and Social Affairs (2017), own calculations.

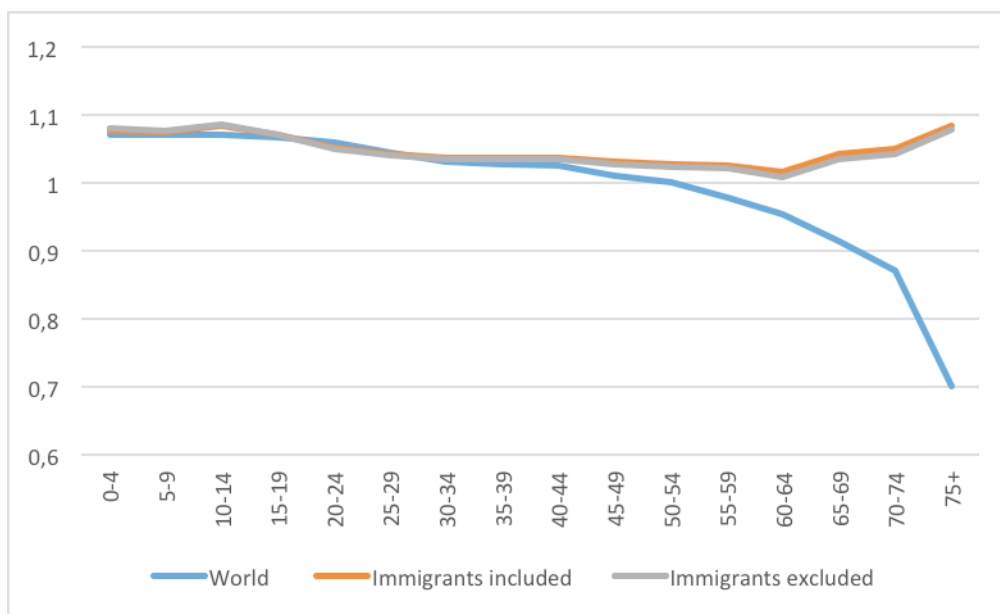**Figure 6: India, sex ratio (male/female) trajectory by 5 year age category, 2015**
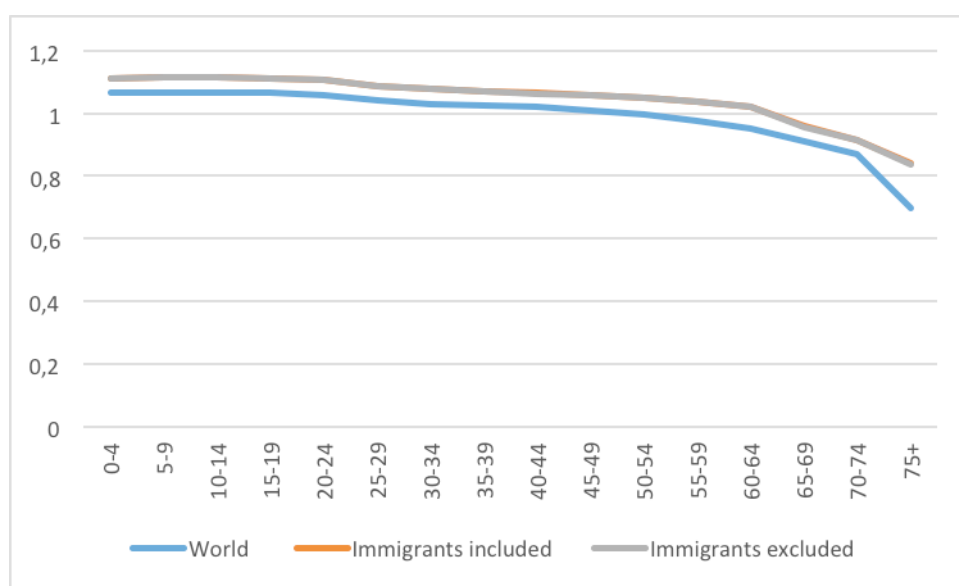
Source: United Nations Department of Economic and Social Affairs (2017), own calculations.

Figure 7: Iran, sex ratio (male/female) trajectory by 5 year age category, 2015
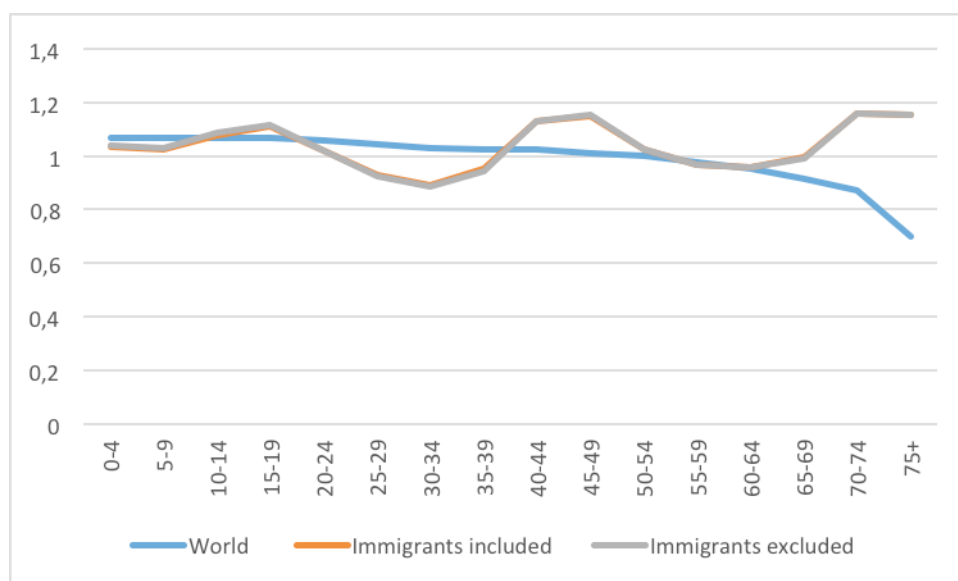
Source: United Nations Department of Economic and Social Affairs (2017), own calculations

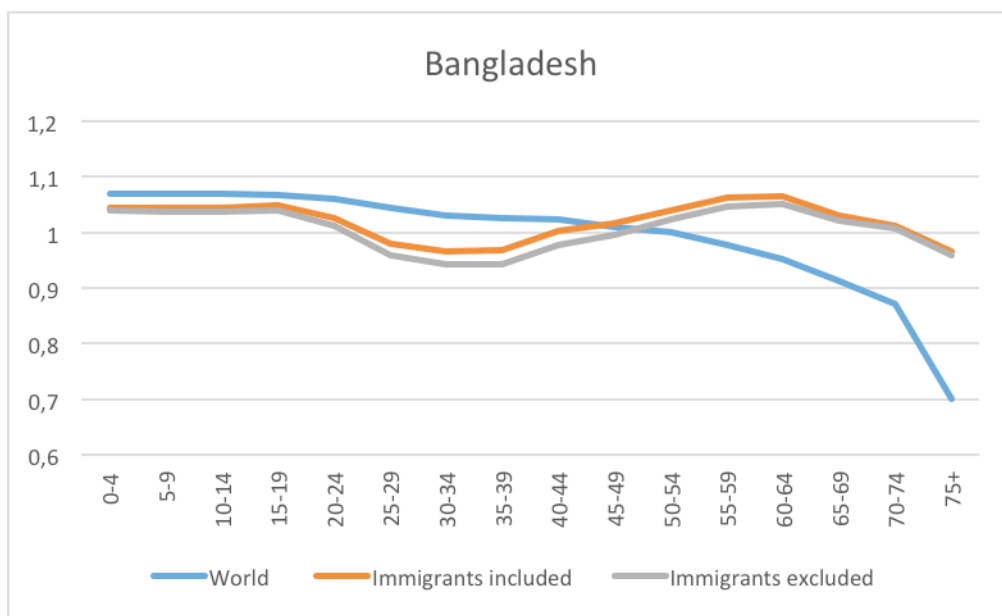**Figure 8: Pakistan, sex ratio (male/female) trajectory by 5 year age category, 2015**

Source: United Nations Department of Economic and Social Affairs (2017), own calculations

Figures 9, 10, 11 and 12 show that the sex ratio trajectories of Bangladesh, Bhutan, Maldives and Nepal with the inclusion and exclusion of immigrants are identical but do not overlap. In both Bangladesh and Bhutan, the exclusion of immigrants leads to an overall reduction in the female deficit. In both countries the bulk of the reduction is concentrated in the working age categories. Consequently, the female deficit is concentrated in the 45+ population for Bangladesh and 30+ population for Bhutan. This situation of these two countries is therefore similar to Afghanistan and Pakistan in allowing for a life-course explanation, cohort effect explanation or joint explanation for the female deficit and therefore accords with the previous findings. In Maldives, the exclusion of immigrants also leads to an overall reduction in the female deficit and converts the female deficit in the 40-74 age category into a female surplus.

Consequently, the female deficit is concentrated in the 15-39 and 75+ age categories. The results from Figure 4 show that the female deficit in these two age categories is large enough to offset the surplus in the remaining age categories. Therefore, in discordance with the previous results and immigrants included sex ratio trajectory, the immigrants excluded sex ratio trajectory yields a cohort effect interpretation for the elderly missing women phenomenon in Maldives. Figure 11 further shows that, similar to Iran, an elderly missing women phenomenon may be expected to re-appear in the future as the population aged 15-39 in 2015 enters the elderly category. In Nepal, Figures 13 shows a trend of slightly feminized immigration. In Nepal, with the inclusion of immigrants the female deficit appears in the elderly category only, thereby supporting the previous results. With the exclusion of immigrants, alongside the female deficit in the elderly population there is a negligible female deficit in the 50-59 age category. Given the magnitude of the deficits and surplus, the cohort effect interpretation, in accordance with the previous results continues to hold with the expectation that, similar to the situation in Iran and Maldives, the country will continue to exhibit an elderly missing women phenomenon in the near future due to the female deficit observed in the 50-59 population.

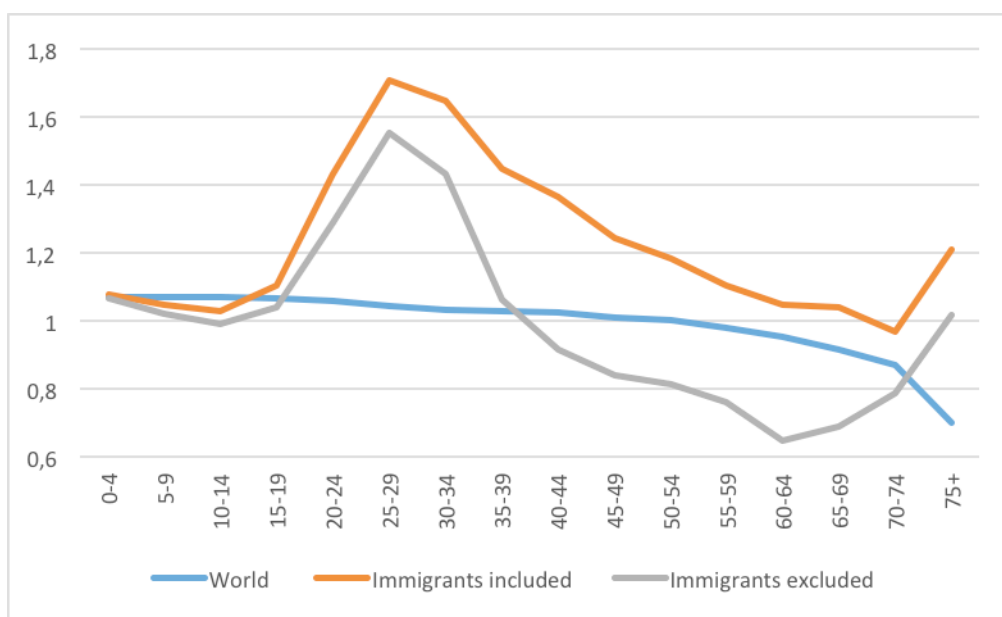**Figure 9: Bangladesh, sex ratio (male/female) trajectory by 5-year age groups, 2015**

Source: United Nations Department of Economic and Social Affairs (2017), own calculations.

**Figure 10: Bhutan, sex ratio (male/female) trajectory by 5-year age category, 2015**
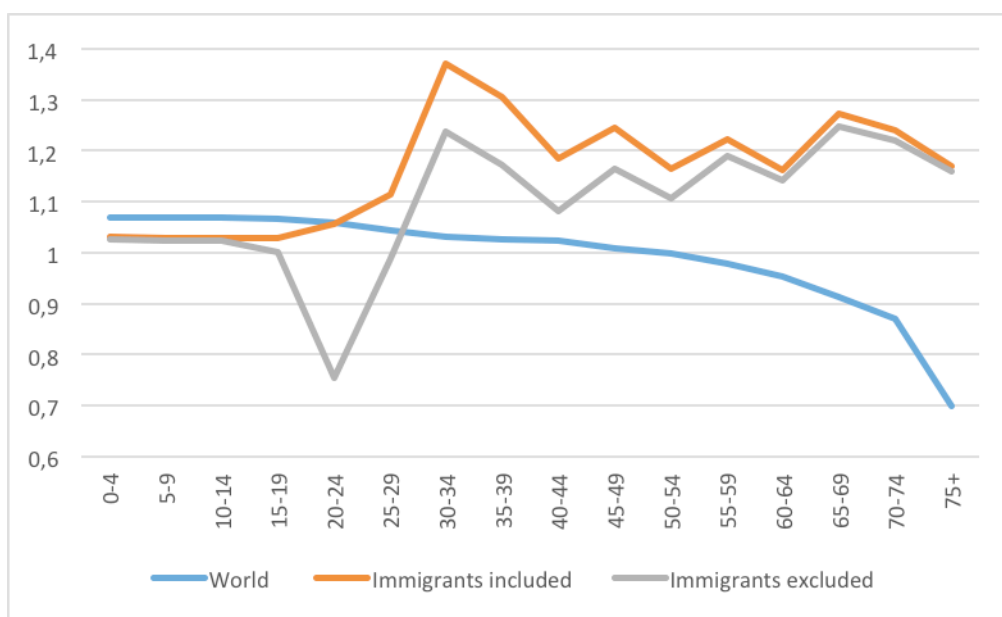
Source: United Nations Department of Economic and Social Affairs (2017), own calculations.

Figure 11: Maldives, sex ratio (male/female) trajectory by 5-year age category, 2015

Source: United Nations Department of Economic and Social Affairs (2017), own calculations.

Figure 12: Nepal, sex ratio (male/female) trajectory by 5 year age category, 2015
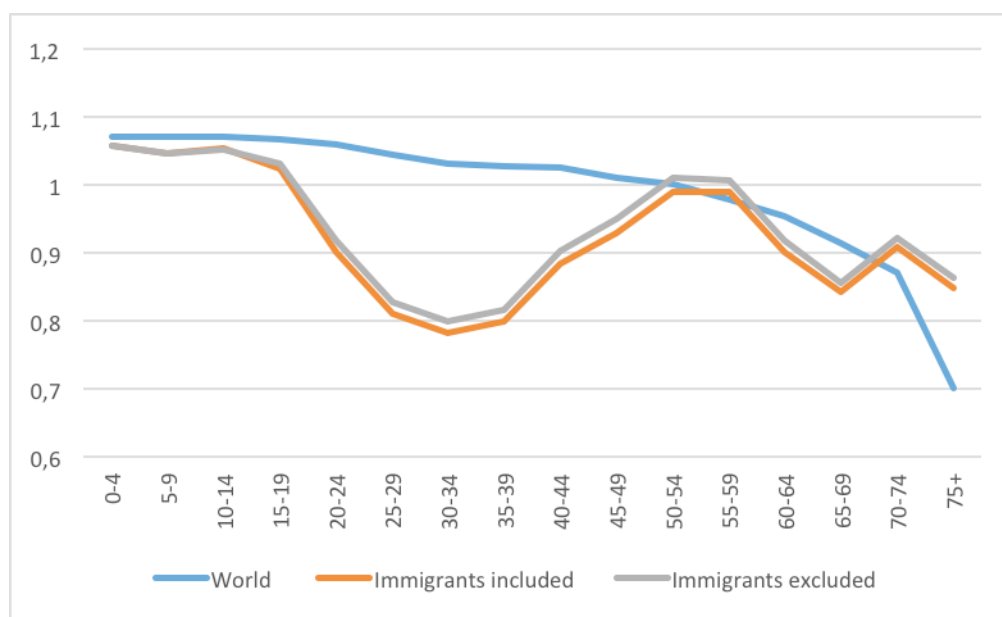
Source: United Nations Department of Economic and Social Affairs (2017), own calculations

Discussion

The results indicate the presence of an elderly missing women phenomenon, both with the inclusion and exclusion of immigrants, in all countries of South Asia except Sri Lanka. In India, the results allow for a clear life course explanation for the phenomenon as the deficit is persistent across all age categories. However, as the deficit does not worsen with age, a hypothesis of cumulative survival disadvantage cannot be confirmed from these results. In Nepal and Iran, the phenomenon can be explained as a cohort effect as it is not persistent across all ages and may fade as younger cohorts, that do not exhibit a female deficit in 2015, enter old age. Nevertheless, there is a potential for the re-emergence of the phenomenon in these countries as younger cohorts who display a female deficit enter the elderly category. In Afghanistan, Bangladesh, Bhutan and Pakistan, the phenomenon may be explained as a combination of life course and cohort effects so that conflicts and/or natural disasters may have exacerbated existing gender inequalities and precipitated the female survival disadvantage. The cumulative nature of this deficit with the ageing of the population lends further credence to this argument. Maldives is the only country for which immigration alters the main results. With the inclusion of immigrants, the elderly missing women phenomenon in both the 60+ and 75+ categories allow for a life course explanation. However, the exclusion of immigrants leads to the emergence of an elderly missing women phenomenon in the 75+ population as a likely cohort effect, albeit, followed by another cohort effect of elderly missing women in the future.

The results depicting the effect of immigration on the female deficit in affected South Asian countries are compatible with the literature on immigration trends in the region. The exclusion of immigrants leads to the feminization of the sex ratio trajectory in Maldives, Bhutan and Bangladesh with Maldives having had the strongest impact and Bangladesh having had a negligible impact. Both Maldives and Bhutan are labour receiving countries, with sex ratios of immigrant workers being highly skewed in favour of males: 92% of the registered immigrant workers in Maldives and 99% of the immigrant workers in Bhutan are male (UNESCAP 2010). Although Bangladesh is primarily a labour exporting country, Rohingya refugees from Myanmar and a limited

number of foreign workers form its relatively small immigrant population (UNESCAP 2010; Wickramasekara 2011). The feminization of the sex ratio trajectory upon the exclusion of immigrants may be due to the masculinization of foreign workers in the country. In Nepal the exclusion of immigrants leads to a feminization of sex ratios in the country. This is because amongst all South Asian countries (including Sri Lanka) Nepal has the most feminized immigrant population, with women accounting for more than half of the total immigrant stock in the country (UN 2017; Timothy and Sasikumar 2012).

In Afghanistan, Iran, Pakistan and India the sex ratio trajectories with the inclusion and exclusion of immigrants are identical. Migrant inflows in the latter three countries primarily consist of refugees and return refugees (UNESCAPS 2010). Return refugees to Afghanistan, Afghan refugees in Pakistan and Afghan and Iraqi refugees in Iran predominate the immigrant populations in the three countries respectively (Majidi 2017; UN 2017). In addition, a relatively small fraction of Pakistani and Nepalese workers in Afghanistan and a fraction of Chinese workers in Pakistan comprise the immigrant population in the respective countries (UNESCAPS 2010). A consequent 1:1 ratio of men to women amongst these immigrants may explain the identical sex ratio trajectories upon the inclusion and exclusion of immigrants in these countries[2]. India, has the third most feminized immigrant stock in South Asia (followed by Nepal and Sri Lanka; Timothy and Sasikumar 2012). From 1990 to 2010 female immigrants formed approximately 48-49% of the immigrant stock, indicating a roughly equal proportion of men and women in the immigrant population, leading to identical sex ratio trajectories upon the inclusion and exclusion of immigrants (Timothy and Sasikumar 2012).

While immigration has been accounted for in the sex ratio analysis, the absence of gender and age disaggregated emigration data has the potential to thwart an accurate evaluation of the (elderly) missing women phenomenon. It may however be argued, that given the emigration and migration profiles of the South Asian countries displaying the female deficit, the inability to incorporate emigration merely leads to an underestimation of the (elderly) missing women phenomenon. Although South Asian countries are classified as net emigration countries due to the high emigration *vis-à-vis* immigration rates, with the exception of Sri Lanka, the share of female emigrants from countries in the region remains disproportionately low (Wickramasekara 2011; Timothy and Sasikumar 2012; UN 2017). Restrictive emigration policies have limited female outflows in the past in Bangladesh, India, Pakistan and Nepal and, at a minimum, men continue to form more than 50% of emigrants from these countries (ILO 2014; Timothy and Sasikumar 2012, Simkhada *et al*. 2018). From Afghanistan, Bhutan and Maldives combined, women comprise 0.8% of the international migrant stock of South Asia, allowing men to predominate emigration flows therein (UNESCAPS 2010; UN 2017). A similar situation holds for Iran where Afghan return refugees aside, OECD data reveals the predominance of male *vis-à-vis* female Iranian emigrants in highly skilled occupations (Dumont *et al.* 2007). These patterns of emigration make it clear that the results provide a conservative measure of the extent of the (elderly) missing women phenomenon in respective South Asian countries and that the problem is significantly more deleterious than depicted in this paper.

While the absence of gender and age disaggregated emigration data may not curtail the analysis, the lack of longitudinal data for a majority of affected countries hampers an identification of the exact causal mechanisms behind the (elderly) missing women phenomenon. In the case of India, a substantial body of literature provides evidence of

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[2] Note: A sex ratio (male/female) of 1 does not imply the absence of the (elderly) missing women phenomenon because, as the population ages the preponderance of women in the population is expected to increase and sex ratios (male/female) decrease.

factors throughout the life course as the main causative mechanism, examples of which include: sex selective abortion at the time of birth (Manchanda *et al*. 2011); gender discrimination in nutrition and health care during childhood (Das Gupta 1987); reproductive mortality in young adulthood (Sanneving *et al*. 2013); violence in adulthood (Anderson and Ray 2010) and poverty in old age (Dreze and Srinivasan 1997). The results for India in this paper support this body of literature. Further, the availability of representative longitudinal data for the 45+ population in the country may allow a further elaboration of the casual mechanisms. For the remaining countries it is interesting to note that neither of the countries display a female deficit at the time of birth, a causal factor that is not only immediately evident in sex ratios and non-cumulative in terms of survival disadvantage but also has predominated the literature on the missing women phenomenon. With the exception of Maldives and Nepal, this may be explicable by religion. In Afghanistan, Bangladesh, Iran, Maldives and Pakistan over 90% of the population is Muslim (PEW 2019). Literature on sex selection at birth in India and amongst immigrant communities in Western countries provides strong evidence of the absence of sex selection behaviour amongst Muslims (e.g. Borooah and Iyer 2004; Almond *et al*. 2013). Therefore, in Afghanistan, Bangladesh and Pakistan factors after the stage of birth are more likely whereas in Maldives and Iran the cohort effect explanation (conflict/natural disasters) is the likely causative mechanism.

Substantial literature from Afghanistan, Bangladesh and Pakistan points to the persistence of gender inequalities at all ages after birth across these countries (e.g. Zaman 1999; Bartlett *et al*. 2005; Qureshi 2012). These gender inequalities are similar to those identified for India after the stage of birth in the preceding paragraph. The previous results however depict that the deficit doesn't emerge immediately after birth but rather in the 20+ population of Afghanistan and 45+ populations of Bangladesh and Pakistan. Given the evidence from literature, this may be attributable to a worsening of discrimination in these countries which may or may not have been triggered by conflicts or natural disasters. The likelihood of conflicts and natural disasters to have operated as a cohort effect is entirely plausible given the history of these countries. From 1946 to 2017, the UCDP/PRIO armed conflicts database records 40 conflicts for Afghanistan, 13 conflicts for Pakistan, 11 conflicts for Iran and 4 conflicts for Nepal where the total death toll had exceeded 1000 deaths[3] (Gleditsch *et al*. 2002; Petterson *et al*. 2018)[4]. The Emergency Disasters Database records the following numbers of deaths by natural disasters for each country over the past 70 years: 16,025 in Afghanistan; 200,000 in Bangladesh; 304 in Bhutan; 131,353 in Iran; 325 in Maldives; 15,802 in Nepal and 97,988 in Pakistan (Guha-Sapir 2016). These figures indicate the occurrence of conflicts and natural disasters that have the potential to have a detrimental lingering long term impact on female mortality and thereby either give rise to a female deficit or exacerbate the already existent female deficit.

The severity of elderly missing women phenomenon, in countries where it follows a life course explanation (Afghanistan, Bangladesh, Bhutan, India and Pakistan), may be generating adverse consequences for the population as a whole that could be magnified for future generations. Literature from China and India already details the consequences for women of a surplus of young men of marriageable age who are unable to find wives: social victimization, sexual slavery, forced prostitution, kidnapping and forced marriage migrations (Kaur 2004; Ebenstein and Sharygin 2009; Trent 2015). Such consequences are likely to be magnified in each subsequent age category

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[3] The UCDP/PRIO armed conflicts database classifies the intensity of a conflict (by death toll) into two categories: category 1 includes a death toll between 25 and 9999. Category 3 includes a death toll of 1000 or more (Gleditsch et al. 2002; Petterson et al. 2018).
[4] For the 21 conflicts recorded for Bangladesh, the death toll per conflict is less than 1000 deaths/conflict.

due to their potential spill-over effects on preceding age categories. For example, the female deficit in young adulthood in China precipitated an indelible spill-over effect by creating missed opportunities for a union between men and the missing women and thereby depressing fertility rates (Attané 2006). At the elderly stage, the persistent shortage of women has the potential to increase male rates of widowhood, thereby not only multiplying the problem of forced marriage but also exacerbating the quality of life of daughters and daughters in laws who provide caregiving services (Ezdi and Künemund 2019). In this manner, a surplus of elderly men is likely to shift the care of elderly from the family to the society further precipitating the breakdown of traditional norms and intensifying the already existent pressure on economic and social institutions to cater to a rapidly aging South Asia.

Given the negative social consequences of the elderly missing women phenomenon, immediate remedial action is necessary to rectify the female deficit where it occurs. One possible course of action is the implementation of social pensions. Social pensions constitute a variety of cash transfer to older people that are non-contributory in nature (i.e. do not require employment or income contributions), often do not require the elderly to withdraw from the labour force and are contingent on the elderly meeting specific age and income requirements (Barrientos 2015). Hence, elderly women may be in a unique position to benefit from social pension schemes, due to the large proportion of their lives spent in caregiving roles (signifying their absence from the labour market) and their general propensity to participate in the informal labour market both of which precludes their access to contributory pension schemes (Paolisso and Leslie 1995; Vlachantoni and Falkingham 2013). Social pensions may temper the elderly missing women phenomenon by providing families with an incentive (i.e. the social payments) to allow women to survive to old age; providing elderly women with financial independence for their health, nutrition and contributions to the joint pool of family resources; protecting the household against income shocks and hence ensuring stable access to consumption resources; and allowing for a positive multiplier effect on younger generations of women (e.g. higher spending on health and nutrition) due to the financial stability brought by social pensions (Ezdi and Künemund 2019).

Social pensions alone however may not be sufficient in reversing the elderly missing women phenomenon. As the case of South Korea has shown, effective legislation and widespread awareness can go a long way in reversing the missing women phenomenon (Chung and Das Gupta 2007). However, South Korea only experienced the phenomenon at the time of birth and it is much easier to curb the phenomenon at the earliest life stage than several life stages simultaneously. Nevertheless, effective legislation to chastise female subordination and awareness to raise the value of women alongside policies like social pensions to grant women greater independence are likely to affect gender norms and may arrest at least a worsening of the missing women phenomenon in the long term.

Conclusion

This paper develops a theoretical framework to examine the (elderly) missing women phenomenon and applies this framework to countries across South Asia. The results of this paper reveal that although the majority of missing women literature has concentrated on explaining the phenomenon at the time of birth and during childhood, a substantial female deficit persist in the elderly (60+) population of all South Asian countries except Sri Lanka. Although the same results persist with the inclusion and exclusion of immigrants, the analysis clearly shows the importance of accounting for migration when estimating missing women.

The results for some of the South Asian countries are not very surprising in terms of missing women in their total population: Pakistan, India and Bangladesh have already been discussed in literature as having missing women in their total population and Anderson and Ray (2012) have discussed the existence of missing women in the elderly population of India. However, the presence of a female deficit, especially in the older age groups, in the remaining countries, i.e. Afghanistan, Bhutan, Iran, Nepal and Maldives, is mostly undocumented.

The results further reveal that the female deficit across the South Asian countries can be characterized as a cohort effect (Iran, Maldives and Nepal), life course effect (India) or combination of the two (Afghanistan, Bhutan Bangladesh and Pakistan). In general, the persistence of the deficit as a cohort effect implies its one-time occurrence and its future disappearance as younger cohorts who do not display the female deficit enter old age. However, in the case of all three countries of South Asia displaying the elderly missing women phenomenon as a cohort effect, the deficit re-emerges in future cohorts of the elderly and therefore requires further exploration. For the remaining countries, that display the phenomenon as a life course effect or combined cohort and life course effect, the stage is already set for the elderly missing women phenomenon in the future. Immediate remedial action in the form of legislation and awareness supporting gender equity as well as social pensions is necessary to prevent at least a worsening of the deficit.

It is clear that an analysis of longitudinal data (preferably from the time of birth), absent for a majority of the affected countries, would help enhance an examination of the (elderly) missing women phenomenon by depicting the magnitude of the female deficit at each life stage, thereby allowing the identification of the life stage that is most heavily responsible for the masculinization of current cohorts of the elderly population. This may also allow for improved evaluation of the factors responsible for the phenomenon in the affected country and for more targeted policies to be implemented. Longitudinal data would also be useful for a comparison of the timing of a female deficit in a given life stage with the timing of historical events (such as conflicts or disasters) in the affected countries. This would help in evaluating the case of the South Asian countries that exhibit the elderly missing women phenomenon as a one-time cohort effect, and hence confirm the plausibility of the cohort effect interpretation.

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