Skewed sex ratios at birth in Italian migrant populations: evidence from a longitudinal register 1980-2017

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Abstract

Using the Longitudinal register on reproductive histories, a database on the children of all the Italian and foreign women living in Italy who had at least one child registered in the Italian Registry from 1999 to 2018, we perform analysis of SRB by birth order (first, second and third), sex of the previous child, intergenesic interval and citizenship of the mother. The analysis by birth order and sex of the previous child shows considerably higher than expected SRB for third births among Indian and Chinese communities when the first and second births are girls. A skewed SRB is also present among Indian babies born after a female firstborn. More detailed analysis of SRBs for immigrants from India, by the sex of the previous child and intergenesic interval between second and third birth, indicated that the selection-bias decreases when the intergenesic interval is longer. As further step of our analysis will be to investigate the determinants of the phenomenon. To perform this new analysis the information from the Longitudinal register on reproductive histories will be integrated with those from Delivery Certificate Survey, with the aim of outlining, in the country of destination, the factors related to this discriminatory behaviour towards girls. To carry out multivariate analysis on data referred to Italy, we'll implement a logistic regression model only for citizenship with imbalanced sex ratio at birth and with significant presence in Italian territory. The dependent variable is the sex of the newborn child.

1. Background and aim of the study

Sex selection due to son preference is an ancient phenomenon extensively documented and widespread in various patriarchal societies, especially in certain eastern and southern Asian countries (Das Gupta et al 2003).

In the past, sex discrimination in these patriarchal societies was perpetrated after birth, resulting in an unbalanced child sex ratio due to excess female mortality (Coale, 1991). This pattern changed almost 40 years ago when prenatal diagnosis technology enabled early knowledge of the sex of the future born. At the same time, many societies characterised by male-preference were arriving at the final stages of their demographic transition. The fertility decline, combined with scant change in gender equity, increased the "risk" of not having at least a male child and can be seen as a major determinant for the growing sex selection market in all its aspects. By having knowledge of the sex of the foetus, couples could then resort to (legal or illegal) abortion to eliminate any undesired female offspring (Chen et al. 2013).

While in the rest of the world sex ratios at birth SRBs fluctuate and remain stable around the known demographic constant of 106 males born for every 100 females, in those countries were sex-selection has been widely practiced we now observe persistent alterations in SRBs. According to latest available World Bank data (2019), the following countries have SRBs that considerably exceed the value of the demographic constant:

China (117 in 2007 and 115 in 2017)
Singapore (107 in 2017)
Hong Kong (107 in 2017)
Azerbaijan (117 in 2002 and 113 in 2017)
Georgia (111 in 1997 and 108 in 2017)
Vietnam (112 average 2013/2014 and 111 in 2017)
India (111 in 2017)
Armenia (117 in 2002 and 113 in 2017)
Uzbekistan (108 from 2012 to 2017)
Albania (109 in 2002 and 108.0 in 2017).

Remarkably, South Korea managed to reverse its trend, reaching an SRB of 107 in 2017 after peaking at 114 between 1987 and 1992 (World Health Organization, 2011). Nepal has recently witnessed an increase in

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male births, reaching 107 in 2017, while Afghanistan, Tunisia and Nigeria are cases calling for attention (Guilmoto 2015; Kaba 2015). The available evidence suggests that in some countries prenatal diagnosis technology enhanced and transformed the practice of sex selection by making it customary in the prenatal period. Sex selection before birth, however, did not wholly replace excess female mortality, especially in India and China (Kashyap 2018, Guilmoto et al. 2018).

As several of the countries characterised by unbalanced SRBs are also emigration countries, scholars have begun to consider the possibility that emigrants may still hold their son preference even in the new context of settlement and possibly practice prenatal sex selection.

Studies which have looked in detail at the extent of sex ratio imbalances by demographic characteristics in countries like India, South Korea and China often conclude that wealthier, urban families tend to discriminate more than the poor (Filmer et al 2008; Das Gupta 1987; Das Gupta 2003). The positive socio-economic selection of migrants compared to the non-migrant population may, therefore, enhance the occurrence of sex selection in migration contexts. Over the last decade or so, a growing number of studies have focused on new-born children with a foreign background and have found evidence of higher than expected SRBs among births from immigrants originating from South East, Eastern Asia and Albania in countries including the US, UK, Canada, Spain, Norway, Sweden, Greece, Australia and Italy (Dubuc et al 2007, Almond et al 2008, Almond et al 2009, Singh et al. 2010, Verropoulou et al. 2010, Ambrosetti et al 2015, González 2014, Mussino et al 2018, Edvardsson et al 2018).

Few studies have addressed this topic in the Italian context. All of them have reported an imbalance in SRB among births from immigrants of Indian and Chinese origin. The study by Meldolesi (22) was limited to the period of 2006-2009 and used data on birth records. Research by Ambrosetti et al. (18) explored the SRBs of immigrants in Italy systematically by analysing births from foreign mothers from countries where sex selection at birth or son preference is widespread, and that are among the largest foreign communities in Italy. Data document an excess in male births from couples where both parents are Indian or Chinese during the period 2005-2013 and from Albanian couples starting from 2008. Researchers found a positive association between the excess of male births and higher parity births of parents from countries with traditionally imbalanced SRBs. They also found a positive relation between previous abortions and the mothers' support for female discrimination.

A more recent study on fertility ideals carried out by Mussino and Ortensi (2018) indicated that the ideal number of children among Indian, Albanian and Chinese women settled in Italy is around 2. This finding confirms that migrants from countries with traditionally imbalanced SRBs support small families. At the same time, this preference implies a higher "risk" of lack of male offspring.

Crucial aspects of the drivers of prenatal sex selection among immigrants are however still unresearched in the Italian context. Previous findings regarding non-migrants show that prenatal discrimination at the first birth is generally infrequent (Guilmoto 2015). First and even second births appear to be left to chance, but the SRB does increase with birth order, and that increase is highly dependent on the sex of earlier siblings.

To disentangle this relationship, our study analyses SRB among immigrants by birth order and sex of the previous child using the Longitudinal register on reproductive histories provided by ISTAT. Given the composition of the immigrant population in Italy, we focused on the SBR of Albanian, Indian and Chinese children. Further, insofar as previous evidence for the Italian region of Lombardy suggested that SBRs among Tunisian new-borns is worthy of attention (Ambrosetti et al 2015), we also include the SRBs of new-borns Tunisian in the present analysis. Moreover, we analysed SBRs of new-born Sri Lanka and Pakistani citizens because son preference is very diffused in those countries (Qadir et al. 2011; Kabeer et al. 2014) even though no evidence of prenatal sex selection has ever been reported for them. We include SRBs among new-borns to Italian women as the control group.

The current analyses aim to respond to the following research questions in the Italian context:

RQ1. Is there evidence of SRB imbalance among immigrant communities from countries where sex selection is documented?

RQ2. Is there evidence of SRB imbalance among the most relevant communities from countries where son preference - but no sex selection - is documented?

RQ3. Are SRB imbalances dependent on birth parity, sex of siblings and intergenesic interval?

RQ4. What are the possible factors affecting skewed SRB in the migratory context?

2. Data source

The data used to compile descriptive statistics on births at the national level were drawn from the Longitudinal register on reproductive histories. This longitudinal data source is based on the Survey on births

from the Resident Population Registers, an individual and continuative survey on births established by ISTAT in January 1999 which provides information on the main demographic characteristics of new-borns and parents at the municipal level. The individual sheets currently retrieve information on the child (sex, date and place of birth, nationality, birth order), his/her parents (place and date of birth, nationality, marital status) and the main details about the head of the household. The last data available refer to 2017.
ISTAT applies the Darlink deterministic record linkage to link data from the surveys on births by year with the Lists of Municipal Registries to build the Longitudinal register on reproductive histories. In the first instance, Darlink is used to group all live births of the same mother recorded in the various registers of live births between 1999 and 2018. At a later stage, researchers use Darlink to "fill the gaps" in the offspring using information on mothers in the Lists of Municipal Registries, and, through the study of relationship within the mother and all the other member of the household, to identify the link mother-child.
The Longitudinal register on reproductive histories contains a vast and valuable information asset: information about the offspring of all the Italian and foreign women resident in Italy who have had at least one birth registered in the Italian Registry from 1999 to 2018. The database contains information on more than 11 million births recorded as from 1975 (year of birth of the first sibling of children born between 1999 and 2017). Moreover, for the foreign population, this register is crucial because it also contains data on births of resident foreign-born children with at least one sibling born in Italy between 1999 and 2017. We restrict our analysis to births that occurred from 1980 on, when obstetric ultrasonography became widespread as a prenatal test for pregnant women.

As further step of our analysis consists in investigating the determinants of the phenomenon. To perform this new analysis the information from the Longitudinal register on reproductive histories will be integrated with those from Delivery Certificate Survey, with the aim of outlining, in the country of destination, the factors related to this discriminatory behavior towards girls.The Delivery Certificate Survey (CEDAP, Certificato di Assistenza al Parto) is collected by the Ministry of Health for births that took place in Italy. CEDAP is a continuative data source since 2002 on annual deliveries, collected in hospitals' birth departments. The dataset contains information on parents' socio-demographic background, mothers' reproductive history, pregnancy characteristics, delivery and neonatal characteristics.
Our analysis will focus on 2009 births, as this is the year with the most numerous second born children of Indians, Albanians and Chinese in Italy. Through a deterministic record linkage technique, we will link CEDAP of that year with the Longitudinal register on reproductive histories in order to study the determinants of the phenomenon of sex selection, introducing variables related to the reproductive history of mothers and their socio-economic background.

3. Preliminary results and further developments

First, we consider all births. Table 1 illustrates that SRB is above the biological constant for births recorded in the period 1980-2017 for Indian new-borns (115.6; 95% CI 113.4-117.8). The SBR point estimates were also higher than the biological norm for Chinese and Tunisian children, but given the small number of births, it is difficult to assess the nature of the deviation. We observe a systematic excess of male births in second-order births of Indian children (117.7, 95% CI 114.0-121.5) and third-order births of Albanian (109.9, 95% CI 106.8-113.1), Chinese (102.7, 95% CI 117.3-124.2) and Indian children (144.8, 95% CI 137.5-152.5). We also find deviations for first-order births of Tunisian and Pakistani children, second birth order Pakistani children and third birth order Tunisian children although the sample is too small to assess the existence of systematic prenatal sex selection.

Considering that parents may (or may not) practice sex selection depending on the sex of the previous births (Jha et al. 2006, Zhu et al. 2009), to develop our analysis further, we calculated the sex ratio of higher birth orders as a function of the sex of the first and second-order births.

Table 1- SEX RATIO AT BIRTH by citizenship of the child and birth order. Italy 1980 – 2017.

	SRB	Confidence Interval		SRB	Number of births	Confidence Interval		SRB	Number of births	Confidence Interval		SRB	Number of births	Confidence Interval	
	All births	Lower	Upper	1st birth		Lower	Upper	2nd birth		Lower	Upper	3rd birth and over		Lower	Upper
Italy	106.3	106.1	106.4	106.6	5,583,475	106.5	106.8	106.0	3,503,524	105.7	106.2	105.3	1,068,096	104.9	105.7
Albania	106.0	104.9	107.0	106.1	771,98	104.7	107.7	104.4	56,757	102.7	106.2	**109.9**	**19,141**	**106.8**	**113.1**

Bangladesh	104.6	102.4	106.8	104.1	158,93	101.0	107.4	104.9	13,039	101.3	108.5	105.1	6,212	100.0	110.4
Sri Lanka	102.0	99.6	104.4	102.2	16,021	99.1	105.4	101.9	9,033	97.8	106.2	100.7	2,356	92.9	109.2
China	*107.4*	*106.0*	*108.9*	105.0	36,428	102.9	107.2	102.5	28,833	100.1	104.8	**120.7**	**18,650**	**117.3**	**124.2**
India	**115.6**	**113.4**	**117.8**	106.7	19,998	103.7	109.7	**117.7**	**15,151**	**114.0**	**121.5**	**144.8**	**6,002**	**137.5**	**152.5**
Pakistan	106.1	103.9	108.4	*108.2*	*9,812*	*104.0*	*112.6*	*107.1*	*9,445*	*102.8*	*111.5*	104.0	14,002	100.6	107.5
Tunisia	*107.5*	*105.5*	*109.6*	*108.4*	*17,331*	*105.2*	*111.7*	106.2	14,200	102.8	109.8	*107.8*	*11,586*	*104.0*	*111.8*

Source: our elaborations on ISTAT- Longitudinal register on reproductive histories.

Table 2- SEX RATIO AT BIRTH by citizenship of the child. Second births by gender of the first-born. Italy 1980 – 2017.

		Male first-born				Female first-born		
	Number of births	SRB	Lower IC	Upper IC	Number of births	SRB	Lower IC	Upper IC
Italy	1,595,127	**108.7**	**108.4**	**109.1**	1,480,772	103.0	102.6	103.3
Albania	23,586	*108.5*	*105.8*	*111.3*	22,966	101.6	99.0	104.3
Bangladesh	4,941	*109.0*	*103.1*	*115.3*	4,690	103.3	97.5	109.4
Sri Lanka	2,912	105.6	98.2	113.6	2,895	101.0	93.9	108.7
China	9,550	*107.8*	*103.6*	*112.3*	9,968	97.6	93.8	101.5
India	5,392	**113.0**	**107.2**	**119.3**	5,750	**126.6**	**120.2**	**133.4**
Pakistan	3,682	*109.1*	*102.3*	*116.4*	3,298	106.3	99.2	113.8
Tunisia	5,725	105.4	100.1	111.0	5,112	105.1	99.5	111.0

Source: our elaborations on ISTAT- Longitudinal register on reproductive histories.

Descriptive analysis by birth order and sex of the previous child shows SRB above the natural ratio for Indian children accordingly as to whether the firstborn was male or female (table 2). The same result is found for Chinese (155.7, 95% CI 144.0-168.5) and Indian children (207.6, 95% CI 181.5-239.1) when the first and second births were girls, and for Indian (125.5, 95% CI 110.5-142.8) and Tunisian children (116.4, 95% CI 107.9-125.7) after the birth of a boy and a girl (table 3). The difference between the SRB observed among Italian children and the SRB of Indian or Chinese children born after two girls is particularly striking. In the first case, the observed SRB is below the demographic constant (hypothesising a biological tendency for these couples to have girls: Gellantly 2009, James 1975) and has a similar trend in most of the foreign groups analysed. Among Chinese and Indian new-born, the SRB of babies born after two girls is, on the contrary, exceptionally high. We observe a higher probability of having a boy if previous children are boys, except for Sri Lankans, among all the children regardless of their citizenship, also hypothesising, in this case, the role of a biological component in the absence of sex selection.

Table 3-SEX RATIO AT BIRTH by citizenship of the child. Third birth by gender of first and second-born. Italy 1980 – 2017.

	Male first- and second-born				Female first- and second-born				Previous births were a girl and a boy			
	Number of births	SRB	Lower CI	Upper CI	Number of births	SRB	Lower CI	Upper CI	Number of births	SRB	Lower CI	Upper CI
Italy	*188,029*	**110.2**	**109.2**	**111.2**	159,464	100.4	99.4	101.4	283,259	105.0	104.2	105.8
Albania	2,232	*111.8*	*102.9*	*121.5*	3,829	103.8	97.4	110.6	3,673	*111.7*	*104.7*	*119.2*
Bangladesh	772	*112.7*	*97.9*	*129.9*	776	101.6	88.2	116.9	1,271	106.0	95.0	118.4
Sri Lanka	276	78.1	61.3	98.8	261	90.5	70.8	115.4	384	105.3	86.2	128.8
China	1,230	104.3	93.3	116.7	2,631	**155.7**	**144.0**	**168.5**	1899	106.9	97.7	116.9
India	417	**133.0**	**109.7**	**162.0**	926	**207.6**	**181.5**	**239.1**	947	**125.5**	**110.5**	**142.8**
Pakistan	1,306	*109.3*	*98.1*	*121.9*	1,086	96.4	85.5	108.6	2,381	101.6	93.8	110.1
Tunisia	1,504	*108.3*	*97.9*	*119.9*	1,368	97.4	87.6	108.3	2,636	**116.4**	**107.9**	**125.7**

Source: our elaborations on ISTAT- Longitudinal register on reproductive histories

Finally, considering that the SRB is significantly high for both Chinese and Indian children, we calculated SRB for Chinese and Indian descendants, by sex of the previous child and intergenesic interval between second and third birth. Our findings show that when the first two children were boys, the SRB is respectively 111.9 for Chinese (95% CI 95.2-131.7) and 153.2 for Indians (95% CI 115.8- 206.5) for an intergenesic interval of less than 4 years, and 97.8 for Chinese (95% CI 83.9- 114.2) and 117.6 for Indians (95% CI 90.5-153.9) for an intergenesic interval of 4 years or more. While in the case of the first two children being girls, the SRB is respectively 141.4 for Chinese (95% CI 126.7-158.1) and 271.6 for Indians (95% CI 218.7-345.5) for an intergenesic interval of less than 4 years, and 171.2 for Chinese (95% CI 153.4- 191.7) and 174.9 for Indians (95% CI 147.4-209.1) for an intergenesic interval of 4 years or more. We can conclude that selection decreases when the interval is longer for Indians while for Chinese an increase in SRB is recorded for births occurring after a longer intergenesic interval.

As further step of our analysis will be to investigate the determinants of the phenomenon (RQ4). To perform this new analysis the information from the *Longitudinal register on reproductive histories* will be integrated with those from *Delivery Certificate Survey*, with the aim of outlining, in the country of destination, the factors related to this discriminatory behaviour towards girls.

The study will proceed with explorative multivariate analyses on different data sources linked together; preliminary studies were applied for the region of Lombardy because it is one of the Italian regions most affected by immigration. Although referring only to a region, in the two-year span of analysis, foreign children born in Lombardy accounted for 27% of the total number of foreign children born in Italy (Istat, 2015).

To carry out multivariate analysis on data referred to Italy, we'll implement a logistic regression model only for citizenship with imbalanced sex ratio at birth and with significant presence in Italian territory. The dependent variable is the sex of the newborn child. Among the possible covariates: the parents' age, educational level, profession, previous abortion, the presence of prenatal diagnosis (villocentesis, amniocentesis, number of ultrasound examinations) in order to assess the possibility that these medical examinations are used as a prenatal sex selection tool and the birth order (presence of one, two or more previous children), a key variable for the study of birth selection (Guilmoto, 2015); once completed the new database containing the offspring of all the Italian and foreign women living in Italy (Istat), it'd be possible to consider, between covariates, the birth order by sex.

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