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Valentine BECQUET,* Christophe Z. GUILMOTO**

Sex Imbalance at Birth in Vietnam: Rapid Increase Followed by Stabilization

Son preference has led to a deficit of female births in many Asian countries since the 1980s, driven in part by the decrease in fertility and the development of modern sex determination technologies. But will this trend continue? While sex ratios at birth are returning to normal in countries such as South Korea and China, in others, future trends are difficult to predict. In this article, the authors examine the sex imbalance at birth in Vietnam since the early 2000s. They reveal geographical and socioeconomic disparities and show that after a period of increase it now appears to be levelling off, signalling a possible future trend reversal.

Vietnam, which had a population of 91 million in 2014, is the most recent large country to experience a rapid increase in its sex ratio at birth (SRB).⁽¹⁾ Skewed sex ratios were first observed in the 1980s in India, China, and South Korea, then in several Eastern European countries during the decade following the collapse of communism (Den Boer and Hudson, 2017; Guilmoto and Duthé, 2013; UNFPA, 2012).

The case of Vietnam has attracted attention for some time, and the recent rise in the sex ratio has come as no surprise. It mirrors the trend already observed in China (Bélanger et al., 2003), a country that shares the same cultural heritage, illustrated notably by “patriarchal”⁽²⁾ practices inherited from the Confucian tradition. Both countries have also experienced a sharp fertility decline, impelled by authoritarian government policies and rapid growth of the private healthcare sector (Attané and Scornet, 2009).

(1) An increase has also been observed in Nepal in the last ten years (Frost et al., 2013). On the increase in sex ratios at birth, see Guilmoto (2015) for a demographic overview and Croll (2000) for the anthropological context of discrimination against girls.

(2) Here, the term “patriarchal” is a summary reference to the gender systems that favour boys over girls. See, for example, the remarks by Susan Greenhalgh (2013).

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At 107 male births per 100 female births, the SRB was perhaps already abnormally high before 2003, as suggested by the registers of two hospitals in Hanoi and Ho Chi Minh City (Bélanger et al., 2003). The figures drawn from the 1999 census are ambiguous, however, and do not confirm the existence of a sex imbalance at birth on a national scale (Bélanger et al., 2003). By contrast, the increase in the share of male births in Vietnam from 2003 is clearly identified by the annual population surveys and by the 2009 census (Ministry of Planning and Investment et al., 2011).⁽³⁾ The figures reveal an almost continuous increase in the SRB from 107 in 2002 to 111 in the 2009 census and finally 113 in 2014. They are detailed in this article.

It is difficult to track this trend, however, due to the lack of reliable data; no vital statistics data on births are published despite the close administrative supervision of the country's 11,000 communes (*xã*) (Pham et al., 2010). The task is further complicated by large interregional differences in the SRB that reflect the heterogeneity of Vietnam's peoples and their family norms. The country (Figure 1) lies in an intermediate zone between eastern Asia, with its ancient patrilineal traditions (northern Vietnam), and Southeast Asia characterized by systems of bilateral descent (southern Vietnam). This situation is evidenced by the diversity of its family structures (Guilmoto, 2012; Haines, 2006).

It is of key importance to estimate and monitor increases in the SRB because the driving forces behind this dynamic of sex imbalance at birth observed in Asia and Eastern Europe are still poorly understood. It is difficult to predict if and when this upward trend will come to an end. We will examine the hypothesis of a future stabilization of the SRB, as observed on most of the other countries affected by skewed sex ratios in the recent past. We will also seek to determine whether the recent increase is due to increased prevalence of prenatal sex discrimination throughout the country, or rather to the spread of the practice to groups that were initially least affected. Here we refer to the specific role of the diffusion of techniques, ideas, and behaviours, a debated question already addressed elsewhere, notably in research on fertility decline (Balbo and Barban, 2014; Cleland, 2001).

This article begins by presenting the 2014 intercensal survey and the measurement problems encountered when estimating the SRB from these data. We will then briefly describe the background to the sex imbalance in Vietnam, focusing on the son preference inherent to the patrilineal kinship system, as its intensity can be measured from the 2014 figures. In the following sections, we present several salient dimensions of the sex imbalance at birth, notably regarding family composition and regional and socioeconomic disparities. We point up the steady increase in the SRB between 2009 and 2012 and its subsequent stabilization. In the last section, we examine its possible future evolution and its diffusion across regions and social groups.

(3) See Guilmoto et al., (2018) on the factors that triggered this increase.

Figure 1. Map of Vietnam



Source: Authors' construction.

I. Data and methods for studying the sex imbalance at birth

This study is based mainly on data from the Intercensal Population and Housing Survey conducted in 2014 on 4,214,452 individuals in 1,121,850 households (5% of Vietnamese households). A “long questionnaire” was administered to 361,650 of these households (1.6%) including questions on the socioeconomic characteristics and birth histories of all women aged 15–49 in the household, and on the sex of their last five births. We used these birth histories to calculate differential parity progression ratios by birth order and sex composition of the births (Section IV). As data on parity are truncated at the survey date, we used the Kaplan–Meier estimator to calculate these parity progression ratios by the time in years since the previous birth.

Sex ratios were calculated from the 2014 survey data using two different methods. First, we estimated the SRB by examining the age-sex structure of the population born since 2010 – 289,409 children – to obtain a figure, after correction, for the effect of sex differentials in mortality.⁽⁴⁾ The SRB and regional differences could thus be analysed by back-projection. The second method involved using the distribution of births drawn from women's birth histories, making it possible to calculate sex ratios by the mothers' level of education, parity and sex composition of the offspring, and the household's socioeconomic status.⁽⁵⁾ To obtain a larger sample and facilitate comparison with the 2009 figures, in most cases we aggregated the births from 2010 to 2014.

Without reliable annual series of SRBs based on vital statistics data, we resorted to comparing estimates from varied sources and of unequal reliability. To estimate changes in the SRB, we also drew upon data from the 15% sample of Vietnam's 2009 General Population and Housing Census (3,692,042 households). We were thus able to compare two sex ratios at birth aggregated over five years, before the 2009 census and before the 2014 intercensal survey. In addition, we used the results of the representative demographic surveys conducted in April each year by the General Statistics Office (GSO) to reconstitute the SRB series from 1999 up to the provisional figures of the 2017 survey. However, they only cover a 1–2% population sample, and too few figures are published.

II. The factors driving prenatal sex selection

Increasing recourse to prenatal sex selection has been observed in a number of countries since the 1980s. For many years, this change in behaviour was attributed to contextual factors specific to each country, such as the dowry system in India, the one-child policy in China, the sociopolitical transition in Eastern Europe, or the traditional Confucian family in South Korea. But these countries clearly share certain similarities; despite major differences in their political systems, religious and cultural traditions, and economic growth rates, a comparable increase in the proportion of male births emerged at around the same time in all of them. While the timing and intensity of this trend differ across these diverse countries and regions, demographers have gradually brought to light the existence of a common model.

In short, whatever the political, cultural, or socioeconomic context, prenatal sex selection occurs when three prior conditions are met (Guilmoto, 2009).

(4) To do this, we used the survival ratios by sex derived from the 2012 WHO life table and from that of the 2009 census. Mortality below age five is higher among boys due to biological factors, and this correction makes it possible to obtain the true sex ratio at birth.

(5) This composite variable was constructed based on a multiple correspondence analysis of 17 indicators concerning the dwelling (construction materials, amenities, etc.) and household goods (television, vehicle, etc.). It can be used to define the quintiles. A similar method is described in Ministry of Planning and Investment et al. (2011).

The first condition is a “demand” factor linked directly to a preference for sons. The second is the “pressure” exerted by low fertility, which increases the risk of having only daughters. The third corresponds to a “supply” factor, that of the availability (legality, cost, etc.) of new reproductive technologies and hence of sex-selective abortion, the most widely used form of prenatal sex selection.⁽⁶⁾

1. Son preference

While son preference is the factor with the longest history in Vietnam, the reasons for this preference are constantly changing within the family, the community, and society. In a patrilineal system – particularly prevalent in the north of the country – sons hold a central position and represent the perpetuation of the patrilineal system (Bélanger, 2002; Khuât, 2009). They bear certain responsibilities that were reinforced after the *Dôi Moi* by the resurgence of family-centred traditions and rituals (Luong, 2003; Werner, 2009).⁽⁷⁾ Although daughters often provide regular financial support to their elderly parents (Barbieri, 2009), they cannot assume the symbolic role of a son (Rydström, 2003). Son preference is a cultural and social trait linked primarily to family norms and to the role played by men in Vietnamese society.

2. Fertility decline

Fertility in Vietnam has been at replacement level for the last ten years (2.09 children per woman in 2014; General Statistics Office, 2016). This means that with a biological sex ratio at birth (105 male births per 100 female births), there is a 22% risk of not having a son. In regions or social groups where fertility is close to 1.8 children per woman, the risk is 27%. Decreasing fertility reduces the flexibility of reproductive behaviours: fewer parents in Vietnam are willing to have a third child, and fourth births are now rare (4% of births in 2010–2014). While in the past couples increased their chances of bearing a son by having large families, this option is now much more rarely chosen because the cost of rearing a child is high.

Moreover, population policies discourage parents from having more than two children. Vietnam’s two-child policy (*một hoặc hai con*) was introduced in 1988, when the total fertility rate (TFR) stood at four children per woman.⁽⁸⁾ While often likened to the one-child policy in China, Vietnamese birth control measures are less coercive; not only is the two-child limit less strictly applied, but enforcement, based on moral persuasion and economic sanctions, is also less authoritarian (Goodkind, 1995; Scornet, 2000, 2009). And before the 2000s, despite the preference for sons, there was no evidence of obvious

(6) Other prenatal sex selection methods exist, such as male sperm sorting or *in vitro* fertilization and selective implantation of male embryos, but they are prohibitively expensive, so not widely used.

(7) The *Dôi Moi* (renewal) corresponds to the process of liberalization and transition to a market economy initiated by the Vietnamese government in 1986.

(8) Decree 162/HDBT of 18 October 1988.

discrimination against girls, such as infanticide or negligence resulting in excess mortality of small girls (Attané and Scornet, 2009).

Today, couples with just two children are at higher risk of having only daughters. Yet in a manner of speaking, having a daughter is a lost opportunity to have a son (Eklund, 2011). Couples are constrained by two norms: first, a social norm whereby having no more than two children enhances individual well-being, and second, a family norm which dictates that a son is needed to perpetuate the lineage (Becquet, 2015). Parents wishing for a son will thus opt for a technological solution to outsmart the randomness of nature.

3. The development of ultrasonography

In the past, numerous traditional though ineffective means were used to influence a child's sex before its conception.⁽⁹⁾ With the development of ultrasonography, the sex of the fetus can now be identified *in utero*, and parents can abort a fetus of the “wrong” sex. Indeed, the emergence of new reproductive technologies in the 2000s is thought to have triggered the increase in the SRB observed in 2003. Modern and affordable technologies of this kind were initially rare and accessible only to the wealthiest couples, but they have rapidly spread across the country (Gammeltoft, 2014; Gammeltoft and Nguyễn, 2007). Pregnant women began to ask for multiple ultrasound scans, far more than the number recommended by health guidelines, and the simultaneous development of the private healthcare sector meant that this new demand could now be met (Ha et al., 2002). As elsewhere in East Asia, Vietnam also organized awareness campaigns about genetic abnormalities and congenital malformations; these in turn accelerated the spread of ultrasound scanning during pregnancy.⁽¹⁰⁾

Vietnam also has a liberal policy on abortion, which was legalized in 1954 in the North and in 1975 in the South (Bélanger and Khuât, 2009; Wolf et al., 2010). It has been used as a means of birth control alongside modern contraception, with the government providing abortion on demand in the medical institutions accredited by the Ministry of Health.⁽¹¹⁾ The data show a rapid increase in abortion rates in the early 1990s, shortly after the birth control policy came into force (Goodkind, 1994). Pregnancy termination became a routine medical procedure, both in urban hospitals and clinics and in rural areas served by mobile medical teams. In 1996, the abortion rate was 111 per 1,000 women aged 15–44 (Henshaw et al., 2007); it had fallen to 26 per 1,000 by 2003 (Sedgh et al., 2007).

(9) These methods included consulting a soothsayer or a Chinese calendar to find out the most propitious dates (according to the woman's age) for sexual intercourse; following special diets; or taking traditional medicines with rice alcohol to strengthen the sperm carrying the Y chromosome (UNFPA, 2011; Becquet, 2015).

(10) The government discourse on reproductive health promotes “population quality”. See, for example, Gammeltoft (2014) and Phinney et al. (2014).

(11) Under Article 44 of the Public Health Protection Act dated 30 June 1989, abortion is authorized in Vietnam up to the twenty-second week of pregnancy.

According to the annual Population Change and Family Planning Survey of 2013, 96% of women had at least one antenatal visit during their most recent pregnancy, with 4.7 visits on average (Ministry of Planning and Investment, 2014). Women with higher education have the largest number of antenatal visits (6.1 on average). Low-educated women (primary level) also had more than three antenatal visits on average during their most recent pregnancy, a frequency that illustrates the high level of antenatal healthcare provision, even among the least advantaged populations.⁽¹²⁾

Despite the Ordinance on Population of 2003, which made it illegal to divulge the sex of the fetus during an ultrasound scan, the majority of Vietnamese mothers learn the sex of their unborn child in this way. According to the 2013 annual Population Change and Family Planning Survey, the proportion is 83%, although given that the practice is illegal, this figure is certainly underestimated. The percentage is slightly higher for women who do not have a son (84%) than for those who do (80%), and this difference is statistically significant at the 99% confidence level. Likewise, the survey results show that women reporting a desire to have a child of a particular sex are significantly more likely to know the sex of the fetus. Place of residence does not appear to be a discriminating factor, however, since 85.1% of women in urban areas and 82% in rural areas know the sex of their unborn child.

The growing availability of reproductive technologies is both a solution and a constraint. Pressured by both state and family norms, couples can now use prenatal sex selection as a means to guarantee the birth of a son while limiting their family size. But this option is also a new constraint, since couples can no longer blame chance or “bad luck” for their lack of a son and thereby avoid the stigma of having daughters only (Becquet, forthcoming). With the widespread availability of contraception, abortion, and now sonography, demand has changed, leading to an extreme form of fertility control regarding not only family size but also the sex composition of offspring.

III. Measuring the intensity of son preference

Vietnam has a long tradition of son preference. It is the most ancient factor underlying prenatal sex selection and the most complex to measure. Its extent can be determined by analysing reported fertility intentions.⁽¹³⁾ For the first birth, women tend to prefer a boy over a girl (24% versus 4%). For second births, 64% of mothers want a boy after having a girl, while only 35% want a girl after a boy. For higher order births, 82% of women who only have girls want

(12) Up to 2016, the World Health Organization recommended four antenatal visits and has since raised the number to eight. Retrieved from <http://apps.who.int/iris/bitstream/10665/250801/1/WHO-RHR-16.12-fre.pdf>

(13) These figures are based on data from the 2013 annual Population Change and Family Planning Survey.

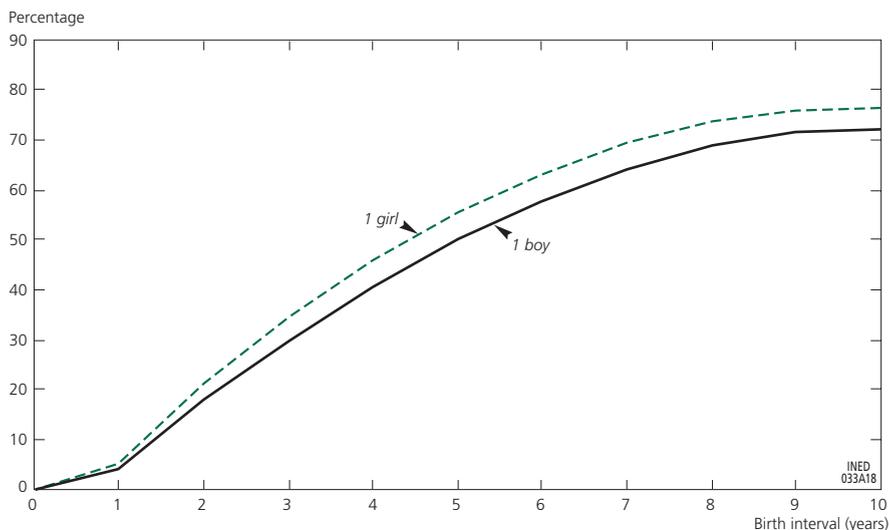
a boy, while just 60% of those who only have boys would prefer a girl. But as suggested by the study of reported preferences in the 2002 Demographic and Health Survey (Fuse, 2002), intentions recorded in this type of survey are not perfect indicators of actual behaviours – it is safer to rely on observation. Observed demographic behaviours will be used here as a measure of revealed preferences.

Parity progression ratios by sex of children already born reveal the effect of sex preference on fertility behaviours and show how couples adapt their fertility to this preference (Becquet and Sacco, 2018). We examined the probability that a couple will have another child after a birth, by parity and sex composition of existing offspring.⁽¹⁴⁾ As is customary, we limited the estimation to birth intervals of ten years at most, since longer intervals are rare.

Figure 2 shows the probability that a couple will have a second child (a_1) in the ten years following the first birth. Given that the Vietnamese total fertility rate stood at 2.1 children per woman in 2014, this probability is high. Three-quarters of couples have a second child, whatever the sex of the first; more precisely, 76.4% after a girl and 72.3% after a boy. This modest difference is nonetheless statistically significant at the 99% confidence level, indicating that if the first birth is a boy, a second birth is slightly less likely.⁽¹⁵⁾

The parity progression ratio of two-child families is just 23.2%, as third births are much less frequent. But it is strongly influenced by the sex of the two

Figure 2. Probability of progression to a second birth (a_1) by sex of first child and birth interval, 2004–2013



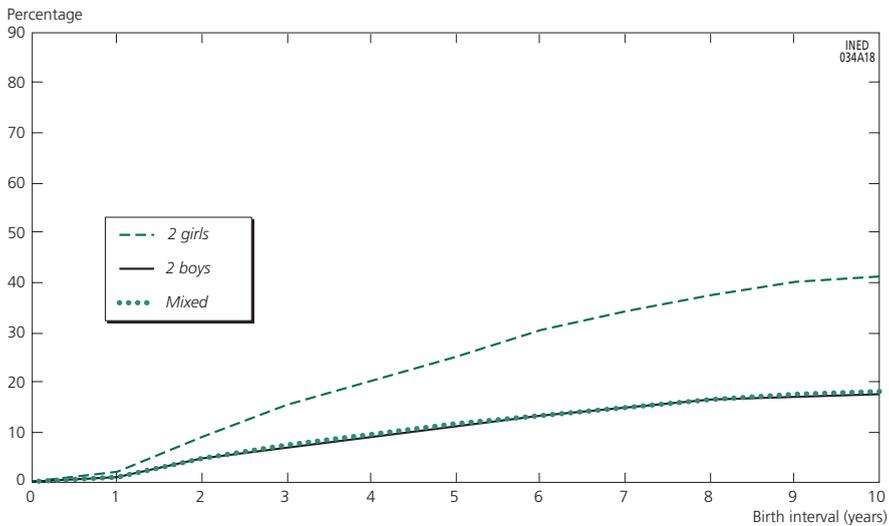
Source: Authors' calculations based on the 2014 Vietnamese intercensal survey.

(14) As the calculations are based on sibships, and not women, and given that the immense majority of Vietnamese women have children within marriage, we refer here to couples who have an additional child and not women.

(15) All probability differences are verified here using the logrank test.

previous children; 41.1% of couples with two girls will have a third child, compared to around 18% of couples who already have at least one son (Figure 3). This is a strong marker of son preference. Two-child couples with no sons are 2.3 times more likely to have a third child than those with at least one. We can also interpret these figures by observing that the proportion of parents not having a third child is “one-quarter” lower among those who have two daughters (59% versus 82% for parents of two sons). If these proportions were representative of the entire population, son preference would affect the reproductive behaviours of more than a quarter of Vietnamese couples. But the existence of prenatal sex selection for first births makes the situation more complex.

Figure 3. Probability of progression to a third birth (a_2) by sex of children already born and birth interval, 2004–2013



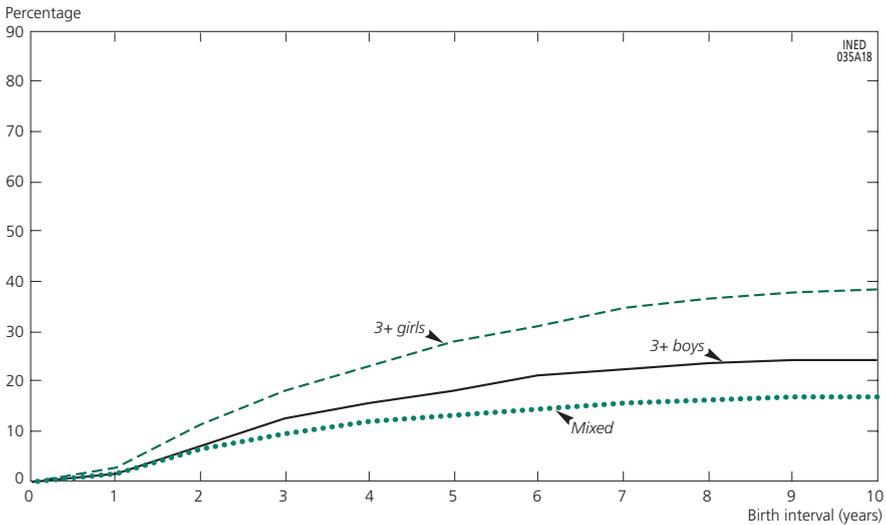
Source: Authors' calculations based on the 2014 Vietnamese intercensal survey.

A similar proportion of couples have a third child after a boy and a girl as after two boys. In other words, couples tend to enlarge their families to make sure they have a son, not to have a daughter. Having no girls has very little effect on the probability of having a third child.

Figure 4 illustrates behaviours after three or more births. While the proportion of couples with no sons is lower at higher parities, their subsequent fertility is twice as high as that of couples who already have a son. However, the desire for a mixed sex composition of offspring now appears to play a role. The parity progression ratio is lowest (16.9%) for three-child parents who already have children of both sexes. It increases slightly, though significantly, by 7.5 percentage points for those with no daughters but by 21.5 points for those with no sons. A mixed sex composition appears to be the preferred choice, and the absence of a daughter has a measurable effect on reproductive behaviours.

Couples can thus have children of the preferred sex simply by applying fertility stopping rules. Most preferences are for sons, although a desire for children of both sexes also exists. We will now examine how access to modern sex-selection methods provides an alternative means to decide the sex composition of offspring in Vietnam.

Figure 4. Probability of progression to a fourth or higher birth (a_{3+}) by sex of children already born and interval between births, 2004–2013



Source: Authors' calculations based on the 2014 Vietnamese intercensal survey.

IV. Measuring the sex imbalance of births in 2010–2014

1. Estimating the sex ratio at birth

We estimated the sex ratio at birth using the 2014 intercensal survey data. Two separate methods were applied, based first on the age and sex distribution of children, and second, on the birth histories of the female respondents. Table 1 shows the SRBs calculated over two different periods (one and five years). When the SRB is calculated from the age distribution, it is adjusted to take account of differential survival by sex (see Section II).

Calculated over the 12 months preceding the survey, the sex ratio at birth in 2014 is around 112.5 male births per 100 female births. An almost identical result is obtained using the two different types of data: 112.7 with the age-sex structure corrected for mortality and 112.2 using the women's birth intervals. This figure places Vietnam below China or Azerbaijan but above India or the Balkan countries (Guilmoto, 2015). Calculated on the population born since 2010, the sex ratio is 112.2 with the age-sex structure corrected for mortality and 111.1 using the women's birth intervals. And while Banens (2000) found

Table 1. Sex ratios at birth by date of birth and type of data used

	Period of birth	
	2010–2014	April 2013–March 2014
Estimate based on age-sex structure		
Observed sex ratio at birth	111.4	112.2
Adjusted ^(a) sex ratio at birth	112.7	112.7
[Confidence interval] 95%	[111.4–113.0]	[111.0–114.4]
Number of children born during the period ^(b)	289,409	67,627
Estimate based on birth history		
Sex ratio at birth	111.1	112.2
[Confidence interval] 95%	[109.7–112.5]	[109.3–115.2]
Number of births reported over the period ^(b)	93,411	22,599
(a) Adjusted to take account of differential survival by sex.		
(b) Weighted numbers.		
<i>Source:</i> Authors' calculations based on the 2014 Vietnamese intercensal survey.		

specific under-reporting of female births in Cochinchina in the early twentieth century, there is no evidence of this practice in Vietnamese censuses or surveys.

2. The scale of variation across the country

The existence and intensity of sex selection in a country depend on several factors that vary across populations in a country. For example, fertility levels are lower in the cities, and access to modern prenatal sex-selection technologies more limited in remote rural areas and among the most deprived populations. Likewise, the degree of son preference differs across regions and social groups. The prevalence of sex-selective abortion thus tends to vary within the countries where it is practised. In India and China, for example, the sex ratio at birth is practically normal in Andhra Pradesh or Tibet but above 125 in the Punjab or Anhui (UNFPA, 2012). Large differences in the SRB across regions or socioeconomic groups in Vietnam have already been described using data from the 2009 census (Ministry of Planning and Investment et al., 2011), and we will compare these results in Section V.

Table 2 shows the variations measured in the 2014 intercensal survey. The six major regions of Vietnam give an initial idea of the spatial variations across the country, although there is also a degree of heterogeneity within the regions themselves.⁽¹⁶⁾ The national SRB is between 111.1 and 112.2 for the period 2010–2014, but it ranges from 108.6 to 117.0 across the regions. The three regions with the least imbalanced SRBs are the Northern Midlands and Mountains Areas, the Central Highlands, and the Mekong Delta. The first two are characterized by conditions that do not favour prenatal sex selection, i.e. a low level of social development, a lower percentage urban, higher fertility than elsewhere, and a large proportion of ethnic minorities. By contrast, the Mekong Delta in the extreme south is a well-developed agricultural region with

(16) The North Central and Central Coastal Areas, for example, are more than 1,000 km in length.

a large network of towns and cities. It is also one of the Vietnamese regions most influenced by the traditions of Southeast Asia. It formed part of the Khmer Empire for several centuries and shares many cultural and religious characteristics with Cambodia and Thailand (Khmer ethnic group, Theravada Buddhism and religious syncretism, bilateral descent, etc.).

Table 2. Geographical and socioeconomic variations in the sex ratio at birth, 2010–2014

Characteristics	SRB ^(a)	Number ^(b)	Confidence intervals (95%)
Regions			
Northern Midlands and Mountains Areas	110.1	46,973	108.1–112.1
Red River Delta	117.0	69,282	115.3–118.8
North Central and Central Coastal Areas	111.7	62,740	110.0–113.5
Central Highlands	108.8	19,512	105.8–111.9
Southeast	111.8	43,697	109.8–114.0
Mekong Delta	108.6	47,205	106.7–110.6
Socioeconomic level of the household			
Very poor	108.5	15,773	105.1–111.9
Poor	110.6	15,480	107.2–114.2
Median	111.5	18,497	108.4–114.8
Rich	113.0	20,432	109.9–116.1
Very rich	113.9	23,230	111.0–116.9
Mother's educational level			
No schooling	107.1	5,781	101.8–112.8
Primary	111.2	19,085	108.1–114.4
Lower secondary	111.2	25,747	108.5–114.0
Upper secondary	114.4	17,334	111.0–117.9
Vocational training	111.9	10,184	107.6–116.3
University	114.8	9,771	110.3–119.4
(a) Adjusted to take account of differential survival by sex.			
(b) Weighted numbers (varying samples due to missing data).			
<i>Source:</i> Authors' calculations based on the 2014 Vietnamese intercensal survey.			

The prevalence of prenatal sex selection is high in the northern Red River Delta (Becquet, 2015), the region with the highest SRB. At 117 boys per 100 girls in 2010–2014, the sex imbalance is comparable to that of China over the same period (Guilmoto, 2015). The region was occupied by China for more than a thousand years and is strongly influenced by Confucian traditions. It is the cradle of the Kinh civilization, characterized by patrilineal and patrilocal family norms and low fertility, which explain the strong pressure on couples to bear a son. The Southeast region and the North Central and Central Coastal Areas have SRBs close to the national average, and their populations are more mixed; the latter region includes provinces close both to the Mekong Delta in the south and the Red River Delta in the north. The Southeast region, for its part, is historically close to the traditions of Southeast Asia but has been settled

by large numbers of migrants from the north since 1975. This may explain why the SRB, at 111.8, is higher than in the Mekong Delta.

The sex ratio at birth increases with the household's socioeconomic status. The richer a woman's household, the more likely she is to use prenatal sex selection to choose the sex of her children. Confirmed by other sources (Le et al., 2017; Ministry of Planning and Investment et al., 2011), these differences in behaviour by standard of living are partly explained by two of the factors mentioned above, i.e. low fertility and access to ultrasound scans – the poorest women having higher fertility, at 2.34 children per woman (General Statistics Office, 2016), and lesser access to scans. They are also explained by demand for men in rural farming communities, where well-off couples have a stronger son preference. The birth of a son is a source of local prestige; he will inherit his parents' land and venerate his ancestors (Becquet, 2015).

The sex ratio at birth also becomes more skewed as educational level increases, rising from 107 among the least educated to 115 among those with a university education. Likewise, the total fertility rate falls as female education increases, although the difference is now small. According to the 2014 intercensal survey, it is 2.4 among women with no schooling and 2.1 among those with post-secondary education (General Statistics Office, 2016). Access to ultrasound scans varies substantially by educational level, however. The 2013 Population Change and Family Planning Survey by the General Statistics Office shows that knowing the sex of the fetus via an ultrasound scan is strongly linked to educational level; 36.8% of women with no schooling know the sex of their unborn child versus 86.8% of those with upper secondary education (Ministry of Planning and Investment et al., 2014).

3. Effect of number and sex composition of children on the SRB

Beyond socioeconomic and regional differences, recourse to prenatal sex selection depends strongly on the sex composition of existing offspring because its very aim is to achieve the ideal of a small family with at least one son. Table 3 illustrates these variations.

At first sight, the SRB increases most notably for higher birth orders, rising to 122 for third or higher births. This corresponds mainly to parents who have not resorted to sex-selective abortion and whose first two children are daughters. Some of them will abort a subsequent fetus to ensure that the next child is a boy. The “pressure” thus increases with each additional child, and in a context of low fertility, it is often at the third birth that a sudden, sharp rise in the sex ratio occurs, as illustrated by the SRBs measured in South Korea in the 1980s (Park and Cho, 1995) and in the Caucasian countries from the 1990s (Meslé et al., 2007).

Vietnam is a special case, however, as the SRB is skewed from the first birth, while that of higher birth orders (third and above) does not reach the extreme levels measured elsewhere (Guilmoto, 2015; UNFPA, 2012). It is 112.1 for the first birth and falls to 107.8 for the second. This anomaly has already

been observed in Vietnam using data from other sources (Ministry of Planning and Investment, 2011; UNFPA, 2009). In a low fertility context, a sex imbalance in first births as large as the one measured in Vietnam – which accounts for 40% of missing girls⁽¹⁷⁾ – has major consequences for the population, as first children represent a large share of total births.

Table 3. Variations in the sex ratio at birth by parity, 2010–2014

Characteristics	SRB	Numbers	Confidence intervals (95%)
Birth order			
1	112.1	44,108	110.0–114.2
2	107.8	36,252	105.6–110.0
3+	122.4	13,051	118.3–126.7
Sex composition of offspring			
First child	111.8	44,108	109.7–113.9
Second child with elder brother	103.7	18,523	100.8–106.7
Third or higher child with elder brother(s)	107.0	8,121	102.4–111.7
Second child with no elder brother	111.5	17,730	108.2–114.8
Third or higher child with no elder brother	152.4	4,929	144.0–161.4
(a) Adjusted to take account of differential survival by sex.			
(b) Weighted numbers.			
<i>Source:</i> Authors' calculations based on the 2014 Vietnamese intercensal survey.			

The practice of sex-selective abortion from the first birth is explained by the preference for a male first child to ensure that the family includes at least one son (Becquet, 2015). Rather than submitting to the random biology of sex determination, certain women prefer to choose the sex of their first child through prenatal sex selection, thereby fulfilling the family contract, ensuring social recognition from the community, and avoiding any future worry about the sex of their subsequent children. These women may even decide to have no further children after bearing a son, as shown in Figure 1. By comparison with a natural SRB of 105, we estimate that 4.7% of expected female first births are missing, which would correspond to the proportion of women who abort at least one female fetus before having their first child.

The sex ratios by birth order are strongly dependent on the sex of the children already born, since women will abort a fetus if it is of the “wrong” sex with respect to the desired sex composition of their offspring. If we observe sex ratios by presence of an elder male child (Table 3), we see that the absence of a son strongly influences women’s recourse to prenatal sex selection; the SRB exceeds 150 after two (or more) successive female births. Conversely, among women who already have a son, the sex ratio at birth is normal, at close to 105 for all birth orders (second or higher). This may also explain why the sex ratio of second births is slightly less imbalanced than that of first births. The women whose first child was a boy have no further need for sex-selective abortion.

(17) Here, we calculate missing females at each birth order with respect to a “natural” SRB of 105, based on the numbers of births of each sex.

Sex ratios are the most skewed after the birth of two (or more) girls. These distortions are not as large as the extremes measured in Armenia in the 1990s among women without a son (the SRB was 223 after two girls and 304 after four or more female-only births; UNFPA, 2013), but they are comparable to those of India (139 after two girls in 1998 according to Jha et al., 2006).

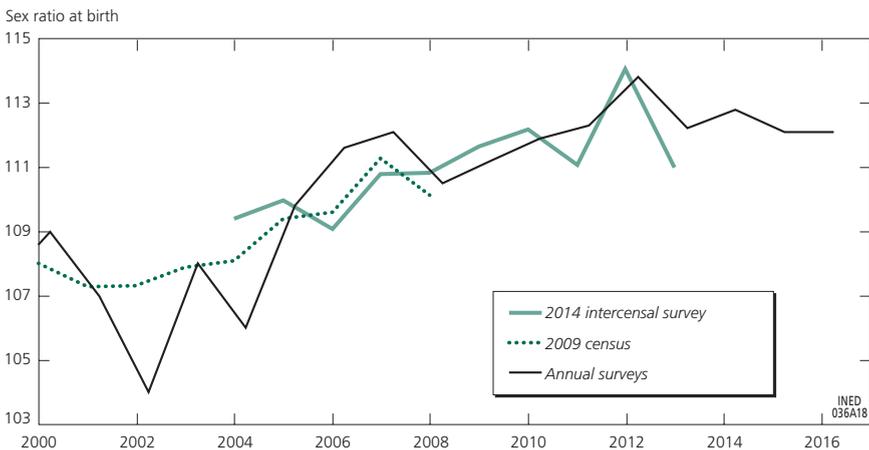
V. Recent evolution of the sex ratio at birth

1. Estimating trends since 2000

To estimate trends in the SRB, we used several data series drawn from the annual demographic surveys described in Section I. We compared them with retrospective estimates by ten-year cohort based on the 2009 census and the 2014 intercensal survey. The first series corresponds to births recorded during the 12 months preceding the annual demographic surveys, available only since 2000 (estimate for 1999). This is the least reliable source because it is based on small samples of births, and annual fluctuations in the estimates are substantial; for example, between 2000 and 2002, the SRB drops from 109 to 104 (Figure 5). The estimates drawn from the 2009 census are based on a larger sample (15% of enumerated households). Here, the curve is more regular, with no suspicious fluctuations. The back-projections based on the 2014 intercensal survey rely on a smaller sample (5% of Vietnamese households). The data series from the intercensal survey and the annual demographic surveys both reveal an unexpected jump in 2012, to which we will return.

The curve of the SRB since 2000 is characterized by a low of around 107 up to 2003–2004, followed by a steady rise to a ceiling of between 112 and 113

Figure 5. Estimates of the sex ratio at birth according to available sources, 2000–2017



profile suggests that prenatal sex selection started to spread across Vietnam from the early 2000s. It corresponds closely to the observations of Gammeltoft and Nguyễn (2007), whose urban field surveys conducted in 2004 revealed a surge in demand for ultrasound scans during pregnancy. Stabilization of high SRBs is also observed in other countries and regions, such as the South Caucasus, where the SRB levelled off at around 115 after 2000, or India and Albania, where it plateaued at the lower level of 111 (Guilmoto, 2015).

This interpretation calls for several comments and an observation. First, given that the natural SRB generally fluctuates around 105, the initial level of around 107 is already abnormally high. While it cannot be proved, and no consistent data are available (Bélanger et al., 2003), prenatal sex selection may already have existed in some parts of the country before 2003, notably in cities where couples had access to the first high-quality ultrasound scanners in the 1990s. An in-depth study of 1999 census data would be needed to confirm this hypothesis.

The speed of increase of the SRB from 2003 is comparable to that observed in South Korea (107 in 1982 up to a maximum of 115 in 1993), a country that, like Vietnam, is mainly monolingual and where information can spread much more quickly than in large, ethnically diverse countries such as China or India.

The SRB of 114 in 2012 is puzzling. It is statistically different from the 2013 figure (according to the 2014 intercensal survey) and is also attested by the 2013 demographic survey. It may be linked to the traditional Vietnamese calendar, already identified as a source of significant variation in Vietnamese fertility (Do and Phung, 2010), with 2012 being an especially auspicious year for boys.⁽¹⁸⁾ This would confirm that zodiacal beliefs are strongly rooted in Vietnam, as in Hong Kong or South Korea (Lee and Paik, 2006; Yip et al., 2002), and that they can still affect the sex ratio at birth on a cyclical basis. It is clear, however, that the SRB has now stabilized at close to 112.

2. Diffusion of prenatal sex selection

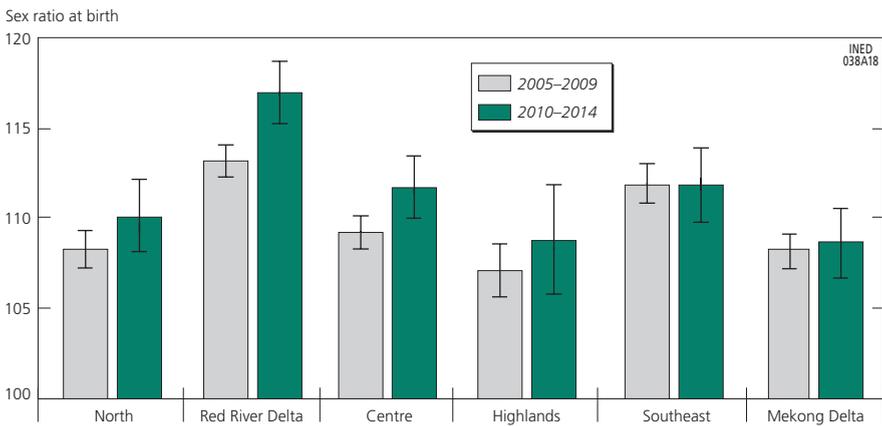
This interpretation of the diffusion process draws on earlier analyses of fertility decline (Casterline et al., 2001) which suggest that the gradual increase in a new practice is due not so much to its uniform intensification across the country in response to an exogenous change, but rather to its propagation across different social groups. In our case, intensification would take the form of growing recourse to sex-selective abortion in the population after 2003 under the effect, for example, of growing demand for prenatal sex selection or growing pressure to reduce fertility. Under the diffusion model, on the other hand, the increase is attributed to the spread of the practice to new users, starting with the “pioneers” and rippling out towards the “laggards”.

We cannot verify the existence of specific channels of dissemination beyond the above-mentioned reference to Gammeltoft’s fieldwork that describes the

(18) 2012 was a year of the Golden Dragon (*Nhâm Thìn*), a lucky year for male births.

growth in demand for prenatal ultrasound scans after the technology became available in the 2000s. That said, we have already observed large differentials in prenatal sex discrimination across social groups in Vietnam, and we can decompose the increase in the SRB between 2009 and 2014 based on these categories. Figure 7 shows the changes observed at the regional level over five years. We see an increase of 4 percentage points in the Red River Delta that widens the gap between this region and the rest of the country. There are two-point increases elsewhere in the north and centre, but the increase is barely visible in the two southern regions. The rise is thus concentrated in the north of the country, primarily in the Red River Delta. The situation of the Southeast region, home to Vietnam’s largest city, Ho Chi Minh City, is interesting. While the SRB was high in 2009, it has since levelled off. Highly urbanized, with a large export manufacturing sector, the Southeast is the country’s richest region, and sex ratios may have become skewed earlier than elsewhere due to its low fertility (already down to 1.7 children per woman in 2009). But its SRB does not exceed 112 thanks to the large-scale presence of settlers from southern regions with less “patriarchal” traditions than in the north (Becquet, 2016; Haines, 2006).

Figure 7. Sex ratios at birth of children born in 2005–2009 and 2010–2014 by Vietnamese region



Notes: “North”: Northern Midlands and Mountains Areas; “Centre”: North Central and Central Coastal Areas; “Highlands”: Central Highlands.

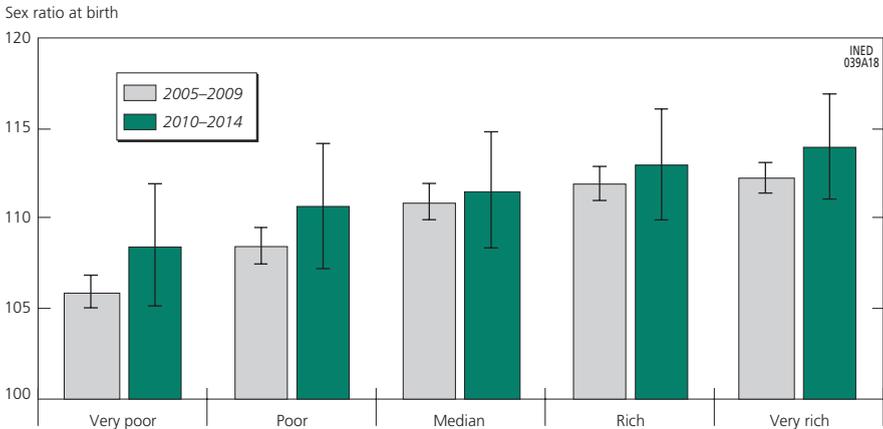
Sources: Authors’ calculations based on the 2009 census and the 2014 Vietnamese intercensal survey.

The estimates, notably those of 2014, concern small samples, so changes are difficult to interpret. They nonetheless point to the existence of weak “horizontal” (spatial) diffusion, limited to the country’s northern provinces, with the largest increase between 2009 and 2014 being observed in the Red River Delta and, to a lesser extent, in the other northern and central regions. In the two southern regions, the SRB is stable.

The hypothesis of “vertical” (socioeconomic) diffusion of discriminatory practices in Vietnam can also be examined, notably via trends in the use of

ultrasound scans to determine the sex of the fetus, the first stage of the sex selection process. The 2013 annual Population Change and Family Planning survey shows a modest increase in the share of urban women who know the sex of their fetus, although the percentage was already very high in 2005 (83.1%) and in 2012 (85.1%). In rural areas, the increase is much larger, rising from 56.6% in 2005 to 82% in 2012 (Ministry of Planning and Investment et al., 2014). In this same survey, the increase between 2005 and 2012 in the proportion of mothers knowing the sex of their fetus was much higher among low-educated women (from 25% to 36.8%) than among the most highly educated (from 83.66% to 86.8%). Figure 8 shows that the SRB increased between 2009 and 2014 in all socioeconomic strata. The rise is slightly faster in the two poorest quintiles. The catch-up is modest, however, and even statistically non-significant because of the small size of the 2014 sample.

Figure 8. Sex ratios at birth of children born in Vietnam in 2005–2009 and 2010–2014, by socioeconomic status of households



Sources: Authors' calculations based on the 2009 census and the 2014 Vietnamese intercensal survey.

Conclusion

There is a severe lack of civil registration data in Vietnam to monitor changes in the sex ratio at birth. While less exhaustive, demographic surveys provide a rich alternative source and a clear picture of overall trends, notably the increase from 2003. They also reveal a general slowdown of this increase over the last few years and suggest that the SRB will level off at around 113. This figure, comparable to the latest official estimates for China in 2015, means that Vietnam has one of the world's highest sex imbalances at birth. But it is also a composite figure that masks the heterogeneity of reproductive practices across the country, between regions where prenatal sex selection is rare and those where it is highly prevalent, such as the Hanoi region, historically more

influenced by China and Confucian traditions. Elsewhere in the country, more egalitarian family systems probably place less pressure on couples to select the sex of their future offspring.

Survey data also confirm the sexist nature of reproductive choices. Fertility behaviours often reflect a preference for sons, with sex-selective abortion being closely linked to the absence of previous male births. These sources are also highly valuable for revealing socioeconomic differentials and the lower prevalence of prenatal sex selection among the most disadvantaged social groups. The increase in the SRB in Vietnam over the last ten years is a historical upheaval of a reproductive regime formerly based on a purely biological distribution of male and female births, but now characterized by deliberate management of the sex composition of offspring. The high SRB will amplify the numerical imbalance between male and female cohorts. It will have unpredictable long-term effects on the cohorts who reach adulthood over the next 20 years, and the unprecedented surplus of young males, particularly in the north of the country, will severely disrupt the marriage market, as is already the case in China and India (Kaur, 2016). Cross-regional comparison of trends in the SRB suggests that the diffusion of sex-selective abortion is limited to the north of the country where son preference is historically strongest (Becquet, 2015).

The sex imbalance at birth has reached a plateau around 112–113 male births per 100 female births. This phenomenon is visible in both the statistical trends derived from numerous estimates since the 2000s and in the figures by social group. The three conditions that drive prenatal selection should not deteriorate over the coming years. First, fertility has stabilized at around 2 children per woman, and a new population bill authorizing couples to have as many children as they want has been under discussion at the National Assembly since 2015 (Becquet, 2015).⁽¹⁹⁾ Second, despite efforts to curb the practice of prenatal sex selection, abortion is already widely available via a network of private clinics spread across the dense urban infrastructure. Third, son preference built upon Confucian traditions, the need for men in farming households and for sons to support the family will all inevitably weaken in response to women's growing economic and social participation, and to the country's rapid economic development and urbanization. The upcoming 2019 census will provide more information on this stabilization process and on the impact of policies to combat prenatal sex discrimination (Den Boer and Hudson, 2017; Rahm, 2017). The sex imbalance may well return gradually to a more natural level, as is the case in South Korea since 1995 and the Caucasus countries since 2005.

(19) The text of this bill can be consulted at duthaonline.quochoi.vn. Article 25 makes specific provision for measures to counter the familial, sacred, and economic causes of son preference.

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Valentine BECQUET, Christophe Z. GUILMOTO • SEX IMBALANCE AT BIRTH IN VIETNAM: RAPID INCREASE FOLLOWED BY STABILIZATION

Vietnam is one of several countries in the world where sex-selective abortion has increased the proportion of male births in recent years. In the absence of exhaustive vital statistics data, we use two indirect methods based on the 2014 intercensal survey to identify trends in the sex ratio at birth (SRB) and to estimate preferences for children of a given sex. These methods provide similar results and confirm the steady increase in the SRB in Vietnam first observed in 2003. However, annual data from the General Statistics Office indicate that the SRB levelled off at between 112 and 113 male births per 100 female births in 2014, and the latest provisional data (2017) suggest that it has since remained relatively stable. Our analysis reveals the disparities in the SRB, which is more skewed in the northern regions and among the most affluent couples, as well as the diffusion of prenatal sex-selection across these regions and across socioeconomic groups over a five-year period. Parity progression ratios also point up differences in reproductive behaviour by showing that Vietnamese couples tend to have more children if they do not already have a son.

Valentine BECQUET, Christophe Z. GUILMOTO • LE DÉSEQUILIBRE DES SEXES À LA NAISSANCE AU VIETNAM : DE LA HAUSSE RAPIDE À LA STABILISATION

Le Vietnam est l'un des pays où la proportion de naissances masculines a récemment augmenté en raison des avortements sélectifs selon le sexe. Les données d'état civil exhaustives faisant défaut, nous recourons à deux méthodes indirectes à partir de l'enquête intercensitaire de 2014 pour suivre les tendances du rapport de masculinité à la naissance (RMN) et estimer les préférences de sexe en matière de fécondité. Ces méthodes fournissent des résultats similaires qui attestent de la poursuite de la hausse du RMN au Vietnam entamée en 2003. Toutefois, les données annuelles du Bureau national de la statistique montrent que la progression du RMN a atteint un plateau en 2014, situé entre 112 et 113 naissances masculines pour 100 naissances féminines, qui apparaît relativement stable jusqu'aux dernières données provisoires disponibles (2017). Cette analyse met en évidence les disparités du RMN, plus déséquilibré dans les régions du Nord et chez les couples les plus aisés, et la diffusion de la sélection prénatale au sein de ces régions et des différents groupes socioéconomiques sur une période de cinq ans. Les probabilités d'agrandissement permettent également d'examiner les différences de comportements reproductifs en montrant que les couples vietnamiens ont tendance à augmenter leur nombre d'enfants lorsqu'ils n'ont pas eu de fils.

Valentine BECQUET, Christophe Z. GUILMOTO • EL DESEQUILIBRIO DE SEXOS AL NACIMIENTO EN VIETNAM: DEL ALZA RÁPIDA A LA ESTABILIZACIÓN

Vietnam forma parte de los países donde el índice de masculinidad al nacimiento ha aumentado recientemente a causa de los abortos selectivos según el sexo. En ausencia de datos de estado civil exhaustivos, utilizamos dos métodos indirectos a partir de la encuesta intercensal de 2014 para observar las tendencias del índice de masculinidad al nacimiento (IMN) y estimar las preferencias de sexo en materia de fecundidad. Los dos métodos llegan a resultados similares que muestran la continuación del alza del IMN comenzada en 2003. Sin embargo, los datos anuales del Oficio nacional de estadísticas muestran que la progresión del IMN ha alcanzado en 2014 un valor –situado entre 112 y 113 nacimientos masculinos por 100 nacimientos femeninos– que parece estabilizarse según los últimos datos provisionales de 2017. Este análisis pone en evidencia las disparidades del IMN, más desequilibrado en las regiones del Norte y en las parejas más favorecidas, así como la difusión de la selección prenatal en regiones y diferentes grupos socio-económicos durante durante los últimos 5 años observados. Las probabilidades de crecimiento de las familias permiten igualmente examinar las diferencias de comportamiento reproductivo, las cuales muestran que las parejas vietnamitas tienden a aumentar el número de hijos cuando no han tenido hijos varones.

Keywords: Vietnam, sex ratio at birth, prenatal sex selection, discrimination, gender, fertility

Translated by Catriona Dutreuilh

