Son Preference, Sex Selection, and Kinship in Vietnam

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Vietnam is a latecomer among countries in Asia recording an excess of male births. As recently as the beginning of the twenty-first century, the country had recorded no tangible rise in the sex ratio at birth (SRB)—the number of males per 100 females—in spite of the many social and demographic features pointing to latent son preference. Since 2005, the increase in birth masculinity has been rapid and the proportion of male births is now higher in Vietnam than in India, a country where the rise in the sex ratio began more than 20 years ago.[1]

Vietnam's case raises several questions about the specific factors that sparked this sudden change, the social context that prompts couples to resort to sex selection, and the anthropological features that may account for the heterogeneity in sex preferences across the country. In this article I reexamine the regional differentials in birth masculinity observed in Vietnam and the influence of gender bias and local kinship systems, following the lessons drawn by Monica Das Gupta and colleagues from the experience of China, India, and South Korea (Das Gupta et al. 2003; Das Gupta 2010). My objective is to follow the evolution of prenatal sex selection first by testing the role played by son preference at the province level and then by relating it to specific dimensions of local kinship systems. This exploration will seek to cast new light on the cultural patterning of demographic behavior in Vietnam.

My analysis is based on microdata from the 15 percent sample of the 2009 census. This sample provides a unique dataset of 3.7 million households to explore the context of high birth masculinity in Vietnam (see Appendix). The article starts by describing the main characteristics of the recent increase in birth masculinity observed in Vietnam, including its social and geographical correlates. I then discuss the role of various factors associated with prenatal sex selection, using regional differentials as a mirror for the recent rise in the share of male births observed in the country. The intensity of son preference, estimated here by sex differentials in fertility (or parity) progression, emerges

as the major determinant of variations in the sex ratio at birth. I highlight the lesser-known role of household structure and relate patrilineal kinship patterns to sex preference. The final section summarizes the analysis and provides an overall statistical model. I end with a discussion of the demographic and policy-related implications of the findings.

The social and geographical features of birth masculinity in Vietnam

The shared past and recently parallel course of the demography of Vietnam and China has long suggested that the gradual rise in birth masculinity observed in China during the 1980s would also be observed in Vietnam. In her review of discrimination against girls across Asia, written at the end of the 1990s, Croll observed that the emergence of sex selection in Vietnam was only a matter of years away (2000: 49). Drawing on various surveys conducted in the 1990s, several studies had documented the presence of an entrenched preference for boys in the country (Haughton and Haughton 1995; Bélanger 2002). But results from the 1999 census, the subsequent Demographic and Health Survey in 2002, and the annual population surveys conducted by the country's General Statistics Office (GSO) failed to document any substantial increase in the sex ratio at birth.

The situation changed noticeably after 2005 with the publication of findings of the annual population surveys, which showed the SRB rising suddenly to 110 male births per 100 female births. This change in birth masculinity levels was then confirmed by several other sources (Pham et al. 2008; Guilmoto et al. 2009; UNFPA 2009; Pham et al. 2010b). The 2009 census puts the sex ratio at birth during the previous 12 months at 110.6.[2] According to the most recent demographic survey, the sex ratio at birth reached 111.2 in 2010 (GSO 2011a). But as is common with sudden changes in a demographic system, transformations are rarely uniform across families, social categories, and regions.

Census data identify some of the main differentials in birth masculinity. First, 2009 data confirmed the unusual SRB distribution by parity that had been detected from survey estimates (UNFPA 2009: 30–31; Pham et al. 2010b). Census data based on the 247,600 births during the previous year indicate that while the SRB among first births is relatively high (110.2), it fails to increase at parity 2 (109.0), and it increases only moderately among higher-order births (115.5).

Second, census estimates demonstrate that the proportion of male births tends to be higher among better-off or more educated women, while there is almost no birth imbalance among children born in poor households. The sex ratio at birth is highest among families with better-quality housing and access to more expensive household appliances such as a computer, washing

machine, or air conditioner. I have used these household-level indicators to devise a synthetic index of socioeconomic status that strongly correlates with the sex ratio at birth, rising from 105.2 in the poorest quintile to 107.5 and 112.8 in the second and third quintiles, with no further increase among the remaining two quintiles (GSO 2011b). The same picture emerges when considering the positive correlation of the SRB with mother's level of education: the sex ratio is at its normal biological level among illiterate mothers and increases with schooling duration, reaching 113 among women who have studied ten years or more at school.

Third, sizable variations in SRB levels emerge when comparing populations by ethnic group, using the Kinh (ethnic Vietnamese) as a reference category with a population sex ratio of 111 among children below one year of age.[3] The sex ratio of all other large minority groups is distinctly below that level, starting with the two largest, the Tay and the Thai, both of whom have a sex ratio of 104. Among other minority groups, the highest SRB (108.9) is found among the Hoa (ethnic Chinese), who are more prosperous than other minority populations.

Finally, regional variations, which had been observed previously (Guilmoto et al. 2009), tend to be more pronounced according to census estimates by province.[4] These regional differences[5] confirm the concentration of high-SRB provinces in the north. The areas with sex ratios above 120 belong to a distinct regional cluster consisting of the three contiguous provinces of Bac Ninh, Hai Duong, and Hung Yen that lie at the heart of the Red River Delta to the east of Hanoi. The highest sex ratio is found in Hung Yen (125). This province is surrounded by another ten adjacent provinces where the SRB exceeds the national average, encompassing almost the entire Red River Delta. By contrast, in the central and southern parts of the country, there are fewer than ten provinces with a SRB above 110, including three provinces to the south of Da Nang (Quang Nam, Quang Ngai, Binh Dinh) and Ho Chi Minh City (formerly Saigon) in the south. Provinces with a sex ratio below 105 are mostly in the mountainous, minority-inhabited areas along the borders with China, Laos, and Cambodia.

As observed also in China and India, geographical differences in birth masculinity levels across Vietnam largely exceed variations associated with individual or household socioeconomic features such as ethnicity, socioeconomic status, or educational level. This spatial concentration of high SRB levels, a recurrent feature of prenatal sex discrimination, is usually explained by identifying either the important explanatory variables that are spatially clustered or the typical spatial diffusion mechanisms that account for this strong geographical concentration. The lack of a time series for the recent increase in birth masculinity in Vietnam prevents me from testing the latter hypothesis. I rely upon a more theory-grounded perspective on prenatal sex selection to identify the possible factors behind this distinct spatial patterning.

Understanding observed variations in birth masculinity

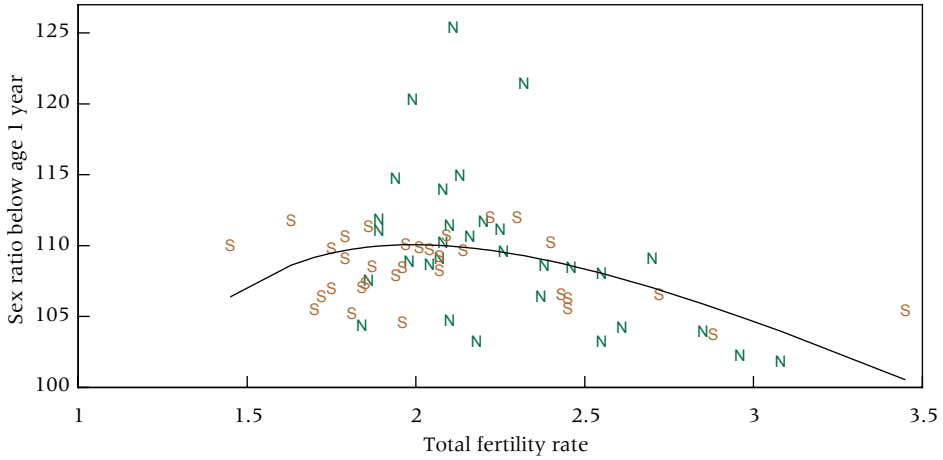
Prenatal sex selection as analyzed across Asia can be associated with a number of factors such as family planning policies (China), unequal marriage exchanges (India), patriarchal family systems (South Korea), and economic downturns (Caucasus). Individual analyses stemming from a given local or national environment give rise to a particular narrative summing up the specific context and the presumed factors behind the emergence and diffusion of prenatal sex selection. But from an analytical viewpoint, it is probably more fruitful to refer to a single explanatory framework built around three necessary factors of prenatal sex selection, which can be summed up as the "ready–able–squeezed" preconditions that I outlined in a previous article in this journal (Guilmoto 2009). Readiness captures the perceived "need" for sons expressed from a variety of social, economic, or cultural perspectives. This pure "demand" factor is complemented by a parallel "supply" dimension encompassing the ability to access modern prenatal sex selection (permissive abortion legislation, ultrasound technology). The last precondition corresponds to the "squeeze effect" of low fertility, when the reduction in the number of children raises the risk of remaining sonless. I now examine these three preconditions for Vietnam.

The role of fertility decline

Women in Vietnam gave birth on average to more than 6 children in 1970 on the eve of the country's fertility decline. The gradual reduction in birth rates over the following four decades brought the national average to replacement level during the mid-2000s. The fall in fertility in Vietnam has been both sustained and steady, facilitated by a moderate family planning policy that has avoided many of the pitfalls of the earlier Chinese experience.[6] During the last decade, fertility, as measured by the total fertility rate, has declined further, from 2.6 in 1999 to 2.0 in 2010.

The reduction in family size in Vietnam has resulted in an increasing proportion of parents with no son when biology is the only determinant of birth masculinity. Moreover, differentials in average family size across the country may result in different levels of "fertility squeeze" among regions and social groups. Regional variations in TFR levels are not negligible, with estimated levels ranging from less than 1.5 (Ho Chi Minh City and the adjacent province of Binh Duong) to more than 3.0 in four minority-inhabited provinces in the northwest and in the Central Highlands. Nevertheless, four-fifths of provinces report a low to moderate fertility level between 1.5 and 2.5 children per woman, and it can be said that the fertility transition is nearly complete in Vietnam, except in the less developed provinces characterized by remoteness, low urbanization, widespread poverty, and unfavorable mortality conditions.

FIGURE 1 Relationship between average fertility (TFR) and sex ratio below one year of age by province, Vietnam, 2009 census



NOTES: N = North Vietnam; S = South Vietnam. The trend curve is fitted with fractional polynomials.
SOURCE: Provincial estimates of TFR and sex ratio below one year of age from GSO (2010).

The potential relationship between birth rates and sex ratios at birth can be assessed by comparing province-level total fertility rates in 2009 with census-based sex ratios below one year of age. In the figures, I also distinguish North and South Vietnam to examine whether a distinct spatial patterning is observable in the relationship between social and demographic variables.[7] Figure 1 sums up the complex relation between these two dimensions. Notice first the overall curvilinear relation linking SRB and TFR. Reading the figure from right to left indicates that the SRB is rather low in high-fertility provinces and reaches its highest values in provinces with average fertility levels. Provinces with below-replacement fertility have a slightly lower SRB, giving this figure an inverted-U shape. But the link between fertility levels and SRB remains tentative, as illustrated by a few extreme SRB values: many northern provinces lie above the trend line, and this is especially conspicuous for the six provinces where the SRB exceeds 113. Note also that the SRB in North Vietnam is distinctly higher in provinces with lower fertility levels, unlike southern provinces where below-replacement fertility tends to coincide with normal sex ratios.

Supply factors

The supply dimension refers to the second necessary precondition of prenatal sex selection, that is, accessibility to technology for prenatal sex identification and to induced abortion. In Vietnam, abortion has been legal since the 1960s and abortion rights are confirmed by the 1989 health law. Menstrual extraction and induced abortion are widespread in Vietnam and have been estimated in

2002 as terminating 46 percent of all pregnancies. More recent reliable figures are not available. Late-second-trimester abortions are not uncommon.[8] Several studies have also shown that women choosing abortion tend to be Kinh and of higher educational or socioeconomic status, even though abortion costs rarely exceed US$10. The same differences between socioeconomic groups are observed in the use of antenatal care (Knowles et al. 2008).

Apart from socioeconomic characteristics of the population, the ability to resort to sex selection depends crucially on the presence of health services offering affordable prenatal ultrasound services. In this regard, the private health care sector in Vietnam has played an increasingly large role during the last two decades since the *Doi Moi* reforms that made privatization possible. Today, it successfully competes with the public sector (Tran et al. 2005; Ha, Berman, and Larsen 2002). Ultrasound tests in particular have become extremely common. According to a survey conducted in 2006, some 74 percent of pregnant women had an ultrasound test, with the proportion reaching 90 percent in the Red River region and among the two wealthiest quintiles of the country's population (GSO 2006). The annual 2007 population survey conducted by the General Statistics Office also indicated that around 64 percent of recent mothers knew the sex of their child in advance. This proportion exceeded 80 percent among college graduates and urban residents, while a majority of women who are illiterate, who delivered at home, or who wanted more children stated that they were unaware of the sex of their baby before its birth (UNFPA 2009: 37–40).

The supply factor is therefore of key importance to understanding the sudden rise in SRB levels in Vietnam. The other preconditions for prenatal sex selection—rapidly declining fertility and son preference—had already been met before 2003. It may be surmised that the country had long lacked the required facilities to inform women of the sex of their fetuses for two reasons—the absence of modern ultrasound equipment and the predominance of the public sector where access to prenatal sex identification was limited. The change in this regard was probably extremely rapid after 2000. Research conducted in 2003–06 has described the mounting "craze for ultrasound" in Vietnam (Gammeltoft and Nguyen 2007a, 2007b; Gammeltoft 2007). According to a more recent survey, pregnant women received on average 6 ultrasound examinations in urban areas and 3.5 in the countryside (Toan et al. 2011). The widespread use of ultrasound began in the early 2000s with the import of new equipment such as 3-D scans.[9] It has been estimated that Vietnam has "about 5000 doctors working as sonologists with 3000 machines … from 3D–4D imaging to portable ultrasound," and the cost of a quality ultrasound examination had plummeted to US$2–10 by 2008 (Gammeltoft and Nguyen 2007a; Phan 2009a, 2009b). I am unaware of time series detailing the spread of modern ultrasonography through the expanding network of private health care facilities, or of data on the frequency of prenatal sex

identification over time. Similarly, there are no province-level statistics on ultrasound facilities that could be related to observed SRB variations. The only available indicator, which refers to the substantial increase in the number of ultrasound examinations performed in public facilities (Guilmoto et al. 2009), probably substantially underestimates the rise in the frequency of ultrasound tests if the private sector is also taken into account.

The role of son preference

The last crucial factor is the demand for sons, a feature widely described in gender studies conducted in Vietnam since the 1990s.[10] Many studies have documented the marginal position and low status of women in Vietnamese society and the preference accorded to male children for social, cultural, and economic reasons. For instance, males in traditional family settings have an essential role in old-age support, household enterprises and agricultural production, ancestor worship, and lineage perpetuation. Their role is closely delineated by the institution of the patrilineage (*ho*, sometime rendered as "clan") built around male ancestors, in which women are included only by marriage. Despite the ongoing promotion of gender equity by the socialist state, the preference for male offspring appears widely shared by women, couples, families, and communities—at least in the north, where all such studies have been conducted.[11]

Fertility decline has increased the anxiety about having male offspring, and many strategies have been devised to ensure a male child, such as adoption, remarriage, and repeated pregnancies. But before the appearance of ultrasound technology, the most common method of son-targeted fertility behavior had long been based on the "stopping rule," where the sex composition of children already born determines the subsequent fertility behavior of women (Basu and de Jong 2010). In Vietnam, the use of contraception or abortion proved more common among women who already had a boy, and, as a result, the sex ratio of the final birth to older women tends to be heavily biased toward boys (UNFPA 2009).[12] Prenatal sex selection appears therefore to be an effective response to a latent demand for sons, especially among women who want both to limit their offspring and to ensure the birth of a male descendant.

What has long been missing from the discussion of son preference is an assessment of its intensity across social groups and regions. Most field studies have described son preference in the Red River region, with only limited information on the variety of social and cultural contexts elsewhere in the country. Moreover, it is usually not feasible from purely qualitative, local studies describing gender-related practices to evaluate the strength of the bias against girls, which determines the extent to which couples are willing to take certain steps—including selective abortions—to prevent the birth of

daughters. Quantitative indicators are mostly limited to the ideal number of children by sex, a measure referring to opinions and attitudes rather than to actual behavior. The preference for sons expressed by the ideal number of sons and daughters and recorded by the Demographic and Health Surveys in Vietnam appears in fact fairly moderate (Fuse 2010).[13]

Fertility behavior provides a stronger indicator of the intensity of sex preference. The stopping rule referred to earlier is one such mechanism, illustrated by the fact that childbearing usually ends with a boy because of son preference. This practice can be explored more systematically by using parity progression ratios (PPRs)—the proportions of women with a given number of children who have an additional child—in the presence or absence of a previous son or sons. Recently, Filmer, Friedman, and Schady (2009) used differentials in stopping behavior according to the sex of previous births as a measure of sex bias in fertility progression. Unsurprisingly, their indicator takes high values in countries of South Asia and in Vietnam, where the absence of previous male births distinctly increases the frequency of an additional birth. This confirms the influence of the sex composition of siblings on PPRs highlighted from limited survey data in Vietnam (Haughton and Haughton 1999; UNFPA 2009; Pham et al. 2010a).

Using the reconstructed sibling population from sample census data, I developed a similar indicator of son preference. This indicator is initially computed for each parity, from which an average overall indicator is derived (see discussion in the Appendix). The indicator of son preference remains close to unity when the prior sex composition of the family is of no consequence for progression to a later birth, but it may rise to 2 if the probability of an additional birth is twice as large among daughter-only families as among families with a son. In the absence of prenatal sex selection, the overall sex ratio at birth is of course not influenced by son preference.[14]

Table 1 presents results of the parity-specific estimates of son preference in Vietnam. Estimates are further disaggregated by region. From the aggregate estimates for Vietnam, the sex bias seems limited (a net effect of 11 percent) from the first to the second birth, a result almost uniform across regions. This concurs with the rather moderate SRB value observed for second births. However, two successive female births have a powerful effect on the probability of a third pregnancy: the overall indicator jumps to 2.1, showing that the absence of a boy tends to double the frequency of third births. Interestingly, while the absence of a son remains a major factor in fertility decisionmaking, the measure of son preference decreases only slightly to 1.9 and 1.6 for higher-order births. The overall indicator of son preference for all parities is estimated at 1.6.

Disaggregated results shown in Table 1 illustrate the range of variations observed across geographic regions. All regions show some effect of son preference on parity progression. The Red River Delta region once again shows the most pronounced sex bias. In that region the birth of a fourth child is 4.7

TABLE 1 Effects of son preference on fertility progression by parity and region, Vietnam, 2009

Region	Effect of son preference at different parities				Average effect of son preference	Number of children
	1→2	2→3	3→4	4→5		
Northern Midlands and Mountains	1.16	2.42	1.60	1.42	1.69	327,759
Red River Delta	1.13	3.70	4.70	3.79	2.61	494,914
North and South Central Coast	1.09	1.94	1.97	1.94	1.60	497,923
Central Highlands	1.05	1.58	1.35	1.25	1.30	179,826
Southeast	1.08	1.68	1.54	1.78	1.38	323,757
Mekong River Delta	1.09	1.73	1.74	1.73	1.43	421,221
Vietnam total	1.11	2.14	1.91	1.62	1.62	2,245,399

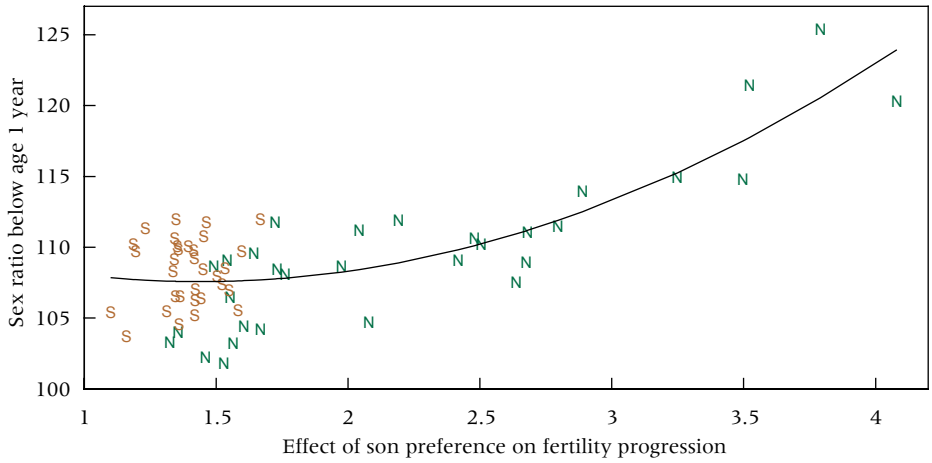
NOTES: Son preference in fertility progression is the ratio of parity progression without a previous son to parity progression with a son (1=no difference; 1.5= 50 percent higher probability of having an additional child in the absence of a previous male birth). Average son preference is the parity-weighted average of parity-specific son preference.
SOURCE: Computed by the author from the 15 percent census sample (See Appendix).

times as frequent after three successive girls as it is after the birth of at least one son. Son preference in the Delta is significantly higher than in the two other northern regions, and twice as high as in the three southern regions of Central Highlands, Southeast, and Mekong Delta. Although not shown in Table 1, differences in the impact of previous male births on fertility behavior are also visible across SES quintiles. An increase occurs from low son preference among the poorest quintile (1.35) to higher levels among the two richest quintiles (1.91 and 1.80). These estimates suggest that the higher levels of birth masculinity described earlier for North Vietnam and for the richer households run parallel to the sex preference expressed by parity progression ratios.

Figure 2 plots my measure of the effect of son preference on fertility progression against the sex ratio at birth by province. On the left side of the figure, the lowest sex differential in parity progression, 1.1, is recorded in Kon Tum province (Central Highlands), and corresponds to a marginal difference of 10 percent between parents with and without a previous male child. But on the right side, the indicator reaches 4.0 in some provinces such as Hai Duong, a predominantly rural North Vietnamese province located midway between the cities of Hanoi and Haiphong. In fact, 16 provinces record values above 2.0, all of them located in the north. A fairly straightforward picture emerges from this comparison: a stronger effect of son preference on fertility progression is clearly associated with a higher proportion of male births. Provinces with the highest indicators of son preference have the highest SRB levels and are also the outliers seen in Figure 1.

A very strong positive association between the two series emerges for northern provinces. The few provinces in the north with a moderate level of son preference display almost normal SRB levels around 105. However, the

FIGURE 2 Relationship between the effect of son preference on fertility progression and sex ratio below one year of age by province, Vietnam, 2009 census



NOTES: N = North Vietnam; S = South Vietnam. See Appendix for details on the estimation of the son preference indicator. Higher effects of son preference on fertility progression correspond to higher values of the sex ratio. The trend curve is fitted with fractional polynomials.
SOURCE: Effect of son preference computed by the author from the 15 percent census sample (see Appendix); sex ratio from GSO (2010).

picture is different for southern provinces concentrated on the left side of the figure. They show little variation in the intensity of son preference and no tangible correlation with observed SRB levels. In other words, the relationship between sex bias in fertility decisions and birth masculinity is extremely strong in the north and nonexistent in the south.[15]

Sex preference and kinship structure

The link between sex ratios at birth and son preference in parity progression is clear, with prenatal sex selection increasingly used as an effective strategy both for limiting one's offspring and for ensuring a male birth. What remains poorly explained is the source of the variations in sex preference observed across the country. Research drawing on field surveys clearly links the preference for sons with the requirements of the traditional society, based on patriarchal family structures and value systems. Although patriarchy is often the concept used for encapsulating gender discrimination, it remains loosely defined, encompassing domains ranging from male dominance in social and economic sectors to strict patrilineal and patrilocal institutions.

Instead of examining social and economic manifestations of gender inequity, I have opted here for a narrower definition of patriarchy that focuses on kinship structures and marriage practices. Marriage practices and the prevalence of patrilateral patterns—in which a married couple resides with

the husband's family—can be examined with census data and reflect directly on the prevalence of patrilineal systems. Kinship structures are often a clear sign of the nature of gender arrangements (Dube 1997; Kaser 2008) and have often been fruitfully used in demographic research (Dyson and Moore 1983; Todd 1985). In Vietnam, previous research using survey data has formally associated the incidence of patrilineality with variations in such demographic outcomes as fertility (Bryant 2002), life expectancy (Hoi et al. 2009), and old-age support (Truong et al. 1997; Knodel et al. 2000; Friedman et al. 2003). At the same time, anthropological features typical of Asian societies have been used to account for the extent of long-standing discrimination against women, characterized both by female infanticide and more recently by the rise in prenatal sex selection in specific regions.[16]

Kinship structure and son preference

The "Vietnamese kinship system" refers to a host of family institutions that have been documented by field studies over the last 50 years. These studies have been largely restricted to the northern provinces and, as a result, Vietnamese kinship structures are often associated with those prevailing in China—the country that ruled North Vietnam for a millennium in the past and deeply influenced its society and culture. Ethnic Kinh, who constitute the majority of Vietnam's population, are mostly characterized by a patrilineal system akin to that found in Confucian China. Relatives are clearly divided into the patrilineal "inside lineage" and the "outside lineage" on the mother's side. But significant divergence from the Chinese pattern has been observed, such as the higher frequency of simple, nuclear household structures in North Vietnam. Even if they remain in the husband's village, married couples do not cohabit indefinitely with the son's parents; on the contrary, they are likely to form a new household either immediately after marriage or a few years later. The marriage system appears to be predominantly patrilateral, although neolocal arrangements are also common.[17] But drawing on additional evidence from studies conducted in South Vietnam, Haines (2006) emphasizes the contrary "mix of influences" on kinship structure in Vietnam and identifies traces of Southeast Asian kinship patterns. Situating Vietnam at the confluence between East and Southeast Asia rather than seeing it as a typical patrilineal society has major implications for understanding the country's kinship systems and gender roles.

A key source of diversity in kinship structures is the presence in Vietnam of a large number of ethnic minorities. Many groups have a shared history with ethnic Kinh, while others are closer to ethnic groups found in neighboring countries. This is the case, for instance, with ethnic populations found in several provinces in the central and southern parts of the country such as the Gia Rai or the E De. Kinh migration to these semi-mountainous areas has been considerable over the last three decades, resulting in a rapid shift in the ethnic composition of the entire region (Hardy 2003). Another aspect of

kinship diversity in Vietnam relates to the history of the southward expansion of the Kinh population (Tran and Reid 2006). The Kinh originated from the northern plains and delta regions, and they progressively expanded southward from the eleventh to the eighteenth century, absorbing local populations of Chamic and Khmer origins.

One would therefore expect family structures across Vietnam's provinces to display a good deal of heterogeneity, with features ranging from patriarchal patterns typical of the Red River Delta to a more bilateral system in southern provinces.[18] Anthropological research, once again focusing on the north, provides an incomplete mapping of Vietnam's kinship systems, since many areas or social groups have not been subjected to intensive surveys. No consistent set of ethnographic mapping across the country exists to allow for the type of regional analysis pioneered for India by Miller (1981). Yet, several anthropological studies (e.g., Haines 2006; Do 1991) document the wider prevalence of bilateral systems in South Vietnam.

Analyses of household structure based on sample surveys have shown the extent to which the south differs from the north's patrilineal norm.[19] Census data make it possible to overcome the limitations of ethnographic and statistical materials by offering a more systematic analysis of household structures across provinces, using the residential arrangements of married children as a yardstick of patrilocal versus bilateral systems. Here I use a simple indicator of kinship systems by identifying the share of males and females among married children residing with their parents. As noted earlier, Vietnamese households are on the whole small and are less likely to include married children than in other Asian countries, but multigenerational arrangements with one married child living with his or her parents are not uncommon, especially following marriage and the birth of children. In fact, 20 percent of the households used in the analysis below (with household head aged above 40) include a married child.[20]

Coresidence of a married daughter with her own family differs of course from patrilineal arrangements in which daughters play only a transient social and economic role in their family of origin. Such coresidence is largely avoided in traditional patrilocal settings since women join their husband's family after marriage and often reside for several years with the husband's family. Uxorilocal residence (in which a married couple lives with or near the wife's parents), on the other hand, is a common feature in the south and constitutes one of the typical traits of its bilateral system. The proportions of sons and daughters of the household head among coresiding married children therefore reflect the relative weight of patrilocal and uxorilocal family arrangements. Table 2 shows significant variations in the proportions of households with married children across Vietnam's regions. The Mekong River Delta has the largest proportions of families with coresiding married children. But of greater interest here is the share of daughters among coresiding married children: their proportion varies across regions from 12 percent to 41 percent and is twice as large in the south as in the north.

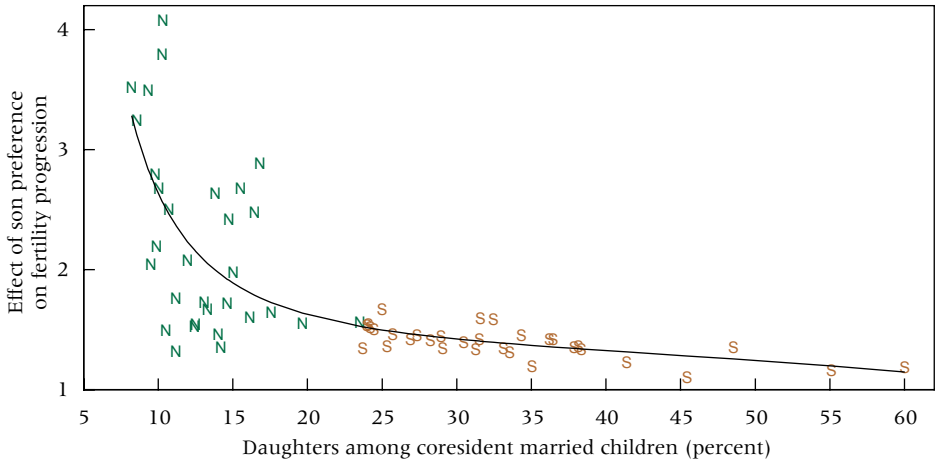
TABLE 2 Coresidence of married children with parents by region, Vietnam, 2009

Region	Percent of households with coresiding married children		Percent of daughters among coresiding married children	Number of households with married children
	All children	Daughters		
Northern Midlands and Mountains	22.5	2.8	12.4	60,339
Red River Delta	16.1	2.3	14.1	100,279
North and South Central Coast	16.4	3.5	21.3	89,479
Central Highlands	16.4	6.6	40.3	18,519
Southeast	23.7	9.8	41.1	79,486
Mekong River Delta	29.2	8.4	28.8	138,768
Vietnam total	20.6	5.1	24.8	486,873

NOTE: Restricted to households whose head is aged 40 years or more.
SOURCE: Computed by the author from the 15 percent census sample (see Appendix).

Figure 3 illustrates the relationship between the prevalence of patrilineal systems and high son preference across Vietnam. Notice first that the proportion of daughters among coresiding married children—ranging from 23 percent to 60 percent—is systematically higher in the south than in the north, and this is especially the case in provinces with sizable minority populations.

FIGURE 3 Relationship between percent of coresiding married daughters and effect of son preference on fertility progression by province, Vietnam, 2009 census



NOTES: N = North Vietnam; S = South Vietnam. See Appendix for details on the estimation of the son preference indicator. Higher proportion of daughters among coresiding married children typical of bilateral kinship systems corresponds to lower effects of son preference on fertility progression. The trend curve is fitted with fractional polynomials.
SOURCE: Computed by the author from the 15 percent census sample (see Appendix).

These values, which reflect the south's mixed kinship systems and the prevalence of bilateral marital residence, correspond very closely to the low levels of son preference in that region inferred from parity progression ratios. In the south, the contribution of daughters to their biological family, illustrated here by coresidence but also attested in various socioeconomic surveys by other forms of cooperation, stands in sharp contrast to the strong preference for sons observed elsewhere in Vietnam. The situation appears less clear-cut in the north, where patrilocal residence predominates and seems only weakly related to the intensity of son preference.[21]

The correlates of high sex ratios in Vietnamese provinces

The preceding review of factors contributing to high sex ratios at birth in Vietnam suggests the interplay of social, demographic, and economic characteristics. This section combines these factors to rank their relative influence by using the variables examined previously in a multivariate analysis of variations in the sex ratio below one year of age at the province level. I have limited the analysis to a restricted number of independent variables. A preliminary multivariate analysis showed a large number of variables to be uncorrelated with the sex ratio at birth, including urban/rural residence, population density, indicators of average education levels, and all variables related to economic status. This absence of correlation may be partly attributable to the limited size of the sample and to potential multicollinearity between variables used.[22]

Table 3 presents the results of the multivariate analysis of the regional variations in birth masculinity. In spite of the very good fit (r^2=.712), only a small number of variables are meaningfully related to birth masculinity

TABLE 3 Multivariate model of the correlates of the sex ratio of children below one year of age by province, Vietnam, 2009

Independent variable	Coefficient	t	P>|t|
Fertility	–0.728*	–2.170	0.034
Fertility (log)	0.437	1.420	0.161
Ethnic minority	–0.052***	–4.200	0.000
Son preference	2.515***	8.240	0.000
Bilaterality	–1.224***	–4.040	0.000
Constant	110.150***	272.850	0.000
No. of provinces	63		
r^2	0.712		

Significance levels: *5 percent; **1 percent; ***0.1 percent. t is student's t-statistic and P>|t| its significance level.
NOTES: All data are province-level averages from the 2009 census. Fertility: total fertility rate; Ethnic minority: percent non-Kinh population; Son preference: the effect of son preference on fertility progression (see text); Bilaterality: percent daughters among coresiding married children (see text). Bilaterality, fertility, and son preference variables have been orthogonalized (in this order).

at this scale of analysis. As expected, the effect of son preference on fertility progression, ethnic minority status, and bilateral marriage systems (including coresidence of married daughters) are the strongest predictors of variations in the sex ratio at birth (computed here by the sex ratio below one year of age). Son preference, even after correction for the collinear effect of fertility and bilaterality, remains the first correlate of sex ratio at birth in Vietnam. This confirms that the demand for sons remains the paramount reason for couples to resort to prenatal sex selection. The prevalence of patrilineal postmarital family arrangements is also a distinct factor increasing the SRB. The proportion of ethnic minorities in a province is the third major factor influencing birth masculinity. The introduction of this factor entirely eclipsed the otherwise well-established influence of the average regional SES level. In addition to specific social and cultural differences, the presence of a minority population is a powerful indicator of low socioeconomic status, poor infrastructure, and lack of geographic accessibility. This result reflects the pronounced residential segregation among Vietnam's ethnic minority groups in spite of the population redistribution occurring through inter-regional migration and of specific policies favoring ethnic minorities.[23] Although fertility plays a less prominent role in this analysis, low fertility tends as expected to increase birth masculinity when other determinants are factored in.

It is noteworthy that variables introduced in the multivariate model have totally displaced the north/south divide that seemed at first to lie at the root of sex ratio differences in Vietnam. An additional geostatistical analysis (not shown) demonstrates that the geographical patterning of the SRB in Vietnam is entirely explained by the variables included in the model presented here.

Conclusion and recommendations

This article highlighted regional variations in the sex ratio at birth in Vietnam. These variations are also found in other countries in East and South Asia where the sex ratio at birth started increasing long before it did in Vietnam. I identified the three variables that determine the prevalence of prenatal sex selection. Sex selection is related to low fertility and social and economic development, and the swift rise in SRB levels observed after 2003 in Vietnam is attributable to the recent widespread availability of ultrasound technology. But these two factors appear secondary to the underlying need for male offspring. Son preference thus emerges as the strongest predictor of current birth imbalances in Vietnam. I then explored variations in sex preference observed in Vietnam and their relation to patrilineal families. I showed that Vietnam's kinship structures are significantly more heterogeneous than previous studies suggest. The majority status of Kinh ethnicity as encapsulated in official statistics conceals significant sociocultural diversity, with parts of the country characterized by bilateral arrangements common in Southeast Asia.

Prenatal sex selection not only points to the intensity of gender bias in Vietnam, but also foretells a future sex imbalance among adults. While the situation is currently less severe than in China or India—where sex imbalances have now accumulated over two decades (Guilmoto 2012b)—the large numbers of Vietnamese women marrying abroad may worsen the potential marriage squeeze for men in the future (Thai 2008). Attempting to avoid such consequences, in 2003 Vietnam introduced a law prohibiting prenatal sex selection and strengthened this law in 2006 by imposing significant fines on medical personnel and women using ultrasound technology for purposes of prenatal sex selection. Even if still rather ineffective, this legislation attests to the early involvement of the government. In addition, several programs to raise awareness of and provide support to girls have been launched on a pilot basis since 2009 (see, e.g., UNFPA 2010b: 78–85).[24]

I conclude by sketching four recommendations for future research and analysis.

First, several key elements of our understanding of son preference are derived from ordinary census data. I have, for instance, devised a new indicator of the effect of son preference on fertility behavior based on the household's child composition, which has allowed me to demonstrate the link between sex preference in fertility and prenatal discriminatory behavior. This relationship cannot be formally established on the basis of in-depth surveys, which are not representative of larger regions and do not provide quantitative measurement of the intensity of existing sex preferences. Similarly, using the information on the coresidence of married children with their parents, I devised an indirect measurement of patrilocality, a trait commonly associated with the pivotal role of sons in their native family. These two results provide illustrations of the insights that can be gained from census micro-data, and how they can supplement limited field evidence by providing indirect quantitative estimates for sociological or anthropological mechanisms.

Second, estimates of the prevalence of son preference as an influence on fertility behavior may lead to a systematic identification of localities and social groups exhibiting greater gender bias. Based on samples of adequate size, such assessment of the intensity of son preference provides more reliable predictors of potential bias against girls than the more commonly used measurements of ideal family composition. This methodology could be applied widely for evaluating the latent demand for sex selection, including in countries where the other preconditions of prenatal sex selection (modern technology, access to abortion, low fertility preferences) are not met. This may be feasible, for instance, in several countries in West and South Asia where son preference has been reported in surveys. I recommend therefore that census-based samples be used to estimate the effect of sex preference on fertility behavior in order to detect the potential for prenatal or postnatal discrimination in specific regions or social groups.

Third, I emphasized the role played by kinship and ethnic composition in explaining variations in prenatal sex selection across Vietnam. In previous work on India (Guilmoto 2008), I stressed the seemingly irreducible spatial patterning of sex discrimination, but census indicators of kinship structures and sex preference used here appear to account for all of the geographical variations in the sex ratio at birth. This suggests that the commonly observed spatial patterning of prenatal sex discrimination derives primarily from differences rooted in local communities. Recent social and economic change has had only limited influence on this geography.

Fourth, these findings have significant implications from a policy perspective. Several concomitant factors such as fertility decline and economic progress are unlikely to change direction in the future. Moreover, smaller families, increased access to health care infrastructure, and higher incomes may soon spread to underdeveloped regions in Vietnam and become a source of further increases in the overall SRB. But the role that underlying kinship structures play in determining the intensity of biased gender preference means that transforming traditional attitudes may prove as difficult as promoting fertility decline was in the past: deep-seated social norms are indeed less responsive to policy intervention than are market imperfections. In addition, we do not know whether the relatively woman-friendly attitudes and policies found in parts of Vietnam will be able to withstand the gradual socioeconomic homogenization of Vietnam's population. The fact that prenatal sex selection can also be detected in the largest metropolitan areas such as Hanoi and Ho Chi Minh City suggests that rapid social transformations and the growing employment opportunities for women have not yet substantially eroded traditional gender arrangements. If local authorities and civil society organizations want to accelerate the return to biologically normal sex ratios, they will have to support a mix of policies combining monitoring of sex selection, changes in the law, targeted financial incentives, and campaigns to change traditional patriarchal values.

Appendix

Data sources

In the absence of published birth registration data, Vietnam's sex ratio at birth can only be monitored by use of decennial censuses and sample surveys. Unless stated otherwise, all data used in this article come from the 2009 census, including mortality rates derived from the life tables computed by the General Statistics Office. Some figures are from the recently published complete census results (GSO 2010), which provide age and sex distribution and ethnicity for administrative units. Since sex differentials in infant mortality are modest, the sex distribution of the population below one year of age is a reliable indicator of sex imbalances at birth. Census data used in this analysis are accessible from the IPUMS International website «https://international.ipus.org/international/».

Most individual and household information is drawn from a sample based on the "long questionnaire" restricted to 15 percent of the population. These sample microdata permit computation of the sex ratio of births recorded during the last 12 months according to a variety of individual and household characteristics. Sample data can also be used to reconstruct the indicators used in this article: birth order, parity progression, and kinship structure.

Reconstructed sibling population

Demographers have long used individual census and survey records of children in households to reconstruct past fertility trends. The procedure—the own-children method developed initially for estimating fertility (Cho et al. 1986)—involves reconstructing birth histories by using surviving children residing with their mothers. The method can also be applied to the reconstructed population of children to assess past trends in SRB with respect to other demographic and family characteristics.

I reconstructed the sibling population from individual records from the 2009 census sample by identifying children (and whenever possible grandchildren) with identical parents. Ninety-four percent of the population below age 15 years can thus be reclassified as siblings. Compared to the age-specific sex ratio, the reconstructed population of children has the advantage of indicating the birth rank of each child and therefore allows for estimation of past SRB levels by parity and by sex composition of the family. The limitation of this estimate is the inevitable underestimation of the actual parity by using child rank in the family: that is, some children are missing from the household of their mothers because of mortality and migration. The bias caused by differential migration and mortality on the sex distribution of children is likely to be modest.

Effect of son preference on parity progression

The parity progression ratio (PPR) at parity n is computed as the proportion of women with n births who have an additional n+1th birth. PPRs can be computed using detailed birth histories collected in population surveys such as the DHS, with the birth history truncated by the age of the mother at the time of the survey.[25] Because the detailed birth history is usually missing from the census, I reconstructed the sibling population as described in the previous section. With it, I can then reclassify surviving children by birth order, sex, and age as well as by other characteristics of their mothers and households. This reclassification permits the calculation of the proportion of children at various parities who have a younger sibling, a measure similar to the PPR. Unlike survey data, the 15 percent census sample is large enough for disaggregated regional and socioeconomic analysis by birth rank and sex composition of the family.

I devised a parity-specific measure of the effect of son preference on fertility progression pertaining to the 1999–2009 intercensal period.[26] This indicator of son preference is computed as the ratio of the PPR *without* a previous male child to the PPR *with* a previous male child. This indicator is equal to one when the sex composition of previous children does not influence subsequent fertility behavior and takes values above one if the absence of a son enhances the probability of an additional birth (see Table 1). I also computed a synthetic indicator of the effect of son preference on fertil-

ity progression by averaging the parity-specific indicator for birth ranks 1, 2, 3, and 4. I used the respective proportions of births by rank in each population studied as relative weights. This indicator of son preference takes the value of one in the absence of sex-specific bias in fertility progression and 1.5 if the absence of a previous male child augments the probability of a subsequent birth by 50 percent.

While this indicator directly reflects the intensity of son preference, it is also indirectly influenced by the fertility target of the parents. Moreover, because the indicator is based on truncated data collected during the census, it may slightly overestimate son preference if birth intervals are shorter among women who have never given birth to a boy.

Notes

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1 On the increase in birth masculinity in Asia, see Croll (2000), Miller (2001), and Attané and Guilmoto (2007).

2 Unless otherwise noted, estimates used in this section are drawn from the 2009 census of Vietnam and are found in UNFPA (2010a) and GSO (2010, 2011b).

3 The Kinh accounted for 85 percent of the total population in 2009. Khong (2002) provides an overview of ethnic groups in Vietnam.

4 Vietnam is comprised of 63 provinces, which are also part of six macro-regions used for statistical purposes: Northern Midlands and Mountain areas, Red River Delta, North and South Central Coast, Central Highlands, Southeast, and Mekong River Delta. A map of SRB variations appears in GSO (2011b).

5 Data presented here are based on the full counts of the population below one year of age, rather than on births during the last 12 months that are only available from the 15 percent sample. As a result of the higher infant mortality among males relative to females, these province-level estimates may tend to slightly understate the actual SRB.

6 The relative flexibility of Vietnam's fertility policy is illustrated by the recent relaxation of the two-child norm by allowing a third birth under several conditions. For a general discussion of fertility decline in Vietnam, see Scornet (2009) and Pham et al. (2008).

7 The Hai Van Pass located between Hue and Da Nang that used to separate the Vietnamese and Champa kingdoms is taken as the boundary between North and South Vietnam. The new statistical macro-region of North and South Central Coast includes both northern and southern provinces.

8 On abortion in Vietnam, see for instance Asian Development Bank (2005), Le (2006), and Wolf et al. (2010). On second-trimester abortions, see Hoang, Phan, and Trang (2008) and Gallo and Nghia (2007). Abortion costs are given by PATH (2006).

9 Gammeltoft (2007: 156) reported that 3D scans had spread in urban areas "over the past five years," a period corresponding exactly to the onset of the rise in birth masculinity in certain areas beginning in the early 2000s. Anecdotal information collected in 2010 from Hanoi's Central Obstetrics Hospital confirms this timing. Based on their fieldwork in 2003, Bélanger and Khuat (2009: 165) suggest that 3D scans were found only in hospitals in the largest cities up to then.

10 A first detailed study was conducted by Haughton and Haughton (1995). For a recent

summary of available research see UNFPA (2010b).

11 The most insightful studies of the gender context in the north are Gammeltoft (1999), Pham (1999), and Werner (2009). On son preference in the north, see also Bélanger (2002) and Rydstrom (2003). For a regional perspective, see UNFPA (2011).

12 It should be noted, however, that excess female child mortality—including sex-selective infanticide—of the type observed in Northwest India and in China has never been documented for Vietnam. No discernible excess infant and child mortality among females has been recorded (Nguyen 2002).

13 The ambiguity in estimating and interpreting sex preferences based on the ideal sex composition of the family is illustrated by a recent comparative study of East Asian countries including Vietnam (Eu, Wongboonsin, and Mihn 2011). Eklund (2011) provides a detailed discussion of the notion of son preference.

14 Basu and de Jong recently described two implications of son-targeted fertility behavior at the aggregate level: girls are born on average into relatively larger families than boys, and similarly girls are born at relatively earlier parities within families because of the tendency of women to stop childbearing with a male birth.

15 The province-level correlation coefficient (r^2) between SRBs and the effect of son preference on fertility behavior varies from 0.73 in the north to almost zero in the south.

16 For a general perspective linking kinship systems and sex preferences in Asia, see Das Gupta et al. (2003), Das Gupta (2010), and Croll (2000). Using ethnographic and census data from the British period, Chakraborty and Kim (2010) provides an informative analysis of the relationship between kinship institutions and sex ratios in colonial India.

17 See monographs referred to in endnote 11. Hirschman and Minh (2002) provides a recent analysis of patrilocality. Hong (2009) stresses the stem family aspects of kinship in North Vietnam. See also Nguyen (2010) on the implications of lineage membership.

18 A bilateral (or consanguineal) kinship system is one in which the mother's and father's families are equally important in terms of descent and inheritance. It is usually characterized by a significant portion of matrilocal marital patterns, in addition to patrilocal and neolocal arrangements. On bilateral descent systems in Southeast Asia, see King and Wilder (2003) and Dube (1997).

19 On the difference between kinship systems in the north and south, see also Hirschman and Vu (1996), Truong et al. (1997), Bélanger (2000), Knodel et al. (2000), and Haines (2006).

20 The frequency of multigenerational living arrangements is also reflected by the fact that as many as 30 percent of children below age five years are classified by the census as grandchildren of the household head.

21 Northern provinces lying below the fit curve in Figure 4—with lower-than-expected son preference—have higher fertility and large ethnic minority populations. These regions have strong patrilineal descent systems, but their high fertility tends to reduce the significance of my indicator of the effect of son preference on fertility.

22 Several key variables display a high level of collinearity. Multicollinearity is especially strong between my indicators of bilaterality, fertility, and son preference. I have therefore orthogonalized these variables to improve the specification of the model. This procedure ranks variables based on the assumption that bilaterality and fertility were prior determinants of son preference. The resulting son preference variable therefore corresponds to variations in son preference that are not accounted for by regional levels of bilateral coresidence and of fertility.

23 The growing socioeconomic gap between Kinh and other ethnic groups is extensively analyzed by Baulch et al. (2002) and VASS (2006). The strong spatial clustering of poverty in upland Vietnam corresponding to minority-inhabited areas is also related to agro-climatic factors and lack of access to markets and urban centers (Minot, Baulch, and Epprecht 2006; Epprecht, Müller, and Minot 2011).

24 Contrary to the experiences of many countries in Asia and in the Caucasus and western Balkans there has been no public

denial of the existence of birth imbalances in Vietnam. Several qualitative and statistical studies have been launched to document the issue over the last five years. I can attest to widespread awareness and commitment expressed by various officials of the Ministry of Health and health managers in Hanoi and Tai Binh hospitals during visits in 2009, 2010, and 2011, as well as to extensive media coverage of prenatal selection.

25 Some women who have not yet reached parity *n* may eventually go on to parity *n*+1 after the survey. As a result, actual cohort-specific PPRs may be underestimated.

26 There are various methods for estimating the intensity of the differential stopping behavior or male-targeted stopping rules. Filmer, Friedman, and Schady (2009) use a slightly different method.

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