
KINSHIP INSTITUTIONS AND SEX RATIOS IN INDIA*

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This article explores the relationship between kinship institutions and sex ratios in India at the turn of the twentieth century. Because kinship rules vary by caste, language, religion, and region, we construct sex ratios by these categories at the district level by using data from the 1901 Census of India for Punjab (North), Bengal (East), and Madras (South). We find that the male-to-female sex ratio varied positively with caste rank, fell as one moved from the North to the East and then to the South, was higher for Hindus than for Muslims, and was higher for northern Indo-Aryan speakers than for the southern Dravidian-speaking people. We argue that these systematic patterns in the data are consistent with variations in the institution of family, kinship, and inheritance.

Ever since Sen (1990) proclaimed that more than 100 million women are missing around the world, referring to the abysmally low fraction of women in the total population, the case of “missing women” has generated considerable interest. In contrast to Europe and North America, where the male-to-female sex ratio is 0.95 (favoring the presence of females), the ratio in many Asian countries—such as India, China, Taiwan, Hong Kong, and South Korea—is as high as 1.06, significantly favoring the presence of males.¹ Moreover, in many of these countries, the male-to-female sex ratio seems to have risen over the second half of the twentieth century with economic development, declining family size, and the advent of technologies that facilitate self-selective abortion or sex-selection (Park and Cho 1995).

In India, and possibly elsewhere in Asia, however, the case of missing women has deep historical roots (Dyson and Moore 1983). Although identifying when the problem of missing women first arose in India is difficult, British officials were well aware of the problem in North India during the mid-nineteenth century.² More reliable evidence from the British India censuses conducted during the late nineteenth century shows that this problem was clearly a northern rather than a southern or an eastern problem. The male-to-female sex ratio was highest in northern regions, such as Punjab; relatively equal in eastern regions, such as Bengal; but relatively low and favored women in southern regions, such as colonial Madras (Dyson and Moore 1983; Visaria 1961).³

Although the regional difference in sex ratios narrowed between the northern and southern regions during the twentieth century, the narrowing is largely due to the convergence of southern sex ratios toward the northern figures. For all of India, the overall sex ratio increased from 1.03 to 1.07 between 1901 and 2001. During this period, however, the sex ratio in the historically most-masculine Punjab region in the North, ranging from

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1. Biologically, for any cohort, sex ratios favor males at birth but favor females over time. See, for example, Kishor (1993), Qian (2006), Murthi, Guio, and Dreze (1995), and Norberg (2004) for details.

2. In North India, the British officials suspected that the Rajputs were practicing female infanticide during the mid-nineteenth century (Miller 1981; Parry 1979). Data show that in 1852, among some of the highest royal clans, the sex ratios of boys to girls ranged from 2.5 to 4.6 (Parry 1979:216).

3. For patterns of sex ratios around the world, see Coale and Demeny (1983) regional model life tables.

1.13 to 1.28, remained significantly higher than the national average. Although some regions in the South (such as Kerala) continue to exhibit a significant feminine bias, the figure in Tamil Nadu (in the South) converged toward those of the North when it grew from 0.96 to 1.01 during the twentieth century.

Because the problem of missing women in India has existed for more than a century and a half and is an endemic and persistent feature of the Indian society, there are strong reasons to believe that the causes of missing women are both historically determined and slow moving. For many scholars, the family and kinship systems, which often determine the rights of women in traditional societies, are the most likely factors for the historically persistent pattern of missing women (see Agarwal 1994; Das Gupta et al. 2003; and Kishor 1993). In a well-cited paper, Dyson and Moore (1983) argued that the northern Indian kinship system based on village exogamy led to lower autonomy of women, lower age at marriage, higher fertility, higher childhood female mortality, and higher sex ratios. By contrast, the southern kinship system, based on cross-cousin marriages, increased the autonomy of women and contributed to sex ratios that favored females rather than males.

In this article, we delve more deeply into the relationship between kinship and sex ratios by studying sex ratios by caste, language, religion, and region at the turn of the twentieth century in India.⁴ From a kinship perspective, the examination of data by caste is essential because castes at the jati level (or subcaste level) were endogamous and because kinship behavior was enforced along caste lines (Blunt 1931). Because the castes were further distinguished by social hierarchy, occupation, and income, data by castes also provide useful information on whether kinship behavior varied by status and income. We also explore sex ratios by language and religion because marriage and kinship relationships are likely to differ among people who speak different languages and practice different religions. Language not only facilitates communication but often codifies norms of kinship behavior (Morgan 1871). Religious institutions also imposed strong restrictions on kinship and inheritance rules. Finally, because regions possess different factor endowments, economic structures, and political institutions, marriage and kinship behavior may differ by geography.

We construct our data from the 1901 Census of India for the provinces of Punjab (North), Bengal (East), and Madras (South). These three provinces were chosen because they represent the three major regions in India. Using detailed subcaste or jati-level data for each province at the district level, we find that sex ratios differed significantly by caste, language, and region. The most significant feature of the data is the variation in sex ratio by region. Sex ratio was the highest in the North; followed by the East; and then the South, where the sex ratio favored females. This regional pattern was extremely robust. The pattern was observed even after we controlled for district fixed effects and when we controlled for differences in caste composition. The same regional pattern also emerged for each caste, language, and religious category. Sex ratios also varied systematically by caste rank, language, and religion but less so with soil and climate. The ratio varied positively with caste rank, was higher for Hindus than Muslims, was higher for northern Indo-Aryan speakers than the southern Dravidian-speaking people, and was higher in areas with higher rainfall.

Although distinguishing between the economic and cultural factors is difficult, we believe that these systematic patterns in the data seem consistent with variations in the institution of family, kinship, and inheritance. Because caste rank is highly correlated with landownership and income, sex ratio variation along caste lines is consistent with both economic and cultural factors. However, the extremely robust regional variations in sex

4. Miller (1981) was one of few to examine the link between caste and sex ratios. Based on the examination of 12 major castes in the United Provinces and Madras in 1931, she argued that upper castes were likely to have higher sex ratios based on their history of female infanticide and the pressures on property.

ratios seem much more consistent with regional variations in kinship institutions than with variations in economic factors. For example, among those of similar castes, sex ratios are consistently higher in the North and the East than in the South even with controls for geographic factors, which should capture variations in agricultural practices across the regions.

This article is organized as follows. In the next section, we present our theoretical framework for studying the relationship between family-kinship institutions and sex ratios and then examine the relationship between kinship institutions and gender bargaining power in India. Then we present data on sex ratios by caste, religion, language, and regions for three provinces, followed by regression framework to estimate the impact of these variables on sex ratios. Next, we explore the origins of the regional divergence of family and kinship institutions in India. We conclude with a short summary.

A FRAMEWORK FOR STUDYING KINSHIP INSTITUTIONS AND SEX RATIOS

Pre-modern India (including our period of study, the late nineteenth century) can be usefully characterized as a “natural state.” In a natural state, as defined by North, Wallis, and Weingast (2006), political elites form alliances with economic elites to create rents by limiting economic entry; they then use those rents to stabilize the political system to limit violence and provide order. In India and elsewhere, the elites used religious and kinship institutions, in addition to their economic and military resources, to establish informal norms and beliefs to define property rights and resolve problems of cooperation and conflict (Greif 2006a). Because the formal bureaucratic organization of the elites was relatively limited in India, the informal institution of religion, caste, and kinship played a paramount role in the lives of local peasants.

Importantly, the family and kinship institutions possessed significant distributional consequences for different members of society, especially between men and women (Stone 1997). In Europe, a kinship system based on bilineal descent, nuclear family, and an inheritance system that gave women the right to inherit property contributed to relatively strong autonomy of women. In many parts of Asia, however, a kinship system based on patrilineal descent, the importance of joint family (i.e., extended family members living in the same household), the inability of women to inherit property, restrictions on remarriage for widows, and severe restrictions on women’s sexual behavior and general conduct all contributed to relatively weak autonomy of women. Because the distribution of family resources between the sexes depends on the bargaining power of men and women within marriage and kin group, the kinship systems are likely to influence sex ratios.

There are two types of family bargaining models: the separate spheres model (Lundberg and Pollak 1993) and the divorce-threat model (Manser and Brown 1980; McElroy and Horney 1981). The spheres bargaining model, with internal threat points determined by the control of resources within marriage, is applicable to the Indian scenario, where divorce is highly restricted, especially for the higher castes. For empirical evidence on the correlation between female bargaining power and the distribution of family resources that affect the relative health, nutrition, and mortality of female members of the family, see Hodinott and Haddad (1995), Lundberg, Pollak, and Wales (1997), and Thomas (1990, 1994).

In Table 1, we summarize our proposed relationship between Indian kinship institutions and women’s internal and external threat points as motivated by the models of family bargaining. In many instances, we believe that the kinship institutions reduced both the internal and external threat points of women simultaneously. See McElroy (1990) for a comprehensive treatment of the empirical content of family bargaining model.

Kinship Institutions and Female Bargaining Power

By placing restrictions on marriageable partners, rules of descent, and rules of residence, kinship institutions define the nature of the bargaining power among different family, kin group, and endogamous members. Moreover, these traditional kinship institutions play a

Table 1. Kinship and Bargaining Power of Women

Kinship Institution	Internal Threat Point of Women	External Threat Point of Women	Region, Caste, Religion
Patrilineal	Declines	Declines	North
Patrilocal	Declines	Declines	North, South
Matrilineal	Rises	Rises	South (Kerala)
Matrilocal	Rises	Rises	
Duolocal	Rises	Rises	South (Kerala)
Close Kin	Rises	Rises	South, Muslims
Exogamy	Declines	Declines	North
Gotra/Sapinda	Declines greatly	Declines	North, Brahmins/high caste
Joint Families	Declines	—	Landowning castes
Arranged Marriage	Declines	—	India
Young Age at Marriage	Declines	—	India, East
Inheritance			
Mitakshara	—	Declines	North
Dayabhaga	—	Declines slightly	East
Dowry	Declines	—	North, high caste
Bride price	Rises	—	South, low caste
Women's right to property	Rises	Rises	South
No Divorce	Declines	Declines	High caste
No Market Labor	Declines	Declines	High caste
Behavioral Restrictions	Declines	—	High caste

major role in determining the bargaining power of women, which in turn affect the health and economic welfare of women and female children of developing countries such as India (Agarwal 1994, 1997; Folbre 1997; Miller 1981).

Anthropologists believe that the bargaining power of family members is likely to be influenced by the restrictions on the alliance formation within and across families and kin groups as defined by different kinship systems. For example, bargaining power of women is lower in patrilineal and patrilocal societies compared with matrilineal and matrilocal societies (Fox 1967; Stone 1997). In a patrilineal society, because consanguine women cannot reproduce the lineage, they are less valuable as allies; however, in matrilineal societies, because sisters reproduce lineages, they are likely to form strong bonds.⁵ Women's bargaining power is also likely to be lower in patrilocal rather than in matrilocal societies. Women tend to live farther from their natal homes and have less support of their natal family when residence is patrilocal than when it is matrilocal.⁶

5. According to Fox (1967), in patrilineal systems, men attempt to gain rights over sexual, domestic, and reproductive services of the wife; in matrilineal systems, men do not have an incentive to do so because they cannot control lineage reproduction.

6. Most patrilineal societies are patrilocal, but residence seems to vary more in matrilineal societies. Fox (1967) argued that women's bargaining power in matrilineal societies is higher in matrilocal than in avunculocal societies, in which the married couple resides with the man's mother's eldest brother.

Women's bargaining position seems to be higher in societies where cross-cousin marriages are allowed than in societies that restrict marriages to non-kin. Because women marry into familiar kin networks rather than to strange families, they are likely to have more allies. Women's property rights are positively correlated with marriages in which women are in close proximity to their natal home, which is often the case in cross-cousin marriages (Agarwal 1994). While the underlying causes of cross-cousin marriages are complex, Agarwal (1994) has argued that cross-cousin marriages were an important means of keeping landed property within kin groups even if inheritance was matrilineal (ancestral property passes through the female line) or bilateral (ancestral property passes through both females and males).

Kinship Institutions in India

In India, kinship organization and female autonomy also varied by caste, language, religion, and region (Karve 1990). Although scholars continue to debate as to why the institution of caste arose and has persisted, the caste (with few exceptions) is an endogamous group whose members were often related to each other by ties of blood or marriage (Munshi and Rosenzweig 2005). Within any given locality, endogamous caste leaders or caste assemblies enforced family, marriage, and kinship norms.⁷ In an agricultural village economy in which land was important, higher castes owned much of the land; the lower castes were artisans, agricultural laborers, and service providers. The kinship ideals exist in all groups but have more influence among the higher castes (Mandelbaum 1970).⁸ In addition, a woman's bargaining position within a family or kin group is thought to be higher among the lower castes than among the higher castes (Gough 1956).

The fact that parents had significant bargaining power over their children in India also contributed to the lower bargaining power of women. Throughout most of India, a woman's social status and identity was significantly correlated with marriage, and most marriages were arranged by parents. Arranged marriages combined with extremely low age at marriage generally lowered the bargaining power of women relative to parents and the extended kin group (Agarwal 1957; Mathur 2007).

From a regional perspective, the most distinctive difference in kinship organization was between North and South India (Dyson and Moore 1983; Karve 1990). Because the northern system was patrilineal and patrilocal whereas the southern system was based on cross-cousin marriages, women's autonomy is generally thought to have been significantly lower in the North than in the South. In addition, a woman's position was further compromised in the North by the gotra system (marriage avoidance with Sapinda kin), hypergamy, early arranged marriages, village exogamy, restrictions on daughters marrying into same villages, restrictions on remarriage for widows, the importance of joint family, strict restrictions on the behavior and movement of women, and the severance of the relationship between the women and her natal family.⁹

7. Dasgupta (1986) noted that of the 560 marriages in lower caste Bagdis of Bengal for which data were collected from 1960–1961, only 23 deviated from kinship norms. Deviants are punished either through fines or excommunication.

8. Kolenda (1987) found that joint family organization is positively correlated with the prohibition of legal divorce initiated by the wife, the dowry system, and control of land and resources by patrilineages and other characteristics of higher castes.

9. In the North, high castes in good position are bound by the rule of Sapinda, which prohibits marriage of two persons who have a common ancestor not more than six degrees removed on the male side or four degrees removed on the female side. Because relatives were likely to be in closer proximity, the Sapinda rule increased the distance of marriage for brides. For lower castes, the rules were less restrictive and followed the avuncular rule, which prohibits unions of paternal and maternal uncle and aunt. It bars marriages between any first cousins or between a woman and any descendant of any of her first cousins (Blunt 1931:60). Also see Gould (1960) and Miller (1954) for discussion and evidence of marriage distances of high and low castes.

The southern kinship system varied more considerably. Although most societies were patrilineal and patrilocal, some (such as the Nayers in Kerala) were matrilineal and matrilocal. However, the prevalence of close-kin marriages significantly increased the autonomy of women in the South. Marriage between close kin tightened the circle of kin groups, and married women lived near their natal families and continued to have close relationships with them after marriage. Although levirate was prohibited, widow remarriage, except for the Brahmins, was allowed.

The regional differences in inheritance practices also provided less access to property for women in the North than in the East and the South (Agarwal 1994). In North India, according to the customary Hindu inheritance laws found in the ancient legal treatises, the Dharmasastra and their commentaries, except for the succession of kings, inheritance was multigeniture rather than primogeniture.¹⁰ Under the Mitakshara legal doctrine, which held sway in most of this region, sons became equal coparceners (joint heirs to inheritance) of the joint family or ancestral property (as opposed to self-acquired individual property) at birth, whereas daughters were entitled only to maintenance and marriage expenses. The doctrine of customary right of property by sons at birth limited the father's power over property.

In the East, however, under Dayabhaga law adopted in Bengal and Assam, sons did not acquire rights to property by birth but only at the death of the father. As a result, fathers possessed significant bargaining power over their children because they could control the size and share of property obtained by sons. For women, their rights to property were slightly more favorable under Dayabhaga because a chaste widow in the absence of sons inherited the rights to manage the property although she was not given the rights to alienate it. Although property rights of women were limited throughout most of India, including the South, at least three regions in South India held pockets of communities that practiced matrilineal and bilateral inheritance.¹¹

Some scholars, such as Goody (1973), Tambiah (1973), and Botticini and Siow (1993) interpreted dowries as a form of premortem inheritance for women, but Agarwal (1994) argued that only a handful of groups in South India practiced dowry in this form. Based on a survey of ethnographic evidence, Miller (1981) found that although dowry was practiced throughout India, its practice was more prevalent in the North and among the propertied classes. In addition, Agarwal (1994) wrote that in the North, the dowry was transferred to the groom's parents, but in the South, it remained the property of the wife.

Finally, there were significant differences in kinship and inheritance rules between the Hindus and Muslims in India. The Muslim kinship system shared similarities with the southern Dravidian system in that close-cousin marriages were preferred, and women were allowed to inherit property.¹² However, male-biased social hierarchy also existed in Muslim families: a son inherited twice as much a daughter, a brother inherited twice as much as a sister, and a husband inherited twice as much as a wife (Nasir and Kalla 2006).

DATA

This section presents the data on sex ratios by caste, religion, language, and regions for three British India provinces—Punjab (North), Bengal (East), and Madras (South)—using the 1901 Census of India. The British collected data on castes in the earlier censuses of 1865, 1872, and 1881, but the caste definitions were based on the fourfold categorization of Brahmins, Kshatriyas, Vaishyas, and Sudras. In 1891, however, because of the influence of

10. Multigeniture refers to the division of an inheritance among all sons or, possibly, also daughters; primogeniture is the norm of bequeathing all inheritance to the oldest son.

11. In South India, Nangudi Vellalars of Tamil Nadu practiced bilateral inheritance; and several groups, including the Nayers and Tiyyars of Kerala, and the Mappilas of north Kerala, practiced matrilineal inheritance.

12. Bittle (2002) reported that 23% of Muslims in India practiced consanguineous marriages in 1992–1993. For other religious groups, the figures were 17.1% for Buddhists, 10.6% for Hindus, 10.3% for Christians, 4.3% for Jains, and 1.5% for Sikhs.

Nesfield (1885), Ibbetson (1916[1974]), and others, census officials collected detailed caste data at the jati level. The jati subcaste definitions used between 1891 and 1931 are useful for our study because a jati is endogamous.

Because data on population by caste, language, and religion are available only for the aggregate female and male persons rather than by different age groups, we construct sex ratios as the male-to-female ratio. Using the anthropological documents of the British Census, we categorize the numerous subcastes into broad social or occupational categories: religious, landowner, cultivator, professional, trader, artisans (and service), agricultural laborer, and unknown (a detailed classification is provided in Appendix A available on *Demography's* website; <http://www.populationassociation.org/publications/demography>).¹³ Similarly, using the 1901 census reports and various other sources, we classify the different languages into the following categories: Aryan (North, East, South); Dravidian, Munda, Tibetan, Hilly (North, East); Tribal (North, East, South); Foreign; and Unknown (see Appendix B available on *Demography's* website). For religion, we examine sex ratios by Hindus and Muslims because the other religious categories were sufficiently small.

Because sex ratio is measured by using the aggregate population figures for females and males at the district level, it can be influenced by a variety of factors. Visaria (1961) presented a detailed investigation of the causes of variations in sex ratios found in the censuses of India between 1901 and 1941. Based on a rich array of direct and indirect evidence, Visaria concluded that the root cause of high male-to-female sex ratio was most likely female disadvantage in mortality after birth. Although the data on age-specific death rates indicate that female disadvantage is concentrated between the ages of 15 and 40, the data also show that the regional differences in male-female mortality are concentrated in the early ages between 0 and 15.

Table 2 presents the descriptive statistics for the population of three provinces under review. Population density was highest in Bengal, followed by Madras and then Punjab.¹⁴ In terms of the religious diversity, Madras was the least diverse, with only 6% Muslims.¹⁵ In terms of caste and language, however, Punjab was culturally more homogenous than the other two regions. Punjab had significantly fewer languages and caste groups than Bengal and Madras. Although Bengal had a much larger number of castes, it is likely that Madras was culturally more varied as a region: its people spoke 75 different languages, compared with 45 for Bengal.

As noted by numerous writers, India was a land of agricultural villages (see Table 2). Although village-level data on caste are unavailable for 1901, anthropologists have conducted numerous village-level studies during the mid-twentieth century (see Chakraborty and Kim 2008: appendix IV). These studies provide a useful picture of caste organization at the village level. In the villages in all regions, higher castes owned most of the land, but the landowning castes differed by region. In the North, landowning castes were dominated by Rajputs, Jats, and Thakars; in the East and the South, landowning castes were dominated by Brahmans. In addition, especially in Punjab, the landowning castes significantly outnumbered other castes in their villages, whereas in the East and the South, the upper castes were significantly outnumbered by middle and lower castes.

Because the caste categories, at least from an occupational point of view, are not strictly comparable across regions, we must exercise some caution when interpreting the variations in sex ratios by castes. For example, the composition of the religious and landowning castes differ somewhat across the regions. As noted earlier, the Brahmans, who have been included in the religious category in our study, also owned significant amounts

13. For Punjab, we follow Ibbetson (1916); for Bengal, Risley (1892); and for Madras, Thurston (1909).

14. The summary statistics for Punjab include Northwest Frontier Provinces, although in our analysis we focus only on the part of Punjab in the British territory.

15. Other religious groups—Sikhs, Christians, Jains, Parsis, Buddhists, Jews, and Tribals—formed a very small minority in most regions.

Table 2. Descriptive Statistics: Punjab, Bengal, and Madras, 1901

Variable	Punjab	Bengal	Madras
Province Total			
Total population	24,754,737	78,493,410	38,623,066
Area (sq. mile)	150,207	189,837	143,221
Density	179	413.5	269.7
Total Hindu	10,344,333	49,687,362	34,436,586
Total Muslim	12,159,394	25,495,416	2,477,610
Total Sikh	2,130,987	—	—
Total Christian	—	278,366	1,038,854
Proportion Hindu	0.42	0.63	0.89
Proportion Muslim	0.49	0.33	0.064
Proportion Sikh	0.09	—	—
Proportion Christian	—	0.004	0.061
Female	11,402,223	39,215,224	19,584,070
Male	13,352,514	39,974,744	19,038,996
Sex ratio (female/male)	1.171	1.020	0.972
Total number of castes	121	380	321
Total number of languages	24	45	75
Total number of villages	32,663	203,476	54,065
Mean population per village	622	367	706
District Averages			
Districts	29	53	25
Population	485,387	1,494,215	1,379,395
Number of castes	47	78	65
Number of languages	5.5	8.5	7.5

Note: The figures for Punjab include northwest frontier provinces and, for the variable *Total number of villages*, British territory.

of land in the East and the South but not in the North. As a result, the landowning castes in the North (Rajputs and Jats) are likely to be somewhat higher in rank than the landowning castes in the East (e.g., Sadgop, Chaudhuri, and Ahir) and South (e.g., Vellala and Lingayats). Also, some occupational castes, such as fishers and traders, are prevalent in the South but not in the East and the North. Nevertheless, these broad caste categories should provide a useful picture of sex ratios by kinship, status, and occupation.

Table 3 presents data on sex ratios by caste constructed at the district level for Punjab, Bengal, and Madras. Despite some concerns on the comparability of the caste categories across regions, the data show a remarkable pattern of sex ratios by caste and region. Sex ratios varied systematically by both caste rank and by region. For all regions, sex ratios improved in favor of females with decreasing caste rank from the higher landowners to lower-ranking menial service castes. Even within each region, sex ratios varied positively with caste rank.

The variation in sex ratios by region was even more pronounced. Overall, as shown in Figure 1, there is an almost clear divide between the North and the South of India, with a relatively higher sex ratio in the North. Table 3 shows the details for the three provinces

Table 3. Descriptive Statistics: Mean Sex Ratio by Caste and Province, 1901

Variable	Punjab	Bengal	Madras	All
Religious	1.217	1.026	0.996	1.056
Landowner	1.185	1.087	0.980	1.067
Cultivator	1.181	1.010	0.958	1.038
Professional	1.133	1.005	0.981	1.032
Trader	1.159	1.044	0.992	1.042
Artisans	1.106	1.006	0.956	1.013
Agricultural Labor	1.152	0.994	0.989	1.042
Service	1.145	0.967	0.890	0.975
Tribal	1.120	1.062	1.009	1.058
Other		0.989	0.967	0.979
Unknown	1.172	0.960	1.072	0.978
Total	1.151	1.009	0.974	1.024

Notes: Sex ratio is defined as female divided by male total population. To eliminate outliers, we dropped observations from all our analyses if the sex ratio was greater than 3 or less than 0.3 and if the caste population was less than 300.

under study. Within each caste category, sex ratio declined systematically moving from the North (Punjab) to the East (Bengal) and then to the South (Madras). For the religious caste, males per 1,000 females declined from 1.216 in Punjab to 1.025 in Bengal to 0.996 in Madras; similarly, for the service caste, the figures declined from 1.145 in Punjab to 0.967 in Bengal to 0.890 in Madras. Thus, for the study of sex ratios in India, it is important to study the data by castes.

For Bengal, based on Risley's (1892) ethnographic evidence, we investigated whether there was a systematic link between dowry and sex ratios. Risley's volumes contain information on the practice of dowry or bride price for slightly more than 100 castes.¹⁶ We find limited correlation between caste rank and the practice of dowry, suggesting only a partial correlation between dowry and sex ratios. Although all religious and professional castes practiced dowries, the frequency of dowry practice among the other higher castes (such as landowners, cultivators, and traders) and the lower castes was relatively low. In addition, all tribal castes in the sample practiced bride price, but their sex ratio was lower than that of the cultivating and professional castes.

Table 4 presents the population sex ratios by religion for the three regions. The data suggest that regional differences in sex ratios are more important than the religious differences. For each religious group, sex ratio rises from Punjab to Bengal to Madras. However, there were important differences in sex ratios by religion in Punjab and Bengal. In Punjab, the Sikhs—who composed about 9% of the population—had by far the highest sex ratio of 1.298, followed by Hindus and then Muslims. In Bengal, however, where the Muslim figure might be influenced by migration, Muslims had a higher sex ratio than Hindus. In Madras, the sex ratios of the three religious groups—Hindus, Christians and Muslims—were relatively similar.

16. For those castes for which the practice of dowry or bride price could be identified in Risley (1892), we find the following distribution. The number of castes who practiced dowry rather than bride price out of the total identified castes by groups is as follows: for religious, 5 of 5; for landowner, 1 of 8; for cultivator, 4 of 19; for trader, 2 of 8; for professional, 2 of 2; for agricultural laborer, 3 of 26; for service, 2 of 6; and for tribal, 0 of 20.

Figure 1. Sex Ratio Distribution Across Provinces of India, 1901

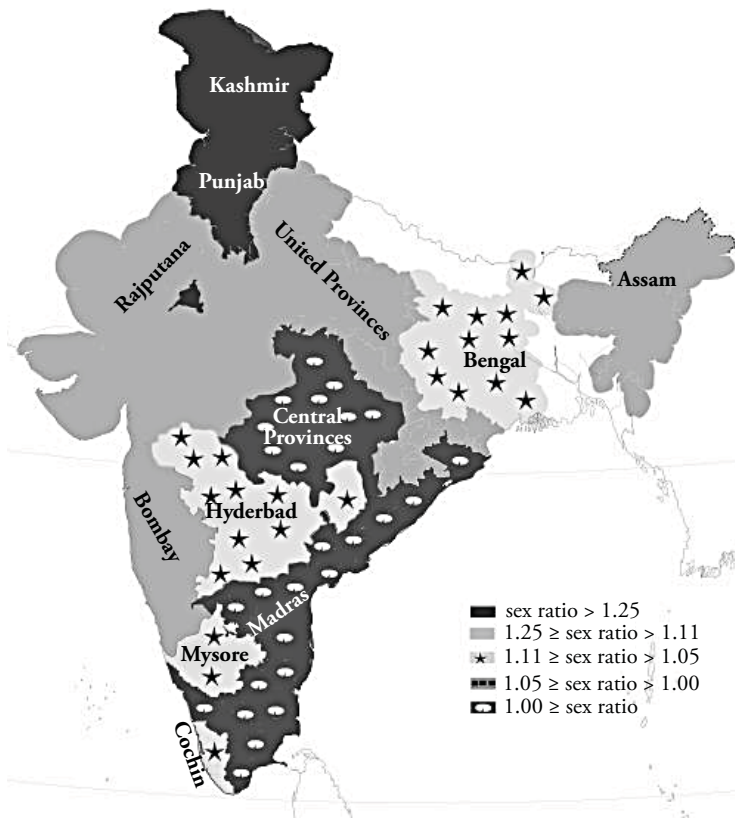


Table 5 presents data on sex ratios by language. Because regional populations are relatively homogenous in terms of language, it is difficult to disentangle the effects of language from the effects of geography. For example, in Punjab, most of the population—except those of tribal origins—speak only the northern Indo-Aryan language. However, when we examine the sex ratio of Central Aryan-speaking people found throughout India, the data suggest that the dominant factor in sex ratio is geography rather than language. Central Aryan-speaking people had a lower proportion of males in Madras compared with Bengal and Punjab. In general, however, we find that sex ratio is much higher for the languages of northern origin compared with those of southern Dravidian or eastern origin.

EMPIRICAL ESTIMATION

Although the data presented in the preceding section suggest significant differences in sex ratios by caste, language, religion, and region in India, the summary data do not shed light on their independent impact on sex ratios. To address this problem, we ran three sets of regressions. First, we ran a regression that controls for caste, religion, region, and geography; unfortunately, we could not control for language in this regression because data on language

Table 4. Descriptive Statistics: Sex Ratios by Religion, 1901

Religion	Punjab	Bengal	Madras	All
Hindu	1.183	0.995	0.972	1.025
Muslim	1.140	1.017	0.970	1.018
Sikh	1.299			1.299
Christian		1.057	0.968	0.986
Total	1.171	1.002	0.973	1.024

Note: The data for Punjab includes north west frontier provinces.

Table 5. Descriptive Statistics: Mean Sex Ratios by Language, 1901

Language	Punjab	Bengal	Madras	All
Aryan (Central)	1.399	1.264	1.063	1.255
Aryan (North)	1.299		1.060	1.272
Hilly (North)	1.161			1.161
Tribal (North)	1.209			1.209
Malayalese			1.263	1.263
Aryan (East)	1.418	1.050	0.991	1.053
Aryan (South)		1.227	1.044	1.050
Tamil		1.513	1.046	1.060
Telegu		1.167	1.006	1.031
Canarese			1.026	1.026
Dravid (Other)		1.072	1.028	1.032
Munda		0.945	1.015	0.953
Hilly (East)		1.093		1.093
Tribal (East)		1.050		1.050
Tribal (South)			1.075	1.075
Tibetan		1.096		1.096
Foreign	1.143	1.018		1.085
Unknown	1.391	1.040	0.983	1.228

Notes: In the census of 1901, 122 distinct languages were identified in the three provinces of Punjab, Madras, and Bengal. As shown in the online Appendix B, these languages were grouped into categories shown in the table. To eliminate outliers, we dropped observations if the sex ratio was greater than 3 or less than 0.3 and if the population within a language category was less than 500.

are provided on a separate basis. Second, we ran a regression that controls for language and region. Because people generally speak a common language within a geographic area, we also present a district-border analysis for language. Third, we aggregated our data to run a regression based on district averages of all relevant variables, including language.

The econometric specification for the caste regression takes the following form:

$$S_{ijkl} = \alpha_0 + \sum_m \alpha_{1m} D_{ijkl}^m + D_{ijkl}^r + Z_k + \delta_k + \gamma_l + \varepsilon_{ijkl}, \quad (1)$$

where i indexes castes, j indexes religion, k indexes districts, and l indexes provinces.¹⁷ The dependent variable S_{ijkl} denotes the sex ratio for caste i , religion j , district k , and

17. We thank our reviewers for this suggestion.

province l . For independent variables, D^m represents a dummy variable for each caste category m (religious, landowner, cultivator, trader, professional, agricultural labor, service, and other menial castes, with artisans as the omitted category); D^r is a dummy variable for religious category, Hindu and Muslim, with the latter as the omitted category. Z_k represents district-level geographic variables such as rainfall, soil type, and coastal indicator. The δ_k and γ_l are district and province fixed effects. Because district fixed effects control for district variations in geographic factors, such as rainfall and other factors that are constant at the district level, we generally prefer the specification with district fixed effects. The ε_{ijkl} is the unobserved error component.

The specification for the language regression has the following form:

$$S_{ijk} = \beta_0 + \sum_n \beta_{1n} D_{ijk}^n + \delta_j + \gamma_k + \varepsilon_{ijk}, \quad (2)$$

where subscript i represents language categories, j indexes districts, and k indexes provinces. D^n represents a language dummy variable for 16 language categories, with southern Dravidian as the omitted category. The δ_j and γ_k are district and province fixed effects.

Finally, the aggregated district average regression specification, which combines the caste, language, religion, and geographic variations, is as follows:

$$S_{jk} = \eta_0 + \sum_m \eta_{1m} P_{jk}^m + \sum_n \eta_{2n} P_{jk}^n + \sum_r \eta_{3r} P_{jk}^r + \gamma_k + \varepsilon_{jk}, \quad (3)$$

where S_{jk} denotes the average population sex ratio in district j , in province k ; m indexes caste; n indexes language; and r indexes religion. P_{jk}^m , P_{jk}^n , and P_{jk}^r represent the proportion of each caste, language, and religious categories, respectively, in district j and province k . γ_k is the province fixed effect, and ε_{jk} is the unobserved district-level error component.

In Table 6, we present the weighted least squares regression results of Eq. (1), with the weights for S_{ijkl} being the square root of the population of caste i , religion r , in district j . Column 1 indicates that compared with the artisan castes, religious, landowner, agricultural laborers, and tribal castes had higher sex ratios but that the opposite was true of service and other menial castes. When we control for district fixed effects in column 4, the religious, landowner, trader, and tribal castes continue to exhibit lower sex ratios than the artisans, whereas the pattern disappears for agricultural laborers. The slight difference in the results could be due to the concentration of different castes in differing districts. We include the province dummy variables, with Madras (South) as the excluded category, in column 5. The estimates show that Punjab and Bengal had higher proportion of males to females compared with Madras even after controlling for caste variations across these regions.

Although district fixed effects are likely to control for district characteristics that stay constant over time, there is considerable interest on the impact of geographic factors on sex ratios because they may affect the relative demand for women in agriculture and other activities. For example, Bardhan (1974) suggested that the economic value of women is driven by differences in female intensity of agricultural production. Because rice cultivation is more intensive in female labor than is cultivation of wheat, the survival chances of girls may be higher in rice-growing areas than in wheat-growing areas. In column 2, we include the various geographic and climatic characteristics, such as rainfall, soil (alluvial, black), and a coastal dummy variable. Because of the lack of data availability of these geographic factors for some districts, the number of observations drops by about 16% for these specifications.

We find that female deficit is significantly positively correlated with rainfall. Because rainfall is likely to be correlated with rice production and with food grain production more generally (Kapur and Kim 2006), the regression suggests that sex ratios in 1901 may have

Table 6. Caste, Religion, and Sex Ratios: All Provinces Combined

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Religious	0.060** (0.012)	0.055** (0.012)	0.055** (0.012)	0.054** (0.010)	0.054** (0.010)	0.055** (0.010)	0.055** (0.010)
Landholder	0.030** (0.009)	0.035** (0.009)	0.033** (0.009)	0.043** (0.007)	0.043** (0.007)	0.042** (0.007)	0.042** (0.007)
Cultivator	0.019 (0.012)	0.010 (0.012)	0.003 (0.012)	0.005 (0.010)	0.005 (0.010)	0.000 (0.010)	0.000 (0.010)
Trader	0.020 (0.013)	0.050** (0.013)	0.046** (0.013)	0.038** (0.011)	0.038** (0.011)	0.034** (0.011)	0.034** (0.011)
Professional	0.014 (0.015)	0.027 (0.016)	0.023 (0.016)	-0.004 (0.013)	-0.004 (0.013)	-0.007 (0.013)	-0.007 (0.013)
Agricultural Labor	0.014 (0.012)	-0.005 (0.012)	-0.015 (0.012)	-0.014 (0.010)	-0.014 (0.010)	-0.021* (0.010)	-0.021* (0.010)
Service	-0.015 (0.015)	-0.002 (0.016)	-0.003 (0.016)	0.002 (0.013)	0.002 (0.013)	0.002 (0.013)	0.002 (0.013)
Tribe	0.018 (0.016)	0.029 [†] (0.016)	0.021 (0.016)	0.015 (0.014)	0.015 (0.014)	0.009 (0.014)	0.009 (0.014)
Other	-0.036** (0.011)	-0.001 (0.012)	-0.001 (0.012)	-0.004 (0.010)	-0.004 (0.010)	-0.003 (0.010)	-0.003 (0.010)
Rain		0.000** (0.000)	0.000** (0.000)				
Coast		-0.007 (0.009)	-0.009 (0.009)				
Alluvial		0.049** (0.007)	0.050** (0.007)				
Black		-0.011 (0.013)	-0.012 (0.013)				
Hindu			0.056** (0.010)			0.047** (0.008)	0.047** (0.008)
Punjab		0.163** (0.011)	0.179** (0.012)		0.275* (0.110)		0.270* (0.110)
Bengal		0.017 [†] (0.010)	0.017 [†] (0.009)		0.205 (0.170)		0.196 (0.170)
District Fixed Effects	No	No	No	Yes	Yes	Yes	Yes
<i>F</i> Statistic (caste)			5.15	5.39			
<i>F</i> Statistic (geography)			34.18	34.94			
<i>F</i> Statistic (religion)				33.66			
Constant	1.031** (0.006)	0.898** (0.012)	0.849** (0.014)	1.221** (0.021)	0.946** (0.110)	1.181** (0.022)	0.912** (0.110)
Number of Observations	5,714	4,792	4,792	5,714	5,714	5,714	5,714
<i>R</i> ²	.01	.13	.13	.33	.33	.33	.33

Notes: Muslim is the omitted religion category; artisan is the omitted caste group; Bengal is the omitted province. All regressions are weighted with weights equal to the square root of population in caste *i*, religion *r*, and district *j*. We also repeat the full specification in column 5 without putting weights in the equation. The unweighted coefficients are only slightly bigger than weighted coefficients, but they are not statistically different. Fewer observations in columns 2 and 3 are due to the unavailability of geography data for the full set of districts. Standard errors are in parentheses.

[†]*p* < .10; **p* < .05; ***p* < .01

worsened for females in districts with higher rice or food production.¹⁸ Importantly, these regressions indicate that the coefficients on caste and region were robust and unchanged even after controlling for geographic factors, suggesting that cultural factors such as kinship systems are likely to be important even after controlling for economic factors. Moreover, when we compare the regressions including geographic variables with the district fixed-effect specifications in Eqs. (4) and (5), we find that the coefficients on caste and region are very similar. Finally, the addition of the religious category in column 6 indicates that Hindus had significantly higher sex ratios than Muslims after controlling for other factors.

Because similar castes and religious groups in different regions may possess different caste rank and kinship behavior, we reestimate Eq. (1) for each of the three provinces and for the Hindus and Muslims. Indeed, the estimates reported in Table 7 hint at important regional differences in caste kinship behavior, which affects the sex ratios. In the North (Punjab), where the male-to-female sex ratio is the highest, the religious, landholder, trader, and cultivator castes all had significantly higher sex ratios than artisans. In the East (Bengal), the pattern was slightly different: religious, landowner, and trader castes had higher sex ratios than artisans, but the professionals, agricultural laborer, and other castes had lower sex ratios. In the South (Madras), however, the pattern was very different. In this region, religious, professionals, and tribal castes had the highest sex ratios, although the differences were not significant. In addition, whereas Hindus had higher sex ratios than Muslims in both Punjab and Bengal, the pattern is not significant in Madras, where there were few Muslims. Finally, when we run caste-wise regressions for Hindus and Muslims separately, the overall results are relatively similar, although the joint significance of castes based on the *F* statistics is not significant for Muslims.

In Table 8, we analyze the relationship between sex ratios by language groups. Because there is little geographic overlap of languages in different regions, the regressions do not include geographic dummy variables. We find that sex ratios among people who spoke the southern Dravidian languages differed significantly from those who spoke Aryan languages in the northern and northwestern regions, but not for those who spoke languages of Aryan origin in the East or the South. In column 1, we omit all the Dravidian languages. Compared with Dravidian languages, Central Aryan and North Aryan had 170 and 222 more males per 1,000 females, respectively. The northern hilly languages had 133 more males. In column 2, we further break the Dravidian languages into the four major southern languages of Canarese, Malayalese, Telegu, and Tamil. In this case, the omitted category is all other Dravidian languages. Again, we find that northern languages had proportionately fewer females than Dravidian languages. Moreover, there were no observable differences compared with people who spoke languages in the other 11 categories. However, because there is little geographic overlap of languages in different regions, these language differences are most likely capturing differences across regions. This is evident from column 3, where the variation across languages does not significantly affect the sex ratios when we include province fixed effects.

Because of the little geographic overlap of languages across broad regions, it is difficult to identify the impact of language on sex ratio. In Table 9, we overcome this constraint to an extent by using the 1921 census data to construct groups of bordering districts; this enables us to track people of the same language across different provinces. We constructed sex ratio by different language groups for the districts bordering Punjab, in the states of Rajputana, Kashmir, and United Provinces. Because all of these districts should exhibit little geographic variation, we should be able to identify the effect of language controlling for geographic effects. The data show that sex ratios differ by language. As compared with

18. Using area under crops data from 1901, we find that female deficiency increases with wheat intensity of agriculture. However, no significant relationship emerged between rice cultivation and sex ratio. Results are presented in Chakraborty and Kim (2008).

Table 7. Caste, Religion, and Sex Ratios: Fixed Effects

Variable	Punjab (1)	Bengal (2)	Madras (3)	Hindu (4)	Muslim (5)
Religious	0.112** (0.016)	0.044** (0.017)	0.018 (0.013)	0.057** (0.011)	0.024 (0.018)
Landholder	0.077** (0.012)	0.067** (0.013)	0.003 (0.009)	0.046** (0.008)	0.027 [†] (0.016)
Cultivator	0.028 [†] (0.017)	-0.004 (0.013)	0.004 (0.028)	0.002 (0.011)	0.012 (0.028)
Trader	0.046* (0.023)	0.042* (0.018)	0.011 (0.012)	0.039** (0.012)	0.015 (0.035)
Professional	0.013 (0.021)	-0.020 (0.020)	0.021 (0.019)	-0.003 (0.014)	-0.019 (0.028)
Agricultural Labor	-0.000 (0.015)	-0.038* (0.016)	-0.004 (0.014)	-0.024* (0.011)	0.004 (0.032)
Service	0.011 (0.028)	-0.001 (0.018)	-0.004 (0.018)	-0.005 (0.014)	0.029 (0.025)
Tribe	-0.040 (0.032)	0.006 (0.020)	0.024 (0.018)	0.011 (0.014)	-0.096 (0.140)
Other		-0.024 (0.016)	-0.001 (0.011)	-0.002 (0.011)	-0.035 (0.023)
Hindu	0.076** (0.010)	0.027 [†] (0.014)	0.008 (0.013)		
District Fixed Effects	Yes	Yes	Yes	Yes	Yes
F Statistic (caste)	11.79	6.27	0.63	8.98	1.22
Constant	0.969** (0.080)	1.202** (0.027)	0.998** (0.052)	1.236** (0.023)	1.134** (0.046)
Number of Observations	1,117	3,187	1,410	4,795	919
R ²	.23	.30	.15	.34	.45

Notes: Muslim is the omitted religion category; artisan is the omitted caste category. All regressions are weighted. Standard errors are in parentheses.

[†] $p < .10$; * $p < .05$; ** $p < .01$

Punjabi-speaking societies (the omitted language category), there were relatively more females within the Hindi (Hindustani), Hilly, and Rajasthani and Gujrati (western) speaking communities. However, even after we control for the language variation, the geographic variations persist. Punjab and United Provinces both had significantly more males than Kashmir, the omitted province.

Because our caste- and language-wise data on sex ratios are not linked, we cannot control for language variations in the caste-religion-district regressions. However, as we saw earlier, accounting for district and province fixed effects possibly controls for all time-invariant regional variations, including those of language. That apart, we also ran an aggregated regression at the district level, combining caste, religious, and language variations as in Eq. (3). The results are provided in Table 10. Interestingly, even with very few units of observation, landholder and cultivator castes continue to show a higher fraction of males compared with artisans in all regressions. Moreover, after we account for caste variations, neither language nor the specific geography variables contribute much toward explaining the variations in sex ratios. (See column 7 or column 8; the latter uses the square root of the population in each district as weights.) However, we should be careful about the

Table 8. Language and Sex Ratios: Province Fixed Effects

Language	(1)	(2)	(3)
Aryan (Central)	0.170** (0.028)	0.149* (0.072)	0.068 (0.079)
Aryan (North)	0.222** (0.030)	0.201** (0.073)	0.035 (0.091)
Aryan (East)	0.026 (0.027)	0.005 (0.072)	-0.062 (0.080)
Aryan (South)	0.065 (0.091)	0.044 (0.110)	0.053 (0.110)
Foreign	0.115 (0.120)	0.094 (0.140)	-0.033 (0.150)
Munda	0.015 (0.061)	-0.006 (0.090)	-0.060 (0.094)
Tibetan	0.121 (0.200)	0.100 (0.210)	0.029 (0.220)
Hilly (North)	0.133 [†] (0.069)	0.112 (0.096)	-0.058 (0.110)
Hilly (East)	0.087 (0.100)	0.065 (0.120)	-0.006 (0.130)
Tribal (East)	0.051 (0.043)	0.029 (0.079)	-0.042 (0.088)
Tribal (North)	0.240 (0.210)	0.219 (0.220)	0.049 (0.230)
Tribal (South)	0.164 (0.160)	0.143 (0.170)	0.153 (0.170)
Canarese		-0.012 (0.093)	-0.002 (0.092)
Malayalese		-0.003 (0.110)	0.007 (0.110)
Telegu		-0.013 (0.076)	-0.004 (0.075)
Tamil		-0.041 (0.077)	-0.032 (0.077)
Punjab			0.180** (0.059)
Bengal			0.082 [†] (0.044)
Constant	0.990** (0.020)	1.011** (0.069)	1.001** (0.069)
Number of Observations	631	631	631
R ²	.12	.12	.13

Notes: Dravidian (southern) is the omitted category. All regressions are weighted with weights equal to the square root of the population in language *i* and district *j*. Standard errors are in parentheses.

[†] $p < .10$; * $p < .05$; ** $p < .01$

interpretation of these results because they do not include the district fixed effects, and the complete model is based on only 85 observations.

In summary, we argue that the data confirm the view that family, kinship, and inheritance institutions in India contributed significantly to determining sex ratios in India. As

Table 9. Sex Ratio by Regional Language Groups (neighboring districts of North India)

Regional Language Group	(1)	(2)
Hilly	-0.884* (0.440)	-0.734† (0.440)
Hindustani	-0.706† (0.380)	-0.836* (0.400)
Kashmiri	1.311* (0.510)	1.491** (0.520)
Western	-0.816† (0.460)	-0.621 (0.480)
Punjab		0.836† (0.440)
Rajputana		0.620 (0.580)
United Provinces		1.120† (0.610)
Constant	1.959** (0.300)	1.182* (0.500)
Number of Observations	66	66
R ²	.29	.33

Notes: Western language group comprises different Gujrati and Rajasthanani languages. Punjabi is the omitted language category, and Kashmir is the omitted province. Standard errors are in parentheses.

† $p < .10$; * $p < .05$; ** $p < .01$

noted by numerous scholars, sex ratio was the highest in the North (Punjab), where the society was patrilineal, patrilocal, and extremely exogamous; and was lowest in the South (Madras), where the practice of close kin marriages provided more favorable kinship relationships for females. Moreover, in the East (Bengal), where the northern kinship and inheritance rules were modified, female proportion improved over those in the North but remained lower than those in the South.

Because the ideal norms of kinship were held more strongly by the higher castes, the positive relationship between sex ratios and caste rank provides additional evidence on the importance of kinship. However, because caste rank is also correlated with wealth and income, it is difficult to distinguish the effects of wealth and kinship on sex ratios. Women from low castes often earned significant family income, so their bargaining power within the family and kin group was likely to be high; in contrast, high-caste women typically did not bring in any income. Yet, it is also important to note that kinship norms had a significant influence on the labor market of women. High-caste women were forbidden to work outside the home, and their bargaining power was based on the rearing of children, especially sons.

In the South, however, the high sex ratio of the upper castes poses a puzzle. If cross-cousin marriages were taken more seriously by the higher castes, one might expect a lower sex ratio for the higher castes. We believe that the high sex ratio of the upper-caste Brahmans in the South may be accounted for by the fact that the Brahmans brought with them the vestiges of northern family norms when they migrated south. Gough (1956) argued that

Table 10. Caste, Religion, Region, and Language: District-Level Aggregates

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Religious	0.141 (0.230)	-0.099 (0.250)	0.021 (0.270)	-0.024 (0.310)		-0.023 (0.390)	0.058 (0.470)
Landholder	0.135 (0.091)	0.049 (0.120)	0.299* (0.140)	0.290* (0.140)		0.330† (0.190)	0.282 (0.210)
Cultivator	0.312* (0.130)	0.150 (0.160)	0.541** (0.200)	0.512* (0.220)		0.517† (0.270)	0.522* (0.280)
Trader	-0.147 (0.330)	0.220 (0.480)	0.382 (0.490)	0.454 (0.540)		0.593 (0.600)	0.494 (0.610)
Professional	3.773** (0.680)	3.161** (0.720)	4.719** (0.740)	4.706** (0.750)		4.884** (0.830)	4.496** (0.870)
Other	-0.296† (0.170)	-0.050 (0.250)	-0.343 (0.250)	-0.340 (0.260)		-0.279 (0.300)	-0.168 (0.300)
Tribe	0.183 (0.150)	0.214 (0.150)	0.367* (0.160)	0.368* (0.170)		0.560* (0.240)	0.437† (0.240)
Agricultural Labor	0.258 (0.170)	0.012 (0.210)	0.203 (0.220)	0.195 (0.230)		0.306 (0.290)	0.271 (0.310)
Service	-4.090** (1.040)	-2.441† (1.260)	-3.178* (1.340)	-3.067* (1.380)		-3.561* (1.690)	-3.728* (1.850)
Punjab		0.159* (0.075)	0.074 (0.093)	0.022 (0.110)		0.059 (0.170)	0.022 (0.180)
Bengal		0.033 (0.065)	-0.077 (0.075)	-0.072 (0.077)		-0.105 (0.120)	-0.070 (0.120)
Rain			0.000** (0.000)	0.000** (0.000)		0.000* (0.000)	0.000† (0.000)
Alluvial			0.011 (0.029)	0.012 (0.029)		0.018 (0.035)	0.017 (0.034)
Black			-0.087 (0.053)	-0.085 (0.054)		-0.080 (0.058)	-0.100* (0.059)
Coast			-0.034 (0.047)	-0.030 (0.049)		-0.018 (0.059)	-0.012 (0.059)
Hindu				0.053 (0.150)		0.065 (0.170)	0.028 (0.210)
Aryan (Central)					0.056 (0.041)	0.082 (0.140)	0.060 (0.140)
Aryan (North)					0.215** (0.042)	0.091 (0.150)	0.057 (0.160)
Aryan (East)					0.031 (0.042)	0.052 (0.140)	0.024 (0.140)
Aryan (South)					-0.222 (0.750)	-1.406 (2.400)	-0.238 (5.170)
Munda					-0.271 (0.400)	-0.316 (0.450)	-0.246 (0.450)
Hilly (East)					0.215 (0.170)	-0.053 (0.330)	0.062 (0.410)
Hilly (North)					0.156** (0.050)	0.164 (0.160)	0.108 (0.220)

(continued)

(Table 10, continued)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	0.949** (0.056)	0.922** (0.100)	0.757** (0.130)	0.704** (0.200)	0.981** (0.028)	0.633** (0.230)	0.702* (0.270)
Number of Observations	95	95	85	85	95	85	85
R ²	.45	.49	.62	.62	.31	.63	.57

Notes: In column 7, the *F* statistic is 2.55 for the group of caste variables, 0.44 for languages, 1.90 for geography variables, and 0.12 for religion. Standard errors are in parentheses. Column 8 uses the square root of the district population as weights.

† *p* < .10; * *p* < .05; ** *p* < .01

even though the southern Brahmans adopted cross-cousin marriages, the Brahman family relationships were characterized by a northern family hierarchy.¹⁹

Finally, the examination of sex ratios by language and religion seem to indicate the importance of kinship. Even when we control for geography, societies who speak the northern Indo-Aryan language, like Punjabi and Kashmiri, exhibited significantly higher sex ratios. Similarly, even in the North and East, Muslims whose kinship norms were similar to those of the Dravidian South possessed lower sex ratios than their Hindu counterparts, even after we control for caste rank. However, although our data analysis does not include the Sikhs, the high sex ratios observed for the Sikhs in Punjab present a significant puzzle because their religious principles were based on the equality of men and women.

ON THE ORIGINS OF KINSHIP SYSTEMS IN INDIA

Why did kinship and inheritance systems differ across the regions in India? Most scholars believe that the origin and the spread of the northern kinship system can be traced to the historical path of the Indo-Aryan conquest. When the indigenous Indus civilization disintegrated around 1500 BC, Aryans started migrating into northwestern India and brought with them new technologies of agriculture as well as military and political organization. However, the diffusion of Indo-Aryan civilization in India did not arise in one “natural state” but many different natural states as the Aryans adapted to different local geographic, economic, and political factors. The variations in the relationships between the political and economic elites in different regions also led to variations in their family, kinship, and inheritance institutions.

In the northwestern Indo-Gangetic plain, the Aryans developed a stable, decentralized, lineage-based, political, and kinship system that survived for centuries. Yet, as the Aryans marched to the eastern Bengal frontier, their political and kinship institutions were modified to form a more centralized state bureaucracy. The royal political elites formed alliances with local Brahmans, who in turn formed alliances with local elites. However, in the South, the slow diffusion—rather than the invasion of Aryans and their ideas—created a distinctly different Aryan-Dravidian society that was much more varied, localized, and segmentary (Stein 1994). In the South, the Aryans adopted the southern practice of cross-cousin marriages.

19. In contrast to the relatively egalitarian relationships among the lowest castes, for the southern Brahmans “the father was superordinate to the son, the elder brother to the younger brother, the husband to the wife” (Kolenda 1987). In addition, the rates of close kin marriages among the Brahmans were lower than those of other castes (Caldwell, Reddy, and Caldwell 1984; Mandelbaum 1970:70).

Political and Kinship Organization in Punjab

The Indo-Aryan culture arose in the northern Gangetic plain, where the monsoon rainfall was moderate, and irrigated agriculture prior to British rule was limited. From a pastoral society that raised cattle, a mature, settled agricultural society emerged in this region. The dominant form of agriculture was wheat and millet, but in places of sufficient water supply, rice was also cultivated. According to Thapar (1984), the rise of settled agriculture coincided with the rise of a kinship lineage society, which was to last for centuries. By the medieval period, the local and regional political structure was based on the warrior Rajput's kinship clans and their networks. Each clan, composed of its maximal lineages, controlled a compact area of 12 to 84 villages, (Fox 1971; Pradhan 1966). Even when the territory was organized under the Mughal Empire, these Rajput clans retained significant control of their local territories.

Given the importance of the kinship clan as a political and economic institution in the North, its kinship system fostered the alliance of kin networks over its maximal lineages. At the clan level, marriages between the families of the same maximal lineage can threaten the political balance within the clan because these families can use marriage to build a more powerful political coalition. By requiring women to marry outside their gotra or sapinda and by requiring them to marry outside the villages of the maximal lineages, the northern system insured the political stability of the maximal clan lineage by significantly reducing the bargaining power of women. At the level of the joint family, marriages also threatened the break-up of the family property because wives had an incentive to seek partition of joint property. By severely restricting the rights of women, the northern system limited the power of women to exercise their autonomy over their husbands and joint family (Mandelbaum 1970; and Mathur 2007).

Political and Kinship Organization in Bengal

In the fifth and sixth centuries, the Indo-Aryan culture gradually marched eastward toward the Bengal jungle frontier. The Hindu Brahmans brought with them the technology of settled agriculture, but because of the abundance of rainfall, the new Bengalis adopted wet rice agriculture. Unlike the pastoral wheat and barley agriculture of the Indo-Gangetic plain in Punjab, wet rice agriculture was intensive in capital and labor: it involved building and maintaining tanks and irrigation channels, planting, transplanting, monitoring of water levels, and harvesting. Although wet rice agriculture was probably associated with a significant increase in productivity, it was also much more risky because few other crops could be grown submerged in water. As a result, the lives of villagers were more likely to be tied to the fortunes of the annual rice crop.

The regional political structure that emerged in Bengal differed in important respects from Punjab. In Bengal, the imperial state seems to have achieved a significant level of centralization by building alliances with Brahmans and other dominant castes who were granted land and protection for tribute and taxes. The Brahmans, in turn, formed local alliances with other dominant Sudra castes to strengthen their local power. Thus, individual Brahmans were able to acquire large territories through the imperial and local alliance.

In Bengal, the northern kinship system was modified. Because the political stability of the maximal lineage was not important, evidence suggests that the gotra or the sapinda rule and the rule of village exogamy were not enforced in Bengal. In addition, as noted earlier, the inheritance rule was modified in Bengal from the rights of equal division of property by sons at birth to rights of the father to divide property at his death. Given that the patriarchal father had significant rights over his property, marriages did not threaten the devolution of family property. Thus, in Bengal, there were fewer benefits from suppressing the autonomy of women. In addition, Bengal was much more ethnically diverse, as evidenced by the greater numbers of languages and castes than in Punjab. The greater

indigenous cultural diversity may also have mitigated a stricter enforcement of a uniform kinship system in Bengal.

Political and Kinship Organization in Madras

In the South, the mountainous track that runs from east to west along the Tropic of Cancer impeded the march of the Indo-Aryan culture to its region. Despite the various military excursions from the North, the northern Indo-Aryan culture diffused slowly throughout the Dravidian South by slow absorption rather than by conquest. In the fertile irrigated river valleys, several major kingdoms—Pallavas, Cholas, and Pandyas—achieved centralized tributary states; in contrast, the less-fertile, drier areas were ruled by numerous minor kingdoms and chiefdoms controlled by dominant landholding groups (Dirks 1993). In the fertile regions, local elites such as the Vellalas granted villages to Brahmans and adopted the Sanskrit traditions.

According to Stein (1994), the political organization in the South was much more localized and segmentary, with no lineage-based territories, because of its geography. Instead, territorial integrity was based on alliances between kings, local chiefs, and dominant landowning castes. For tribute and military alliance with the king, local chiefs and villagers received protection. At the village level, the higher landowning castes built alliances with dominant Sudra castes, such as the Vallala, to control the lower-caste laborers, artisans, and service workers.

In the South, the kinship system diverged significantly from that of the North. Even for the Brahmans who migrated from the North, the preferred marriage arrangement was between cross-cousins, which was not allowed by traditional Hindu law. Stein (1994) argued that the adoption of cross-cousin marriages was consistent with the widespread existence of political and social localism caused by the South's segmentary political organization. Because wet rice agriculture in the South required the development of extensive irrigation works and the close working cooperation of the landholding group, cross-cousin marriages may have increased the efficiency of the agriculture in Madras.²⁰

More importantly, Trautmann (1981) suggested that the Dravidian kinship system in the South was adopted mainly in order for the royal lineages to preserve their localized hereditary kingships. Unlike the northern Indo-Aryan marriage rule of exogamy, the Dravidian cross-cousin marriage system allowed the formation of strong family alliances that lasted over time (Trautmann 1981).

CONCLUSION

This article explores the relationship between kinship institutions and sex ratios in India at the turn of the twentieth century. Using district-level data from the 1901 Census of India, we find that sex ratios varied systematically by region, caste, language, and religion, but less so with climate, soil, and other district characteristics. First, sex ratio was the highest in the North, followed by the East and then the South. Moreover, this regional pattern was extremely robust. Second, sex ratio varied positively with caste rank. In each region, the higher religious or landowning castes possessed the highest sex ratios, and the lower artisan and menial service castes had the lowest. Third, sex ratios varied by language although there was significant overlap between region and language. Sex ratios were lower among those who spoke the Northern Indo-Aryan languages compared with those who spoke the Southern Dravidian language. Fourth, the Hindus had significantly higher sex ratios than Muslims. Fifth, sex ratios were significantly higher in districts with higher rainfall.

20. For the Kallar castes in the South, Dirks (1993:206) wrote that lineages within a natu, a congregation of 12 to 18 villages, were not allowed to marry lineages outside their natu. Thus, the rule of natu endogamy as well as cross-cousin marriages contributed to stable lineage-based territorial subdivisions.

Although it is difficult to differentiate economic from cultural factors, we believe that the examination of sex ratios by caste, language, religion, and region generally confirm the view that kinship systems played a major role in determining sex ratios in India. Regional differences in family and kinship institutions were the most important factor. The sex ratio was highest in the North, where the kinship system provided the least autonomy of women; was intermediate in the East, where the northern kinship was slightly modified; and was the lowest in the South, where the women's autonomy was thought to have been the strongest. The strong positive correlation between sex ratios and caste rank also suggest the importance of kinship. Women's autonomy was significantly lower for higher-caste compared with lower-caste women. The former were not allowed to work outside of the home nor allowed to initiate divorce, and their sexual and social behavior were highly regulated by the kin group. Finally, the variations in sex ratios by language and religion strongly suggest that northern kinship system contributed significantly to higher sex ratios in India.

As discussed earlier, the regional and caste kinship systems arose in pre-modern times when political and economic elites used cultural institutions to establish a working "natural state." Because of social economies to institutions, most societies adopted a uniform kinship system. Yet, just as many formal institutions favor political elites at the expense of the general population, the informal kinship systems are also likely to have significant distributional consequences. To the extent that the kinship rules favored the higher caste elites in each region, the adoption of one kinship system may have reduced the welfare of low castes in each region. Relative to their optimal kinship rule, the low castes may have too few women in the North and too many women in the South. In the North, the low castes may have forgone the benefits of economically productive women, whereas in the South, a cross-cousin marriage system may have increased the genetic costs without providing many alliance benefits.²¹

The continued persistence of the importance of pre-modern cultural institutions, such as kinship systems, remains a puzzle as the role of formal institutions have grown in modern times. Even as the economic value of women has risen over time with the growing importance of education as well as employment opportunities in manufacturing and services, the traditional family and kinship institutions have contributed to a growing son preference. Unfortunately, modernization and the introduction of formal Western institutions seem to have reduced the importance of the southern indigenous kinship system, leading to the emergence of son preference, even in southern India. Thus, a better understanding of the causes of the persistent northern kinship system is likely to provide insights on how to foster greater gender equality in India and other North Asian countries.²²

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21. See Bittle (2002) for evidence on the link between consanguinity, genetic disorders, and morbidity in India.

22. Greif (2006b) provided insights as to why informal institutions based on personalized exchanges may persist even when they become inefficient. Also see Munshi and Rosenzweig (2005).

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