

The geography of deteriorating child sex ratio in China and India

CZ Guilmoto, LPED/IRD, Paris

guilmoto@ird.fr

Isabelle Attané, INED, Paris

attane@ined.fr

Introduction

The deterioration of child sex ratio has run parallel in China and India over three decades with no clear sign of significant improvement during the last ten years. In both countries, fertility transition has often been accompanied by a strong desire by couples to intervene on family composition by sex. While excess female mortality among girls (including cases of selective infanticide) played a role in the skewed sex distribution observed in the past, sex selective abortions are the main cause today for the rapid degradation of sex ratio, which is above 110 boys per 100 girls. An important feature is that sex ratio deterioration –like fertility decline - started earlier and is currently both more widespread and pronounced in China than in India. To some extent, China seems ahead of India by ten years in terms of child sex ratio. Interestingly enough, there is almost a similar gap in the timing of the reforms that launched the economic liberalization of both countries and inaugurated a period of sustained growth.

Less often explored is the fact that maps of child sex ratio differentials in both countries are very different. The comparison of spatial patterns characterizing the sex ratio in China and India will form the backbone of this paper. We will combine ordinary statistical analysis with detailed mapping of sex ratio at various scales and periods to investigate the nature of sex ratio variations and what they can teach us about the mechanisms at work in the degradation recently observed.

At the same time, this paper examines some of the possible factors behind the spatial patterning of sex ratio differentials and trends over times in both China and India, and examines some of the links between increasing masculinity of society and recent changes in fertility as well as in the social and economic context.

This work uses disaggregated data from the last two censuses in China (1990 and 2000) and India (1991 and 2001). After a first statistical description of sex ratio data, census data are mapped at the district/county level using a GIS and subjected to spatial. The same procedure is followed with the 1990-2000 trend data in child sex ratio.

I. China and India: Similarities and differences

The similarities between China's and India's experiences offer an interesting material to examine the dynamics of sex ratio deterioration that has run unabated in both countries during the last phase of their fertility transition.

1. Divergent birth control policies and recent fertility trends

Both China and India experienced sustained fertility decline over the last thirty years. The mean number of children per women decreased from 5 in 1971 to 3 in 2001 in India. The decline was even more significant in China, with that number dropping from 5.4 to 1.8 in the same period of time.

Table 1. Estimates of total fertility rates in China and India from various sources

	1971	1981	1991	2001
India	5.0	4.5	3.7	3.0
China	5.4	2.7	2.3	1.8

In both China and India, but to different extents, large-scale fertility decline started with the encouragement of the governments, although birth control policies were implemented with various levels of efficiency from the 1950s (Attané, 2002; Guilmo et Kulkarni 2004). This section sums up the history of family planning policies in both countries.

India has the distinction of introducing the first family planning programme sponsored by a government. The programme was initiated in 1951 as a part of the First Five-Year Plan of India. There was however very little contraceptive acceptance during this period though the need for government support to family planning was accepted in principle and the issue of population growth discussed in government circles and public bodies. The Second Five-Year Plan (1956-61) introduced in 1956 called for further development of the family planning programme. By 1961, the time the Third Five-Year Plan (1961-66) was introduced, it was realised that fertility had not declined significantly and that population growth needed to be controlled through fertility regulation. In spite of the efforts of the family planning programme, only a negligible proportion of couples had accepted birth control. By the end of the Third Plan period, family planning services had become widely available through government outlets in both rural and urban areas.

A number of developments took place in the mid-1960s, in technology, emphasis, strategy, and organisation. The Lippes' Loop, an intra-uterine device, became widely available. The 'target approach' which specified targets for contraceptive acceptance was introduced. A broad consensus emerged among the elite during the 1960s about the need for fertility regulation and demands for population control gained wider support. In this context, the target approach did not face much opposition. A related development was the liberalisation of induced abortions in India in 1972 and the first Mass Sterilisation Camps organised in Kerala, which showed an efficient way of providing services. Acceptance of contraception increased substantially through the late 1960s and the early 1970s, but the trend was irregular.

The most severe intensification in the programme took place during 1975 and 1976. First, a state of national emergency was declared in India in 1975 during which the administrative machinery acquired enormous powers. Various government programmes including family planning were given priority and specific targets. There were greater pressures on workers to achieve contraceptive acceptor quotas. The imposition of press censorship prevented any organised opposition to government programmes. Finally, in 1976, the Minister for Health and Family Planning announced the first explicit National Population Policy for India. It argued that it would not be wise to wait for such a development to achieve demographic changes as stipulated during the Bucharest Conference. The

policy proposed a number of measures to achieve the goal of reducing the birth rate by 10 points by 1984 and the demand for compulsory sterilisation was explicitly recognised. The 1976 policy announcement was soon followed by the inclusion of family planning in the programme of the youth wing of the Congress Party that was in power in India. There was a phenomenal rise in the acceptance of sterilisation, most of which being vasectomies.

But these pressure tactics became so strong that distinction between persuasion and coercion got blurred. There were complaints of compulsion and post-sterilisation deaths. Though initially the national emergency and press censorship prevented mass protests, family planning attained a negative image as a programme forced upon people. Compulsion in family planning became a major issue in the elections to the Indian parliament held in early 1977, and the ruling Congress Party lost the parliamentary majority. One of the severest critics of the emergency period family planning programme became the Minister for Health and Family Planning in the new government formed in 1977 and its new population policy categorically ruled out any compulsion in family planning. While the new policy also made it clear that the new government was committed to promoting a small family norm and supporting family planning, the programme had stood totally discredited. The programme personnel had come in for severe criticism, and it was perceived that the new government was not really in favour of the programme. Acceptor targets were termed as guidelines and workers were not given quotas. Moreover, after the experience of the 1977 elections, family planning became a risky programme for political leadership to support. The acceptance of sterilisation fell steeply from over 8 million during 1976-77 to below one million during 1977-78.

In spite of the overall setback, acceptance of reversible contraception increased steadily. There was not much aversion to reversible methods since the emergency intensification focused on sterilisations and not on reversible methods. Oral pills were introduced in the programme in the mid-1970s and the acceptance gradually rose. Over time, the family planning programme got more integrated with the health programme. The resentment about the programme weakened over time, acceptor targets were specified, and acceptance increased steadily in the 1980s. Thus, the 1980s was a period of a balanced approach with greater integration of health and family planning, relatively free of controversies, only a moderate political support or opposition, and saw a slow rise in acceptance of contraception. By the early 1990s, the family planning programme in India had reached a stage where awareness about contraception was nearly universal among the adult population and transition to low fertility was in progress as confirmed the National Family Health Survey 1992-93. It was clear that substantial fertility decline could be achieved in India, as it was actually achieved in many states, without a coercive programme even in the absence of notable economic development.

In 1993, the Indian government constituted a committee, popularly known as the Swaminathan Committee, to formulate a population policy. This committee submitted its report in 1994 (India, Expert Group on Population Policy, 1994). The development of the report of the Swaminathan Committee was nearly contemporaneous with the process of deliberations in international forums leading to the 1994 International Conference on Population and Development (ICPD). The issues addressed were fairly similar and, like the ICPD, the Swaminathan Committee report also reflected the new thinking on population. A small family norm was advocated, yet the choice was left to the couple. Population policy was to be driven by the perceived needs of people rather than imposed from the top. Many of its recommendations were incorporated into the programme. Finally, in February 2000, the Government of India announced the new population policy, the National Population Policy 2000. This has some elements of the policies recommended by the Swaminathan Committee and the ICPD but it can not be considered to be primarily based either on the Swaminathan Committee Report or on the ICPD Plan of Action. A specific goal of the National Population Policy 2000 is to achieve replacement level fertility by the year 2010.

During the same period, China opted for a coercive birth limitation policy in order to promote its economic development. At the start of the 1970s, the demographic transition in China was still modest. Mortality was declining. Life expectancy at birth had gained twenty years since the 1949 Revolution, from 41 years in 1950-1955 to 60 years in 1965-1970 (Huang and Liu, 1995). But the birth rate kept rising to all-time highs. With fewer deaths and more births, population growth peaked at more than 2% per year, hitting 2.8% in 1968. Twenty million people were being added each year.

After having been forgotten for some years, birth control became a national priority again. In 1971, the Council of State's Directive 51 marked the official launch of the third birth-control campaign which, unlike its two forerunners, would be pursued relentlessly in the following decades. Three directives were issued in 1973, summarized by the slogan "late, spaced, few" ("wan, xi, shao"), i.e., marry late, space births, and have fewer children (Attané, 2002). Annual birth quotas were imposed. However, the infinite diversity of settlement patterns, cultures, contexts, constraints, modes of production, and other factors did not escape the promoters of this third campaign. The population was officially classified into three groups: urban, rural, and ethnic minorities. From the outset, urbanites were subjected to the strictest rules: no marriage before 25 for women, before 28 for men, and no more than two children. By comparison, peasants were privileged: they were allowed three children and their minimum legal age at marriage was set at 23 for women, 25 for men. Both urban and rural dwellers, however, were required to space births by at least three to four years. No prescribed conduct was defined for ethnic minorities. In any event, as small groups mostly confined to low-density peripheral areas and accounting for a limited share in the total population, they did not have a major role to play in fulfilling the birth-control objectives.¹

In less than ten years, fertility was halved—from an average 5.7 children per woman in 1970 to 2.8 in 1979. This was the steepest decline ever recorded in the world in so short a time span. In urban areas, women already had fewer children than needed for cohort replacement: the number had fallen to 1.4, compared with the 2.1 required to ensure that two children replace their two parents, allowing for mortality.

At Mao Zedong's death in 1976, the birth-control program had already achieved remarkable results and dispelled the threat of a population boom that the country could not support. But this was still not enough. Signs pointed to a resurgence of the birth rate that threatened to jeopardize these fragile gains. Birth control had to be tightened even further. The "*reform and opening policy*" (*gaige kaifang zhengce*), inaugurated in 1978 by Deng Xiaoping, was therefore assigned a second objective: to curb population growth in order to finally ensure economic take-off. The then Premier, Hua Guofeng, declared in 1979: "*We must control population growth effectively and plan births. This is a prerequisite for the development of the national economy, and a problem that we need to solve so that we can achieve the Four Modernizations*" (Chen, 1979). To meet this goal, the new policy officially announced in January 1979 imposed the draconian rule of the single child. Moreover, the rule applied to almost all of China: 95% of urban dwellers and 90% of rural dwellers were supposed to comply. To promote the measure, the authorities established a reward system. Couples had to pledge to have only one child by signing the "*one-child certificate*" (*du sheng zhinü zheng*). In exchange, they would receive various compensations, which varied considerably from one locality to another: monthly bonuses of a few yuan, free medical care and education for the child, easier access to housing, allocation of an additional small plot for peasant families, retirement bonus for employees of State-owned enterprises, and so on. Reversely, couples who resisted the government injunctions—particularly those who gave birth to a second child despite having signed the certificate—faced a variety of penalties, such as the obligation to reimburse the bonuses received, income deductions, fines, partial confiscation of the family plot, and dismissal for recidivist employees of State-owned enterprises (Attané, 2002).

Since 1984, because of hot spots of resistance, the one-child rule is thus no longer systematically enforced in rural areas. There, families—in particular among certain ethnic minorities—are generally allowed to have a second and even a third child. But the eligibility criteria for a second child, however, can vary from one province to another and sometimes even from one district or village to another.

Today, more than twenty years after the adoption of the one-child policy, family planning still relies on the same weapons: persuasion, coercion, and fines. But reforms have led families to gradually emancipate themselves from collective institutions. Birth control is slipping out of the hands of the regime's cadres, and coercive measures are failing. To remain effective, regulations need to be

¹ For more information on the implementation of birth control among ethnic minorities, see esp. Attané and Courbage (2000); Courbage (2002).

adjusted. By promoting local initiatives, decentralization has made it possible to institute new types of penalties more directly targeted at family interests. Nevertheless, the “Population and Birth Control Act” passed in September 2002 reasserts the goal of strict limits on the number of children. However, recent developments suggest changes in the means used to reach the objective. The program’s emphasis has been shifting toward voluntarism for two reasons: first, because it is increasingly difficult for the authorities to interfere in couples’ private lives; second, because the threat of unsustainable population growth has now been eliminated. The new focus is on health: reproductive health, education, and information are the main priorities.

These divergent attitudes toward birth control had strong impact on fertility decline, India displaying in 2001 fertility levels almost twice higher than those observed in China.

2. Subsequent deterioration of sex ratio at young ages

Nevertheless, irrespective of their distinct family planning policies, fertility decline in both countries has been accompanied by a more rapid decline in female births than of male births, inducing deteriorating sex ratio at birth (Table 2).

Table 2. Recent trends in sex ratios at birth at the national level

	India	China
1982	105	107.2
1986	106	
1989		111.3
1990	106	
1995	106	
1999	112	
2000		116.9

In both countries, a large segment of couples chose not only to select the quantity of children to be born, but also to manipulate their “quality” by reducing actively the share of girls in their offspring.

Abnormally high sex ratio at birth (SRB) or among the youth is not a new phenomenon in China. During the 1930s and 1940s, gender distribution at birth was already imbalanced as a result of excess female mortality associated with female infanticide. Reduction in this practice and the improved women status in the Communist era contributed to the retaining of a SRB within the normal range (Chen Wei, 2003). But the early 1980s sound the knell of biological sex regulation at birth. From 1979, the one-child policy turned de facto into a one-son policy. Nobody wanted to give up a male heir, and girls re-started to go missing.

Today, discrimination against girls is rising year by year. Thus, the SRB, normally between 103 to 106 boys for 100 girls (Chahnazarian, 1988), rose from 107.2 in 1982 to 111.3² in 1989 and then to 116.9³ in 2000. This substantial deviation from the normal range implies deliberate interventions to the roughly equal probability of a male or a female birth.

² Between January 1st, 1989 and December 31st, 1989, there were 24,624,887 births, with a sex ratio at birth of 111.3 boys per 100 girls. But data displayed by birth order and mother age at birth totalize only 23,851,876 births, with a sex ratio at birth of 113.9.

³ That’s to say a total of 14,114,536 births between November 1st, 1999 and October 31st, 2000, and a sex ratio at birth of 116.9 males per 100 females for the whole Chinese population. Birth data displayed by birth order are taken from the long

Although the influence of each method used to reach this outcome may vary, sex selective abortions and excessive mortality among female children are the main determinants of observed distortions, while female infanticide and pre-conception sex selection are probably far less common.

Table 3. Recent trends in female to male ratio in infant mortality at the national level

	Infant mortality	
	India	China
1973-75		0.875
1981		0.948
1987		1.023
1989-90		1.153
1992-93	0.9	
1994-95		1.338
1998-99	1.0	
1999-2000		1.465

In China and India as well, the gender differential infant mortality gap widened to the detriment of girls as child survival gradually improved. But mortality during the first year of life is routinely higher among males, in a natural offsetting of excess male births. Excess male infant mortality is a universal phenomenon, and countries where there is no son preference are no exception. Hill and Upchurch (1995) calculated the observed normal female advantage by establishing the ratio of female-to-male infant mortality at 0.78 for a male probability of dying in the first 5 years of life below 0.05. In China, according to our calculation, this advantage had already been lost by 1973-75, with a ratio of 0.875, and is increasingly waning: 0.948 in 1981, 1.156 in 1990, 1.465 in 2000. In India, data are often less reliable and trends are less discernible. This is in particular due to the fact that sex differentials in child or infant mortality are concentrated in north-western areas and almost entirely absent in the rest of the country.

The reasons of this excess female infant mortality are well-established and somewhat related to fertility decline, which caused expression of son preference to escalate. In China, for instance, where son preference is supremely the product of an ingrained social prejudice that “man is better than woman”, girls and women still occupy a marginal position in society, whereas a male heir, as we have seen, offers countless advantages. Because the family planning policy imposes a prior authorization for each birth, and inflicts administrative, financial, and occupational penalties on non-compliant couples, girls become unwanted simply because they deny their parents the possibility of a son, which has led to growing daughter discrimination. Excess female infant mortality is one of these discriminatory practices. In both China and India, poor rural families, in particular, distribute more food and general care to a son than a daughter, and are more inclined to provide them with costly medical care. However, the emergence during the last 20 years of sex-selective abortion (a costly, but reliable technique to alter the sex composition of one’s offspring) has gradually displaced the role of “traditional methods” such as neglect or infanticide.

form questionnaire administered not to the whole population, but to a ten percent sample of households. In this sample, 1,182,138 births were enumerated, with a sex ratio at birth of 119.9.

3. Traditional son preference

Discrimination against females is a product of Chinese culture. Traditionally confined to the domestic sphere, a good wife had “to serve her husband and his parents, to take care of the house and to have male heirs”. Nothing else. Supported by her family until her marriage, the daughter was then entirely devoted to her husband’s family. So, a female birth rarely causes delight, especially for the poorest. Today, “*male birth is welcomed with shouts of joy and firecrackers. But when a female born, neighbours just say nothing*”. Because of superstition, millions of parents still name their daughters “Laidi” (literally “A boy is following”), “Pandi” (“Hoping for a son”) or “Zhaodi” (“Bring us a son”). After marriage, a girl owes nothing to her parents. She does not have to take care of them when they become old; that is the duty of a son —and of a daughter-in-law. In the countryside, people still have to “have a son for old age”, as they will never have any retirement pension. For hundreds of millions of peasants, a son is the only guarantee for old age, and against illness or disability.

In spite of the recent economic development, Chinese the woman remains “inferior to man”, and some wives are still ill-treated or repudiated when they are “incapable” of having a son. The patriarchal clan system, the foundation of traditional social organization, requires early marriage and numerous children, especially males, to maintain clan and family power. Today, family solidarities remain strong and many features of patriarchal culture still dominates daily life such as patrilocal marriage, patrilineal filiation or ancestor worship.

To perpetuate the family name is one of the fundamental male duties in Confucian culture, and the absence of a male heir is the worst dereliction of filial devotional rules, especially in rural areas. Peasants still consider that “the more children you have, the happier you are”, and some of them even say that “to give birth to a boy or a girl, it’s the same, but to have a boy is better”. To have a son is ultimately an indispensable condition for perpetuating ancestor worship.

Rural decollectivization provided another excuse to discriminate against girls. The mirage of personal enrichment revived for peasants when they recovered land usufruct. The family recovered its function as an economic unit, of which it had been deprived during the collectivist period. Thus, the larger the family, the greater are its opportunities to become richer, as land allotment is made on the basis of family size. In the countryside, people often consider that “the early marriage of a son has three advantages: daughter-in-law, descendants and land”. In cities, a child costs more than he yields. In the countryside, he has an economic value because he works in the fields, takes out livestock, etc. Rural exodus and growing disinterest for land work have not altered the necessity to have a son; if he leaves the farm, he will get a more lucrative job in the city. Even if he is not by the side of his parents, he will support them as they grow older. These constraints sustain a strong son preference, which marginalizes women.

Many of the features observed for China holds true in rural India where girls are perceived as of lesser values than boys. Several cultural traits in the kinship tend to reinforce women’s inferiority and subordination to men. One of the recent developments that probably reflects very accurately the declining status of women is the institution of dowry. The dowry paid by the bride’s family to the groom’s tends to be perceived as an extra burden imposed of parents with girls. While dowry was historically a custom restricted to some communities (especially high castes or specific communities in North India), the institution has rapidly spread across regions and across social categories. It is now rather common among lower-status groups that used to practice instead brideprice in the past; dowry is also practised in most regions of South India, where it was previously rare except among some Brahmin castes.

At the same time, the inflation in dowry has been flourishing unchecked for reasons of social and economic pressure that are still now far from being well understood. It is clear that a dangerous combination of economic development, prosperity and social diffusion of new family norms has fuelled the propagation and inflation of dowry. But whatever the cause of these inflationary trends, the result has been to put additional pressure on families with girls and served as a strictly economic justification for sex selection. Traditional preference for son inherited from the landed classes of rural society has now turned into an economic rationale pursued by upwardly mobile middle-classes seeking to maximize their social benefits (reputation, prestige, alliance, etc.) in the marriage market.

Dowry has long been officially banned in India, but this prohibition has had almost no impact on actual marriage transactions. Its rise over the last four decades points not only to the very limited influence of the law on private social arrangements, but also its rather weak implementation, which indicates the prevalence of double standards in such matters. As the Indian government has recently strengthened its regulations banning sex-detection tests, it will be crucial to monitor the implementation of the law to assess the exact nature of the government's involvement.

II. Trends in spatial heterogeneity

1. mapping sex ratio in China and India

The child sex ratio is characterized everywhere by pronounced geographic disparities. Like in South Korea in the past, the average value recorded in China or in India is not representative of the country as a whole. While many areas are unaffected by sex ratio imbalances, there are on the contrary so-called hot spots of girl deficit, i.e. compact areas where sex ratio is uniformly much higher than the national average. As a result, it is often less than half of the country that is responsible for the bulk of sex ratio distortion, while the rest of the country display normal values.

We prepared for the last two censuses several maps for China and India (respectively 1990 and 2000, and 1991 and 2001). A few words are in order about our methodology: we used here the sex ratio (boys per 100 girls) computed from the age group 0-6 for India while retaining the 0-4 age group for China. Original data pertain to the Chinese counties (*xian*) and the Indian districts; these are administrative units of roughly comparable demographic size. However, instead of keeping the original administrative boundaries, we computed the surface values for each map and contoured them in class intervals. As a result, large contiguous areas of homogeneous sex ratio levels appear more clearly on the final maps even when they cut across higher-level units like Chinese provinces or Indian states. We used the same class break values for both countries even though the average level of child sex ratio are different with India recording significantly lower values than China. This may not be appropriate for individual maps, but it facilitates the comparison between the two countries.

It is beyond the scope of this paper to produce a detailed geographic analysis of sex ratio variations within both countries (see also Guilmoto 2005). Maps shown here (Figures 2 and 3) illustrate easily a few common features. First, sex ratio imbalances are not equally distributed in each country. This is the reason why our maps do not show the Western provinces of China where child sex ratio is almost balanced (Figure 1). Many regions appear almost unaffected by the national rise in child sex ratio. Second, there is a distinct clustering of regions. Areas with higher values tend to be close to each other and the geographic distribution is far from being random. This translates into high levels of spatial autocorrelation for the child sex ratio variable. A third point is that maps tend to exhibit the same patterns across time and there is no radical change in the geography of sex ratio after ten years in spite of the rapid increase observed during this period. The fact that the spatial distribution of values appears rather stable suggests that the role played by deficient census registration in a country like China may be limited.

A closer examination helps, however, to identify some significant variations between both Asian countries. For example, female discrimination is more acute in urban areas in India than in the countryside, a feature not found in China where some of the largest cities appear rather less affected than rural areas. A more puzzling aspect relates to the geographical patterning of child ratio in both countries. For its part, China is characterized by a great number of regional hot spots with high child sex ratio. In most regions where minorities (non-*Han* populations) prevail, sex ratio is close to normal values, but this doesn't imply that the rest of the country is homogeneous. There exist large zones characterized by extreme sex ratio values bordering areas where recorded values are on the contrary almost normal. Consider for instance the large pocket encompassing bordering counties of Anhui, Hubei and Henan where sex ratio is often above 150. Our map shows that it is also surrounded by areas in the same provinces (especially Anhui and Hubei) where sex ratio levels are almost normal.

On the contrary, India is characterized by a single, global orientation of its sex ratio patterns, with higher than usual values recorded in the North-Western quadrant of the country from Gujarat to

Punjab along India's western border. In the rest of the country, child sex ratio hardly exceeds normal values and hot spots of abnormal sex ratio tend to be few and small. A systematic geostatistical analysis of child sex ratio data confirms this observation. Spatial autocorrelation appears in India much stronger than in China and extends over a larger radius (Guilmoto 2005). This means that irrespective of the fact that sex ratio levels are on the whole considerably higher in China than in India, the spread of sex discrimination appears more compact in India and less scattered away across different subregions.

This geographic pattern may appear surprising in view of the seemingly stronger political and cultural homogeneity of China. Demographic behaviour and gender bias would be expected to be more homogeneous, especially within the *Han*-dominated areas that constitute most of Eastern and Central China. On the reverse, we would presume that India's sex ratio map be extremely segmented in view of its internal cultural diversity. High sex ratio areas in India illustrated by the maps cut across several States with different linguistic, religious and cultural groups. The spatial patchwork observed on the Chinese map would actually be less surprising in India with its heterogeneous social composition than in a country like China where the homogenizing impact of state policies on the social fabric should be more pronounced.

2. Spatial trends of child sex ratio in China and India

The second part of the study concentrates on the spatial examination of the trends in sex ratio by comparing the last two censuses in China and India, an approach often hindered by the change in the administrative maps between successive censuses as illustrated in Figure 2. India had for instance 593 districts in 2001 as against only 466 in 1991 and intercensal comparison is therefore not possible. Through the use of GIS-based interpolation techniques, it is possible to estimate child sex ratio values for administrative units that do not exist in a given census. The method consists in deriving trends from surface maps of child sex ratio for two periods rather than try to use administrative units that may change between subsequent censuses. Surface maps for each period are computed from ordinary maps by geostatistical interpolation (kriging); these maps yield values for individual spatial grid cells than can then be "subtracted" to compute local trend values during the 1990s.

The resulting maps (Figure 5) shown below indicate where the increase in child sex ratio has occurred during the ten years under study. This increase is far from uniform across both countries. In each case, the increase in the proportion of boys has been concentrated in a few regions. By and large, the increase happened in the areas where sex ratio was already abnormally high in the early 1990s.

From a theoretical viewpoint, change may also be divided into two components: a national trend affecting all regions simultaneously and regional trends that are found only in given areas. The national trend would be associated to structural factors likely to have impacted similarly on every region. To some extent, this component of change can be considered "a-spatial" as it does not possess any distinctive spatial property. On the contrary, regional (or local) factors are delimited and pertain more specifically to local social or economic dynamics.

Trend maps indicate that the structural component appears to have played a rather limited role in the change that has occurred during the ten-year period. China offers probably the most vivid illustration of this as several areas along the coast (in Zhejiang or Shandong) have actually registered a decline in sex ratio during the 1990s, a reverse trend similar to what has been observed in South Korea over the last years. At the same time, sex discrimination has intensified in contiguous provinces such as Jiangsu or Anhui.

In India, improvements in child sex ratio have extremely isolated and most districts have recorded an increase in sex ratio values. However, the degradation observed for example in the North-West (Punjab, Haryana) has been severe and very concentrated. As a result, it is difficult to see sex ratio changes in China and India as a "natural" consequence of large, structural changes across each country. The regional factor seems much more significant in describing the change that has occurred and there is a need for local explanations of the increase in sex ratio rather than wide-ranging explanations (such as economic or demographic change). The influence of rapid economic

development on discriminatory behaviour should probably be understood within local contexts, where responses to new opportunities are mediated by local factors such as cultural or bureaucratic institutions. As the observed increase trends to be clustered in pockets (hot spots of discrimination), the analysis suggests further the specific role that might be attributed to propagation mechanisms in regional change. On the one hand, discriminatory practices tend to spread across all social groups irrespective of community or class. But on the other, the influence of core areas -where girl discrimination is widely practised and socially acceptable- makes itself felt on adjacent regions and proves crucial how areas of with high sex ratio tend to widen over the years. Once more, China and India seem rather different on that account because of the respective role of party political structures and of larger social and cultural models (such as the Punjabi model of development).

III Discussion

Several unresolved issues remain about the causes for the sex ratio differentials observed in these two countries. It is important to stress at the outset that the impact of fertility decline on expression of son preference is in no way automatic: among early decliners, fertility decline in many regions caused little impact on the sex composition of the child population. This is especially true of several regions of India (such as Kerala) where the very rapid fall in birth rates has not been accompanied by a gradual increase in the proportion of boys. In China, the correspondence appears somewhat stronger as exemplified by coastal China where fertility rates and proportion of girls are both significantly lower than in the rest of the country, especially when compared to the Eastern provinces. However, when examined more closely, several areas in Western China where sex ratio has reached levels above 140 boys per 100 girls are rural or peri-urban and do not necessarily coincide with the lowest-fertility zones. Furthermore, the average child sex ratio has slightly improved in some highly urbanized areas (around Beijing or Shanghai for instance).

While the Indian gender geography can be broadly interpreted through a combination of local, traditional institutions favouring patriarchal values and of rapid, economy-driven modernization processes, there is probably distinct diffusion mechanisms that helped new sex selection techniques and modern female bias to spread from core areas to adjacent districts. For China, the determinants of sex ratio differentials across the country are less easily understood as closer examination of local data show that *Han* China itself is still very heterogeneous, even when taking into account geographic or economic disparities between regions. However, the confrontation of recent census data at different dates demonstrates the existence of spatial patterns that are rather stable over time. While this was expected for India where census data have long revealed regional disparities, this result is important for China as the quality of reported data (such as female under-registration) was often mentioned as a possible source for distorted sex ratio values. It is still too early however to try in each country to sort the historical component of sex discrimination (often illustrated in the past by the prevalence of female infanticide) based on age-old institutions from the emergence of a new discriminatory regime founded on modern technologies and fed by a new economic rationality favouring boys.

The persistent difference in the geography of child sex ratio in China and India refer to the interplay of traditional and government institutions in gender arrangements in both countries. The examination of China's and India's sex ratio maps by monitoring the patterns of change levels may allow us to identify the hot spots where policy intervention is required over the years to come. But our investigation leads also to a reappraisal of the recent deterioration of the sex ratio. The existence of firmly established spatial patterns for the phenomenon suggests that structural factors of demographic and economic change play a lesser role than the entrenched system of patriarchal values. Patriarchy has clearly modernized during the last 30 years by absorbing some of the main ingredients of economic and demographic change such as fertility decline or increased monetization. However, its geographic contours have remained rather fixed and the impact of state intervention may be limited, especially in the Indian case.

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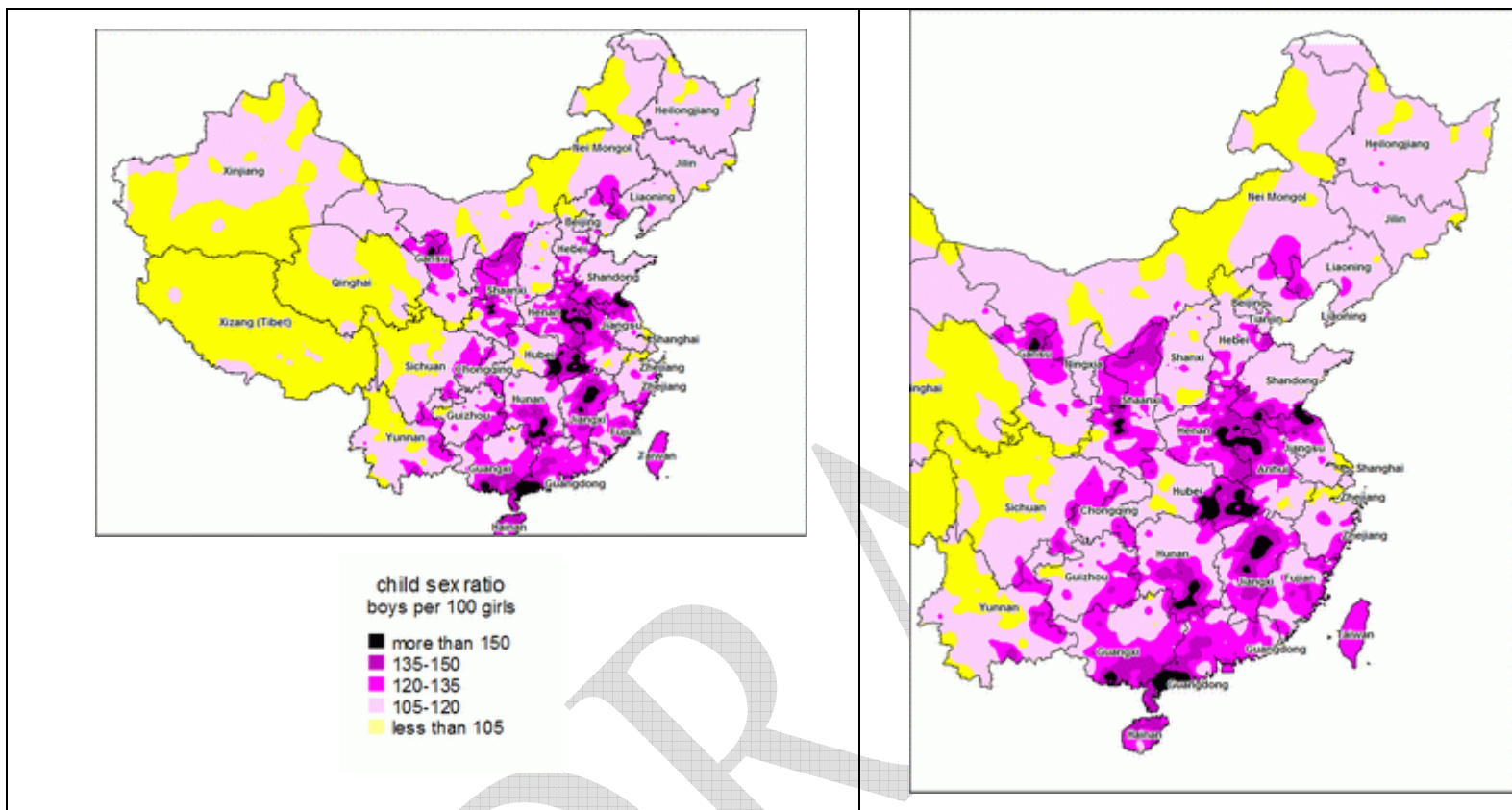


Figure 1 : the preponderance of Eastern China in sex ratio imbalances (2000 census)

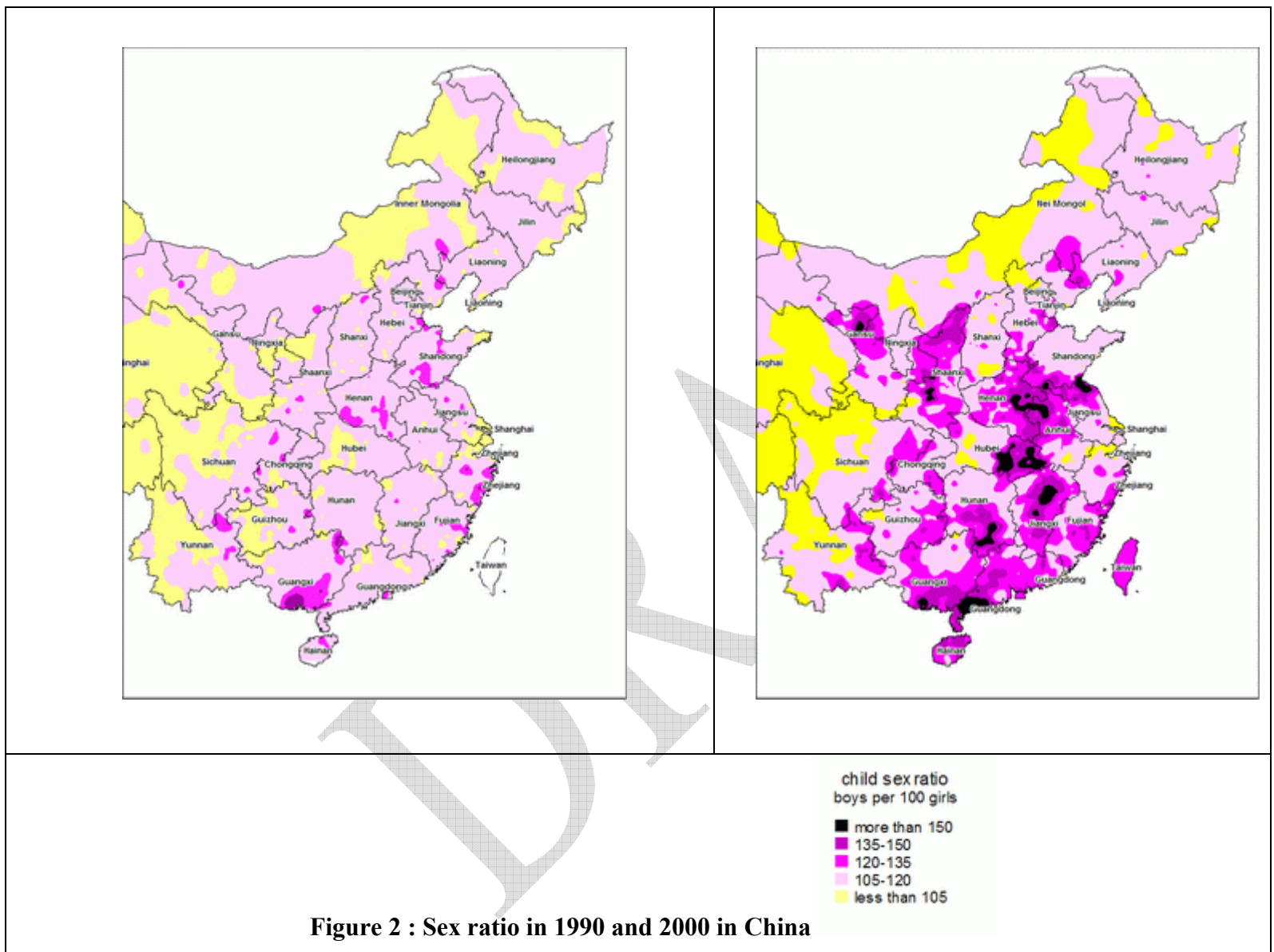


Figure 2 : Sex ratio in 1990 and 2000 in China

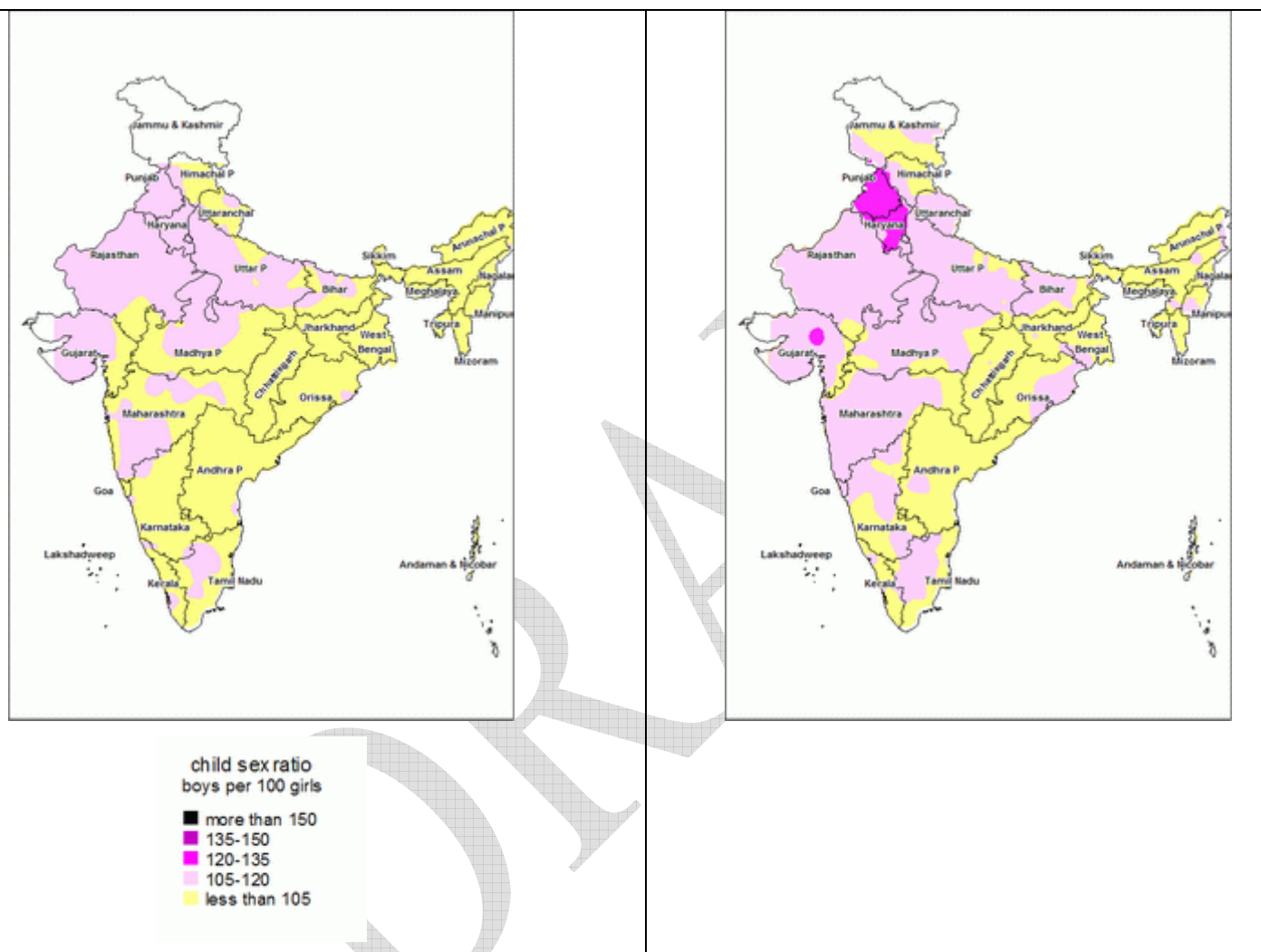


Figure 3 : Sex ratio in 1991 and 2001 in India

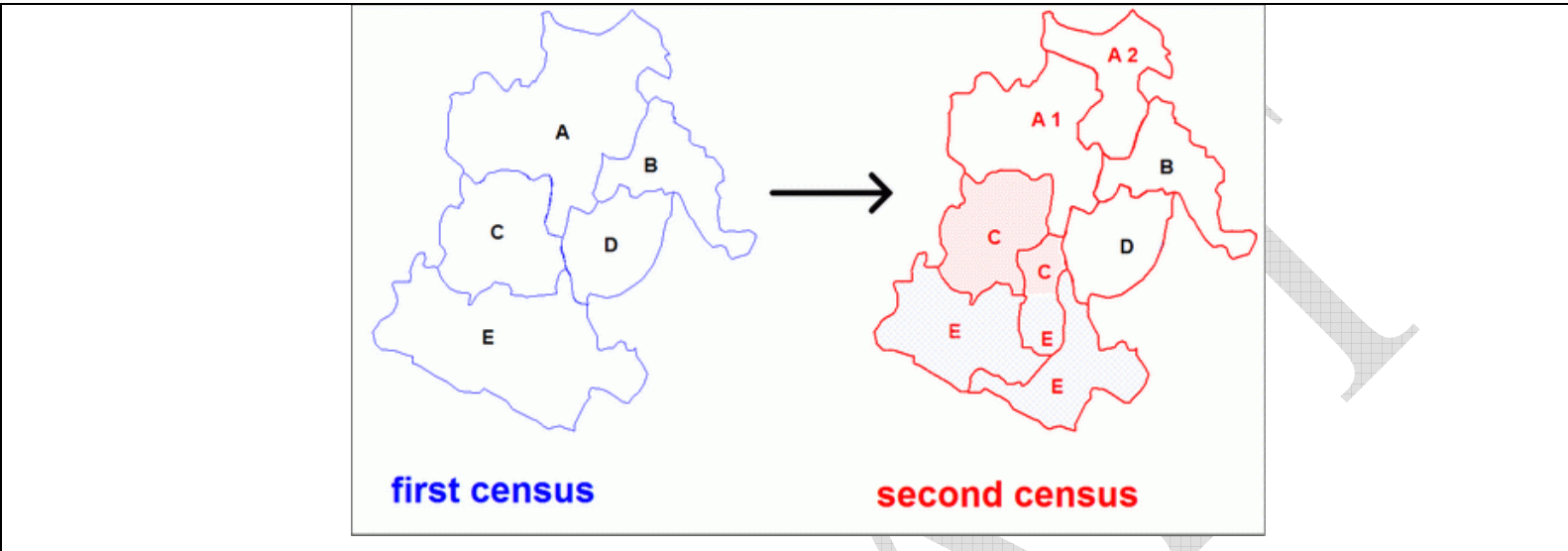


Figure 4 : Intercensal changes in administrative boundaries

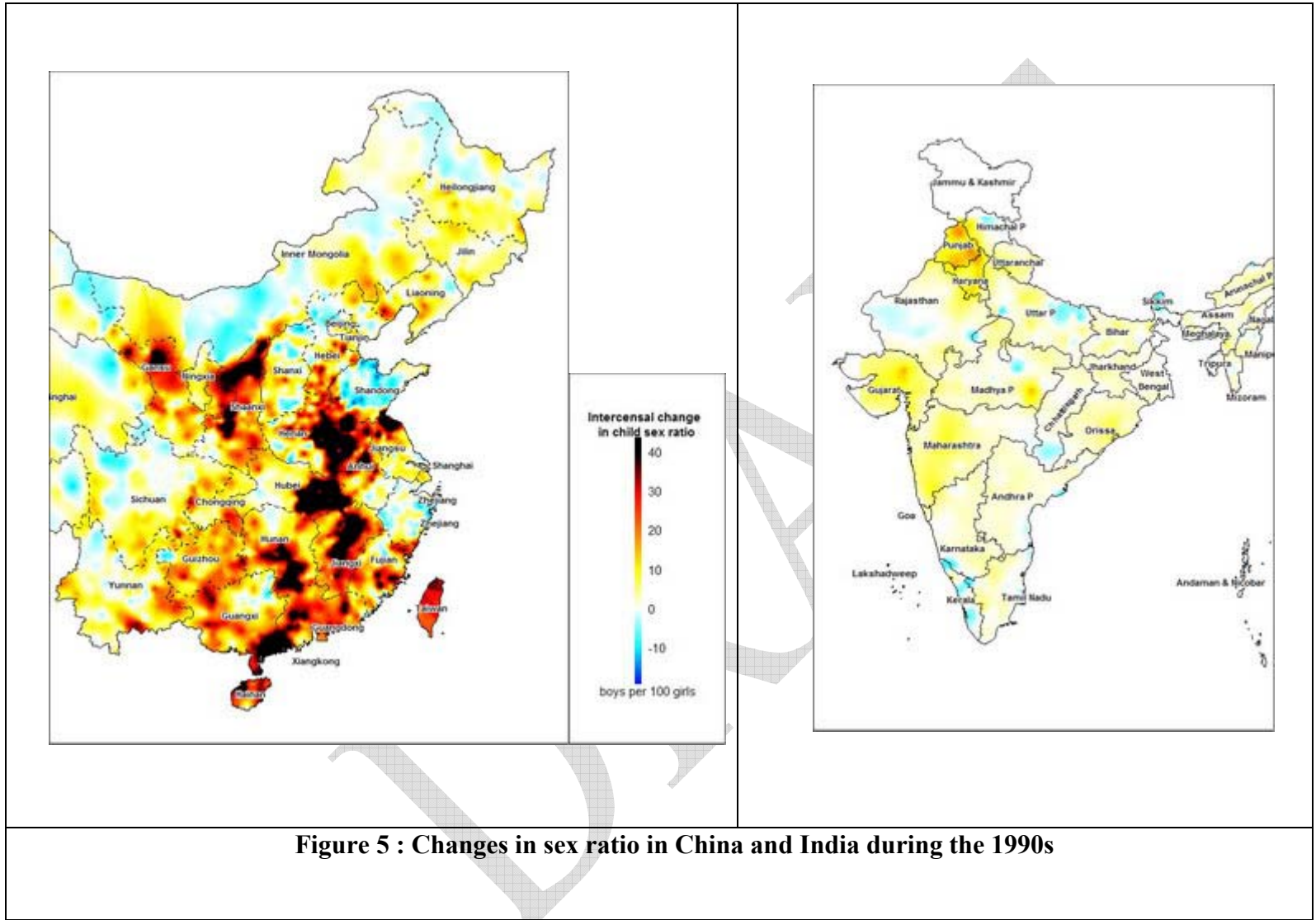


Figure 5 : Changes in sex ratio in China and India during the 1990s