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Determinants of Declining Child Sex Ratio in Rajasthan

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Abstract
The recent provisional census figures for Rajasthan show an alarming drop in sex ratio in the 0 – 6 age group from 909 in 2001 to 883 in 2011. While it was 916 in 1991, a fall of 7 points (0.76%) in previous decade and a much higher decline of 26 points (2.86%) in present decade are indicative of a clear bias against girl child in Rajasthan. Using Pooled OLS and Quantile Regression estimates for the last three decennial censuses, the paper is an attempt to examine the determinants of declining child sex ratio in Rajasthan. A key result we obtained in pooled OLS, suggests that one percentage point increase in male literacy has reducing effect on the juvenile sex ratio by on and average 0.14 percent in the districts of Rajasthan during 1991-2011. This finding is robust and successively increasing in all single decadal year OLS estimates. This means that with an increasing level of male literacy, strong son preference attitude and use of ultrasound machines for female foeticide have been flourishing freely in the state since last two decades The revealing Quantile Regression results indicate that the male literacy rate has an insignificant effect at the 0.05 quantile and it turns significant and increasingly negative at successively higher quantiles, while the female literacy and other infrastructural facilities like safe drinking water have positive and significant effect on the upper tail of juvenile sex ratios. The most public intervention such as strengthening female education and availability of safe drinking water facilities are essential to increase the juvenile sex ratio in the state but not sufficient. Strict enforcement of PCPNDT Act and laws to provide women the right to inherit ancestral property are an utmost need for balancing child sex ratio in the state.

Key words: juvenile sex ratio, Pooled OLS, male and female literacy, infrastructural facilities, decennial census.

1. Introduction

The recent 2011 Provisional Census figures for Rajasthan show an alarming drop in sex ratio in 0-6 age group from 909 in 2001 to 883 in 2011, while it was 916 in 1991, a fall of 7 points (0.76%) in previous decade and a decline of 26 points (2.86%) in 2001-2011 are indicative of a clear bias against the relative life chances of girl child in the state. Thirty three points decline in last two decade is a matter of grave policy concern, not only because it violates the human rights of unborn and infant girls but also because it deprives the state of the potential economic and social contribution of these “missing women.” Though, the child sex ratio in India also stands at a dismal 914, down from 927 in 2001. The Provisional Census figures show that in 27 states/Union Territories of India, the child sex ratio has shown a decline over census 2001. But the decadal decline in child sex ratio at national level is less steep from that of the previous decade (1991 to 2001). In 1991, it was 945 and fell to 927 in 2001, a fall of 18 points (1.9%). This time, it has fallen to 914, a fall of 13 points (1.4%). Highest decline in the child sex ratio was noted in Jammu & Kashmir (-8.71%) followed by Dadra & Nagar Haveli (-5.62%), Lakshadweep (-5.32%), Maharashtra (-3.29%) and Rajasthan (-2.86%) (TNN Apr 5, 2011). The problem is most pronounced in Rajasthan, which has lowest child sex ratio amongst EAG states. While the neighbouring state’s like Punjab and Haryana, which have traditionally seen low sex ratio, have recorded an increasing trend in child sex ratio but Rajasthan is still showing sharper declining trend in the current provisional census report. Despite considerable pressure from civil society groups to implement the Pre-Conception and Pre-Natal Diagnostic Techniques (Prohibition of Sex Selection) Act, the pernicious trend of elimination of girls has continued (Mathur & Rajagopal 2011).

The use of ultrasound technology to reject the unwanted girl child has become widespread in the state. This came in to light in 2006 when a sting operation carried out by the Sahara television channel captured on camera over a hundred doctors violating the law. More cases of female foeticide have been unearthed since then in various parts of the state. After the sting operation, the Rajasthan Medical Council (RMC) temporarily suspended the registration of four gynecologists and three sonologists and the license to the practice medical termination of pregnancy (MTP) and ultra sonology of 29 other doctors. More than 30 doctors violating the pre-Natal Diagnostic Techniques (Prohibition of sex selection) (PCPNDT) act, 1994 were restrained from practice by the RMC on prima facie grounds of violating the code of professional conduct, etiquette and ethics as laid down by the law (Singh & Srivastava 2008). Added to the studies by independent agencies have shown that the two-child norm in Rajasthan for contesting election in panchayati raj bodies in the state have also adversely affected the sex ratio in children. Rajasthan introduced the two-child norm in 1992 and it bars people with more than two children from standing for elections or holding any position in panchayati raj institutions and urban local bodies (TNN Apr 1, 2011).

To combat this scourge, policy makers need to have a better understanding of the socio-economic determinants of juvenile sex ratios. Our paper contributes to the existing literature on gender imbalance in several ways. Most existing studies at the national level have used data from 1991 or the 2001 census, aggregated to either the state or the district level. Since juvenile sex ratios have changed dramatically in the last three decades. The aim of this paper is to examine the trends and determinants of cross district variations in the relative life chances of girl child in the districts of Rajasthan since last two decades.

2. Review of Literature

Much of the literature in Indian sex ratios has focused on a North-South dichotomy in sex ratios (Dyson & Moore 1983, Agarwal 1986 and Sen 2003). This literature has argued that the northern and western regions of the country not only have more rigid norms of female seclusion, particularly related to participation in economic activities outside the home, but also have marriage customs such as large dowry payments that make girls an economic burden on the family. In contrast, women in the South and East enjoy greater autonomy and higher social status within the family. These cultural differences manifest themselves in the form of lower sex ratios at birth in the northern and western states than in the southern and eastern states.

Sex selective abortions and son preference attitude are also identified as determinants of declining sex ratio in certain studies related to Asian countries (D'Souza & Chen 1980; Park & Cho 1995; Kynch & Sen 1983 and Das & Gupta 1987). These studies attributed excess female mortality to a general preference for sons, which in turn traced it to either higher expected return to the labour of male over female children or anticipated old-age support from sons within the patrilineal kinship system (Berik & Bilginsoy 2000). Visariya (1969) also claimed that 'excess female literacy' is the basic reason for declining sex ratio and excess female mortality in turn is the result of female infanticide, female foeticide, neglect of females and maternal mortality. Barbara Diane Miller (1989) examined the changes in the regional patterns of juvenile sex ratio in rural India from the censuses of 1961 and 1971. It was found that while sex differentials in childhood mortality were substantial and widely distributed in India at the time of the 1961 Census, they were even more so by the time of the 1971 census. Yet another recent study of spatial variations in sex ratio in the context of India is Klasen and Claudia (2003), where they found labour force participation rate and literacy rate of women significant in lessening sex ratio; while increasing recourse to sex selective abortions worsen it. Chakraborty & Sinha (2008) examined the determinants of declining child sex ratio in India; the study uses fixed effects model four decennial census data (1971-2001) across fifteen major states found that the child sex ratio is inversely related to the spatial socio-economic characteristics, in particular, female literacy rate and female economic activity rate; with relatively higher elasticity coefficients for urban India.

3. Trends

The overall sex ratio is determined by several factors such as age-specific differences in mortality and migration rates across males and females. For this reason, sex ratios for infants and children are better measures of the differential treatment of males and females in a society. Although the overall sex ratio in Rajasthan has improved to 926 in census 2011 by sixteen points compared to that of 1991, this is highest recorded sex ratio for the state since 1901, when it was 905 though it continuous to be below the national average of 940. The only reason for that is that life expectancy of women has gone up. This means, that there are older women in the population that there were 10 years ago but the main concern remains the poor child sex ratio (TNN Apr 01, 2011). Figure 1 plot that the level of child sex ratio has been in free fall since1981, when it stood 954. It also explores that up to1991 the level of child sex ratio was higher than overall sex ratio and after that it is falling, even in decades when the overall sex ratio increased slightly (1991-2001 and 2001-2011), the juvenile sex ratio continued to fall. These trends probably result from three factors: sex – selective abortions (Feticide) based on prenatal ultrasounds, excess female (relative to male) infant and child mortality, and differential contraceptive use depending upon the sex composition of existing children. All three in reflect a strong cultural preference for sons over daughters (Deolalikar et al. 2009).

4. Inter-District Differences

The latest census reflects the dismal child sex ratio in the state, with only 9 districts reporting the ratio above 900, compared to the 2001 census which had 23 districts above this mark. Figure 2 shows the juvenile sex ratio for thirty two districts of the state at three points of time: 1991, 2001 and 2011. It was that Jaisalmer, Bharatpur, Alwar, Karauli, Sikar and Jhunjhunu consistently had the lowest juvenile sex ratio of any district in Rajasthan over this entire period. Bikaner, Barmer, Churu and Sawai Madhopur had improved juvenile sex ratio in the state with little change over the period 1991-2001. Districts such as Dholpur, Jaipur, Ganganagar and Hanumangarh, which has more balanced child sex ratios in 1991, have seen larger declines between 1991 and 2001. Figure 3 show that Jhunjhunu, the highest literate district of the state has recorded the sharpest decline in the child sex ratio (about 7.5%) of any district in the state during 1991-2011. Indeed twenty six districts, other than Barmer, Bikaner,Udaipur, Churu, Jaisalmer and Sawai Madhopur showing declining juvenile sex ratio between 1991-2011.

The declining child sex ratio in the state may be a pointer to rampant foeticide in the state. Foeticide is a rampant practice, especially in western Rajasthan where girls are considered unwanted. Though through help of NGOs the practice of breaking a pot when a girl child is born, signifying sorrow is changing fast but there are still villages where there is negligible presence of girl child. The districts of Jaisalmer, Barmer, Pali, Chittorgarh, Ganganagar and Jhunjhunu are known for the killing of girl child. Figures in the Census 2011 report point out that the child sex ratio has been on a slide in the state since 1981 and, barring Ganganagar, all districts in the state have reported a fall in the child sex ratio. The districts that have seen the biggest fall in the child sex ratio include Dungarpur, Jaipur, Sikar, Rajsamand and Tonk. The fall in Dungarpur district, a predominantly tribal area, merits a closer inquiry as it shows a drop in child sex ratio by 39 points in the last decade. Three districts, i.e, Jaipur, Jhunjhunu and Sikar are also known for high literacy rates denoting little correlation between higher literacy rates and mindsets which allow girls a right to be born and live with dignity (Mathur, 2011). Other districts that shown a similar decline are mainly located in eastern Rajasthan and include Jhunjhunu, Alwar, Dausa, Bharatpur, Karauli, Tonk, Sawai Madhopur besides Ganganagar, Hanumangarh and Jaisalmer.

5. Data & Methodology

The present paper is primarily based on secondary data collected from decennial census Reports (1991, 2001 & 2011), Government of India, Rajasthan Human Development Report, 2008 and District-Level Household Survey 2 & 3, covering Child sex ratio, overall sex ratio, literacy rate, decadal population growth rate and household access facilities like safe drinking water, toilet facility and electricity. Pooled OLS, fixed-effects and random-effects panel regression models have been used to find conclusions in this paper. As it is well known, the quantile regression technique is a means of allowing estimated marginal effects to differ at different points of the conditional distribution of the dependent variable. Quantile regressions were initially developed as a robust regression technique that would allow for estimation where the typical assumption of normality of the error term might not be strictly satisfied (Koenker & Bassett 1978). However, they are now used extensively to analyze the relationship between dependant and independent variables over the entire distribution of the dependant variable-not just at the conditional mean (Buchinsky & Eide 1994). Appropriate diagnostic tests have also been performed in checking accuracy of the models. SPSS vs. 17 and gretl vs. 1.9.5 software were used for database, figure constructions and regression analysis. Based on the findings, some policy recommendations have also been suggested for balancing the juvenile sex ratio in districts of Rajasthan.

6. Empirical Results

The objective of the paper is to detect the relationship between the shortfall of girls and socio-economic characteristics of districts. The unit of analysis of the study is district, which are not behavioural units, but aggregates of behavioural units (such as household or individuals). The dependant variable in the model is the juvenile sex ratio of age cohort 0-6 years. The conditioning set includes two types of important variables that measure educational attainment as well as intra-household resources including safe drinking water, sanitation and electricity facilities. To begin our analysis, single regression models of juvenile sex ratio were run against each of our chosen economic and social indicators to obtain a graphical representation of how well each variable could explain variances in child sex ratio. These regression plots can be found in figures 4-9. The only variable that held a positive relationship with child sex ratio were safe drinking water facility and decadal population growth rate.

All the variables are taken in natural logarithms because the dependant variable is a ratio and therefore asymmetric around the reference value. With logarithmic transformation, a deviation from a reference point becomes equidistant in either direction (Fossett & Kiecolt 1991). The regression coefficients are then elasticities of the juvenile sex ratio with respect to explanatory variables. The results of ordinary least square estimations of juvenile sex ratio across districts of Rajasthan are reported in Table 1. As a comparison, we also reported pooled (over 1991, 2001 and 2011) ordinary least squares (OLS) estimates as well as OLS estimates for each of three census years. Since the OLS estimates are likely to be biased as high (0.80) correlation between two variables and Variance Inflation Factor (VIF) tests indicated that there is little multicollinearity problem in male and female literacy and that's why it is not our preferred estimates, but there is little point in discussing them. The most noteworthy finding in the OLS estimates is that any increase in male literacy in districts of Rajasthan serves to decrease the juvenile sex ratio and its negative effect on juvenile sex ratio is increasing decade by decade, i.e. its negative elasticity was 0.11 in 1991 had increased 0.36 in 2001 and now it has become 0.40 in the last decade 2011. This means that with an increasing level of male literacy, strong son preference attitude and use of ultrasound machines for female foeticide have been flourishing freely and fairly in the state since last two decades. It also shows that PCPNDT Act has not been properly enforced and no sincere effort has been made to stop ultrasound machines from being used for sex determination and hence sex determination continues to be practiced robustly and rampantly in the state.

Table 1: OLS Regressions of the Log Juvenile Sex Ratio in districts of Rajasthan,1991-2011

Independent Variables	OLS- 1991		OLS- 2001		OLS- 2011		Pooled OLS	
	Coef.	t-ratio	Coef.	t-ratio	Coef.	t-ratio	Coef.	t-ratio
const	**7.099**	37.78	**7.718**	18.09	**8.409**	23.50	**7.048**	0.148
l_LRM	**-0.11**	-2.24	**-0.36**	-2.493	**-0.402**	-3.516	**-0.144**	0.047
l_LRF	0.026	1.215	0.033	0.5818	0.071	1.272	0.013	0.020
l_HAE	0.013	0.664	0.015	0.7368	0.025	1.219	0.0017	0.013
l_HASDW	**0.046**	2.094	**0.112**	2.447	**-0.07**	-1.857	**0.0647**	0.015
l_DPGR	**-0.04**	-2.462	-0.003	-0.090	0.02	1.347	0.0102	0.011
R-squared		0.54		0.49		0.54		0.35
Adjusted R-squared		0.45		0.39		0.46		0.31

Figures in bold indicate statistical significance of the estimated coefficient at the 10% or lower level

OLS = Ordinary Least Squares, Coef. = Coefficient

Though, female literacy rate and Households access electricity facility has influenced positively to juvenile sex ratio in last two decades but the result is statistically insignificant. In contrast, the availability of safe drinking water had a positive effect on juvenile sex ratio in 1991 and 2001 but turned to effect negatively in 2011. Pooled OLS estimation suggests that on an average one percentage point increase in male literacy had reduced juvenile sex ratio by 0.14 percent during 1991- 2011 in the districts of Rajasthan. However, interestingly, household access safe drinking water facility has significant and positive effect on juvenile sex ratio in the study period. While the estimated effect of female literacy, population growth rate and general infrastructure facility (electricity) has positive but insignificant association with juvenile sex ratio.

The quantile regression results (Table 3) are revealing. They indicate that the male literacy rate in districts has significant and large negative effect on the juvenile sex ratio at the 0.25 and its upper quantiles. At the 0.05 quantile, the estimated effect is insignificant, and turns increasingly negative at successively higher quantiles, while the effect of female literacy and other infrastructural facility like safe drinking water have positive and significant effect on the upper tail of juvenile sex ratios in the districts of Rajasthan. The one odd empirical result of this finding is that the local availability of electricity reduces juvenile sex ratio in the higher quantiles but increases them in the lower quantiles. Another interesting, although not unexpected, finding is that, ceteris paribus, districts with larger population growth rates have higher juvenile sex ratios. The relationship between lower decadal population growth rate and a lower juvenile sex ratio is observed in districts of Rajasthan. The imbalance in the juvenile sex ratio is realized through several different parental actions, such as prenatal sex determination using ultrasound technology and sex – selective abortions (female feticide), female infanticide, parental neglect of female children (leading to their lower rate of survival relative to male children), and differential contraceptive use depending upon the sex composition of existing children (with women who bear daughters early in their reproductive years continuing child-bearing while those who bear sons early halting their child-bearing).

Table 2: Quantile Regressions of the Juvenile Sex Ratio for districts of Rajasthan, 1991-2011

Quantiles	Const.	l_LRM	l_LRF	l_HAE	l_HASDW	l_DPGR
0.050	**6.66**	-0.0452	-0.0465	0.0337	0.0523614	0.0291
	(31.38)	(-0.45)	(-1.07)	(1.232)	(1.642)	(1.188)
0.250	**6.95**	**-0.1485**	-0.0083	0.0254	**0.0738327**	0.0191
	(31.64)	(-2.11)	(-0.27)	(1.320)	(3.282)	(1.105)
0.500	**6.94**	**-0.1099**	-0.0013	0.0012	**0.0722592**	0.0036
	(39.42)	(-1.95)	(-0.05)	(0.082)	(4.011)	(0.266)
0.750	**7.10**	**-0.1348**	0.01494	-0.008	**0.0609665**	0.0011
	(71.57)	(-4.24)	(1.078)	(-0.948)	(6.005)	(0.149)
0.950	**7.33**	**-0.2089**	**0.04308**	-0.010	**0.0653482**	-0.003
	(50.80)	(-4.52)	(2.136)	(-0.798)	(4.245)	(-0.343)

Figures in bold indicate statistical significance of the estimated coefficient at the 10% or lower level
t-ratios are shown in the parentheses brackets

Thus, the quantile regression results are consistent with the least –squares results for male and female literacy as well as for household facilities and decadal population growth rate. But there are few discrepancies with the model, as it is indicated that there is multicollinearity problem with male and female literacy rate. It seems from the above analysis that electricity facility or decadal population growth rate does not have significant influence on juvenile sex ratio. The data exploration across districts also revealed that not only does juvenile sex ratio worsen as one moves from southern district such as Banswara, Dungarpur and Udaipur to northern or northern-eastern districts such as Ganganagar, Hanumangarh, Jhunjhunu, Sikar, Alwar, Bharatpur, Karauli and Dholpur, but there is also some clustering of the child sex ratio such that low child sex ratio districts tends to have similar neighbouring districts or even neighbouring states. It is clear indication that low child sex ratio tendency of Indian states such as Punjab, Hariyana and

Himachal Pradesh can be easily seen in the neighboring districts of Rajasthan like Ganganagar, Dholpur and Hanumangarh. Econometrically, this problem can be solved by an introduction of dummy variables (Chakraborty & Sinha 2008).

Finally, it was decided to refine this model by two ways. First, total literacy was substituted to get rid from the multicollinearity problem between male and female literacy. Second, regional (Administratively division) dummy variables were included to find the clusters respond on juvenile sex ratio in Rajasthan. Therefore seven regions (Divisions) are Ajmer (4), Bharatpur (4), Bikaner (4), Jaipur (5), Jodhpur (6), Kota (4) and Udaipur (6). Setting 1 and 0, one's are given to districts of concerning division and 0 otherwise; for instance if the selected region is Ajmer, one's were given to four districts of Ajmer division such as Ajmer, Bhilwara, Nagaur and Tonk and zero's were given to rest of all districts. The process is repeatedly used for another six regions. And lastly, to investigate does the higher female literacy or higher human development indices have a significant influence upon juvenile sex ratio in the districts of Rajasthan for the last three decades, two dummies of 'High Female Literacy' (DHFL) and 'High Human Development Index' (DHDI) were included. One's were given to those districts who have higher female literacy than 50% as per Census of India, 2011 and higher HDI value than 0.6 in accordance to Rajasthan Human Development Report, (An update 2008).

Table 3: Panel Estimation for Juvenile Sex Ratio in districts of Rajasthan, 1991-2011

Independent Variables	Pooled OLS		Fixed-effects		Random-effects	
	Coef.	t-ratio	Coef.	t-ratio	Coef.	t-ratio
const	**6.7622**	115.7	**6.6623**	118.5	**6.74396**	119.0
l_LR	**-0.055**	-3.96	-0.0124	-0.774	**-0.0447**	-3.187
l_HAE	0.0094	0.675	**-0.0423**	-2.451	-0.0046	-0.321
l_HASDW	**0.0370**	2.857	**0.03134**	2.564	**0.03600**	2.947
l_HATF	-0.001	-0.17	**0.02386**	2.156	0.00597	0.6396
l_DPGR	**0.0297**	2.883	**0.04502**	3.950	**0.03382**	3.257
DHFL	0.0005	0.079	-	-	-0.0008	-0.092
DHDI	-0.012	-1.30	-	-	-0.0151	-1.332
DBharatpur	**-0.051**	-3.46	-	-	**-0.0546**	-2.945
DJaipur	**-0.038**	-2.36	-	-	**-0.0370**	-1.816
DAjmer	-0.010	-0.70	-	-	-0.0112	-0.611
DBikaner	-0.027	-1.55	-	-	-0.0311	-1.431
DJodhpur	**-0.031**	-2.28	-	-	**-0.0327**	-1.892
DKota	-0.010	-0.72	-	-	-0.0090	-0.493
DUdaipur	0.0003	0.021	-	-	0.00145	0.0814
R-squared		0.627		0.81		-
Adjusted R-squared		0.56		0.70		-
Akaike criterion		-450.028		-472.664		-447.6311
Schwarz criterion		-411.563		-377.783		-409.1659
Hannan-Quinn		-434.480		-434.312		-432.0828
Figures in bold indicate statistical significance of the estimated coefficient at the 10% or lower level						
OLS = Ordinary Least Squares, Coef. = Coefficient						

The final regression model produces a good fit, with an adjusted R^2 value of 0.56. This adjusted R^2 is slightly higher from our preliminary OLS model. The significant indicators of final OLS model seem reasonable and the sign of coefficients are further clues as to logical interpretations of the variables and dummy variables. For instance, literacy rate exhibits a negative influence on juvenile sex ratio and decadal population growth rate has positive influence on juvenile sex ratio, these two variables collectively validates that higher the level of literacy lower the level of fertility and ultimately lower level of population growth rate and fertility decline is typically associated with lower juvenile sex ratios. There is a large literature that shows that literacy is one of the strongest determinants of fertility decline in India (Rosenzweig & Evenson 1977, Dreze & Murthi 2001, IIPS 2007, Basu 1999 and Jha et al. 2006).

The estimated coefficients on the regional dummy variables are also of interest. Table 3 shows that three divisional dummy had significant and negative association with juvenile sex ratio in the state but two another dummies of high HDI and High female literacy had not found even significant association with juvenile sex ratio. These points to hypothesis that economic growth and human development seldom move together, when it comes to improving gender relations. The results also indicate that the divisions of Bharatpur, Jaipur and Jodhpur have experienced the largest ceteris paribus declines in the juvenile sex ratio during 1991-2011, while Ajmer and Kota divisions have experienced smallest ceteris paribus declines. In particular, Udaipur, one among all divisions of Rajasthan has shown steep rise yet insignificant, comes out looking much better and Bharatpur much worst division in terms of its performance on in juvenile sex ratio between 1991 and 2011. Another interesting, although not unexpected, finding is that, ceteris paribus, districts with higher human development indices and higher level of female literacy have witnessed lower juvenile sex ratios in the districts of Rajasthan during 1991-2001, as it is indicated in random effects panel estimation.

7. Conclusions

In this paper, we have used district-level data from 1991 to 2011, censuses to analyze the policy determinants of juvenile sex ratios in Rajasthan. In particular, we have focused on literacy rate, population growth rate and the availability of household facilities like safe drinking water, electricity and toilet facilities. The most noteworthy finding in the OLS estimates is that any increase in male literacy in districts of Rajasthan serves to decrease the juvenile sex ratio and its negative effect on juvenile sex ratio is increasing decade by decade. In contrast, the availability of safe drinking water had a positive effect on juvenile sex ratio in 1991 and 2001 but turned to influence negatively in 2011. Though, female literacy rate and Household access electricity facility had influenced positively. Pooled OLS estimation suggests that on an average one percentage point increase in male literacy had reduced juvenile sex ratio by 0.14 percent during 1991- 2011 in the districts of Rajasthan. However, interestingly, household access safe drinking water facility had significant and positive effect on juvenile sex ratio during the study period. While the estimated effect of female literacy, population growth rate and general infrastructure facility (electricity) have positive yet insignificant influence on juvenile sex ratio.

The revealing quantile regression estimates also indicated that the male literacy rate in districts has significant and large negative effect on the juvenile sex ratio at the 0.25 and its upper quantiles, while the effect of female literacy and other infrastructural facility like safe drinking water have positive and significant association on the upper tail of juvenile sex ratios in the districts of Rajasthan. The results of regional dummy indicated that Udaipur, one among all divisions of Rajasthan has shown steep rise yet insignificant, comes out looking much better and Bharatpur much worst division in terms of its performance on in juvenile sex ratio between 1991 and 2011.

8. Suggestions

From a public policy perspective, it is reassuring to find that in districts where the juvenile sex ratio is especially imbalanced i.e. districts of Bharatpur and Jaipur division, most public health interventions, such as increased availability of safe drinking water, electricity and sanitation facilities increase the juvenile sex ratio. Moreover, since policy makers ought to be primarily concerned about districts a the lower tail of the juvenile sex ratio distribution, our results suggest a stronger need to target policies combating imbalanced sex ratios to districts such as Jhunjhunu, Sikar and Jaipur. While outlawing prenatal sex determination tests and sex-selective abortions could be considered an obvious policy response, this has already been accomplished in India. Sex selection tests have been illegal in India under the 1994 Pre-conception and pre-natal Diagnostic Techniques Act. Unfortunately, this has done little to stop sex selection abortions from taking place in Rajasthan. Enforcement of the law is weak, and there are loopholes in the law that allows clinics and doctors to continue to perform sex determination tests. Strict enforcement of PCPNDT act is essential for balancing child sex ratio in districts of Rajasthan.

Other than the public facilities we have focused on here, what could such imbalanced sex ratio-combating policies be? A typical response may be to increase female literacy, as quantile regression shows that female literacy had influenced positively in the upper tail of juvenile sex ratio. But an unusual, yet robust finding of empirical framework is that higher male literacy rates in districts have a strong effect on juvenile sex ratios. A possible explanation has to do with strong son-preference culture. As noted throughout this paper, the root cause of imbalanced sex ratio is the strong preference for sons among Indian parents. While there are many reasons for this, one is that, historically, inheritance laws in the country, especially among Hindus, have favoured sons over daughters. Hindu inheritance customs were codified into law in a bill enacted in 1956 that provided the right of inheriting ancestral property only to males. It is widely believed that some of the worst manifestations of gender discrimination in India, such as female feticide and dowry, can be traced to biased inheritance laws favouring sons. There may also be an economic reason for the strong preference for sons among Indian parents. Son preference may be driven by the higher perceived value (by parents) of male relative to female children. Given marriage systems and cultural traditions, sons and not daughters are responsible for the care and upkeep of their parents in old age. One way in which policy can respond is by providing old age benefits to couples that have instituted such schemes, albeit on a very small scale. Evaluation of such programs presents a good area for future research.

During the last three decades, a few stalwart states, such as Andhra Pradesh, Karnataka, Maharashtra, and Tamil Nadu, have changed their laws to provide women the right to inherit ancestral property (Kerala was the first state to change its inheritance law in 1975). In 2004, the Indian parliament introduced and passed the Hindu Succession (Amendment) Bill, which removed the discriminatory provisions of the 1956 Act and allowed parents to bequeath their property to their daughters.

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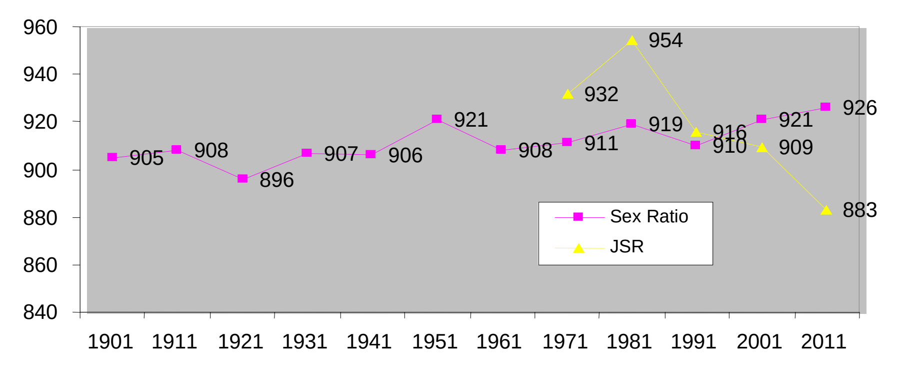
Figure 1: Aggregate and Juvenile Sex Ratio in Rajasthan, 1901-2011



Sources: Directorate of census operations Rajasthan.

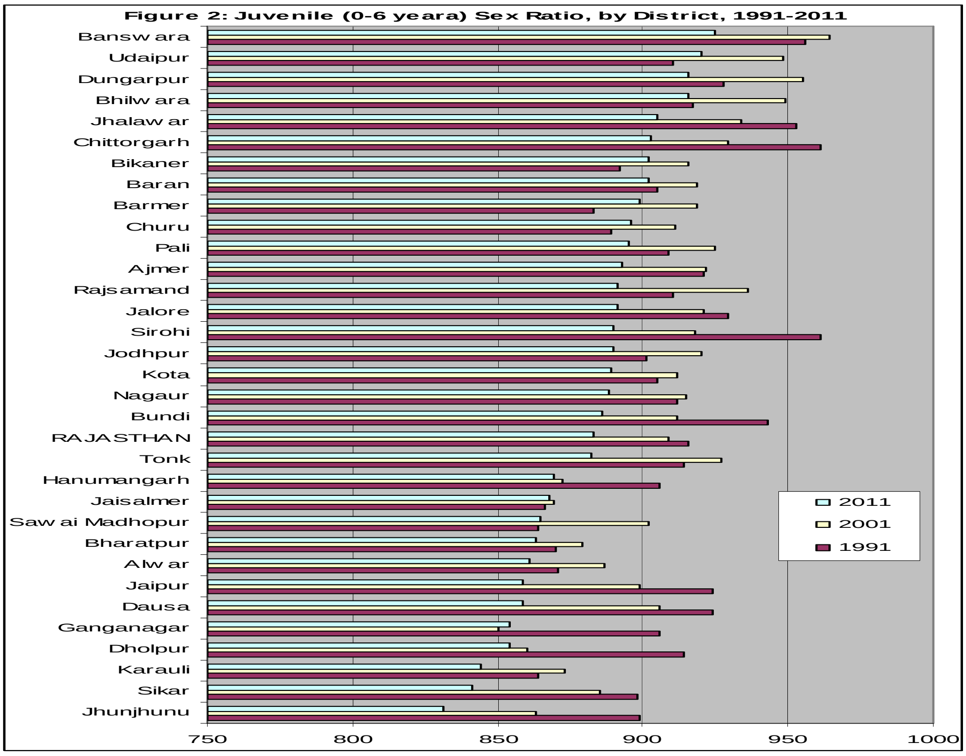


Figure 2: Juvenile (0-6 yeara) Sex Ratio, by District, 1991-2011

Source: http://rajcensus.gov.in/

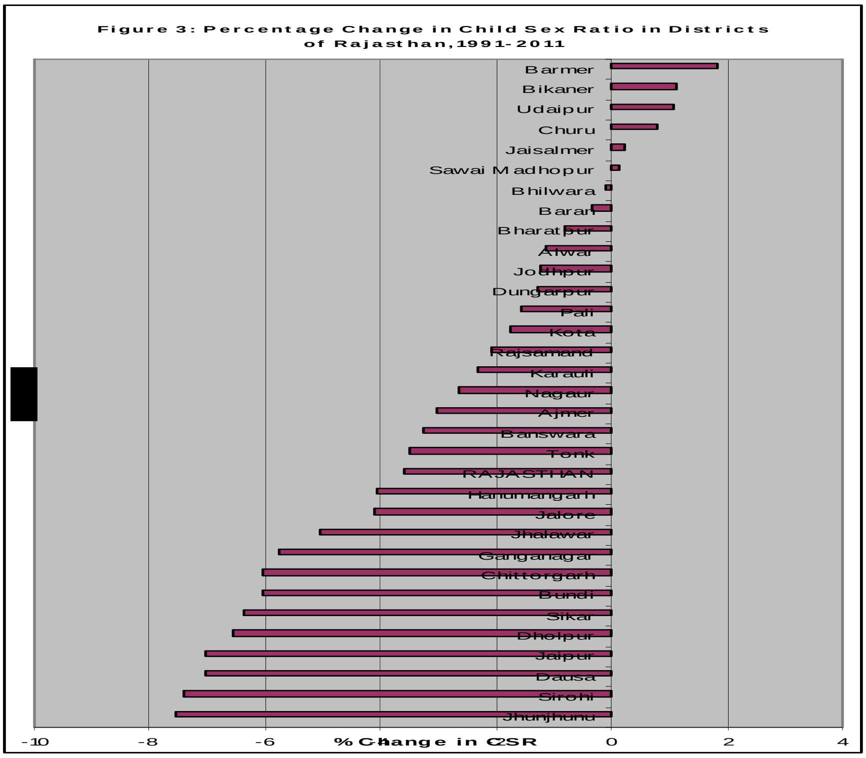
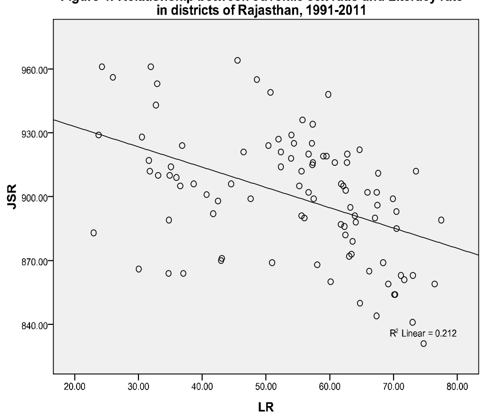


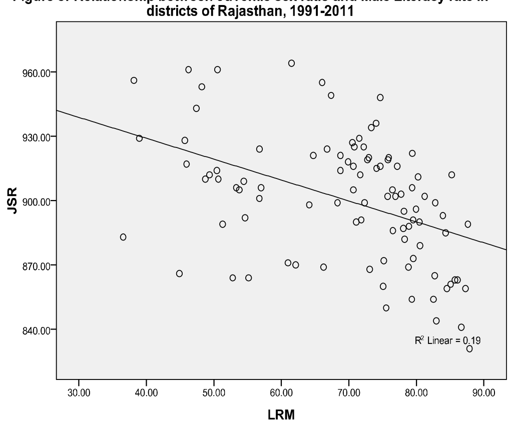
Figure 3: Percentage Change in Child Sex Ratio in Districts of Rajasthan,1991-2011

Figure 4: Relationship between Juvenile sex ratio and Literacy rate in districts of Rajasthan, 1991-2011



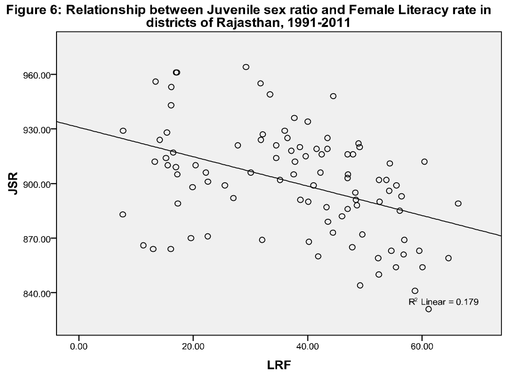
Sources: Census of India, 1991,2001 & 2011

Figure 5: Relationship between Juvenile sex ratio and Male Literacy rate in districts of Rajasthan, 1991-2011



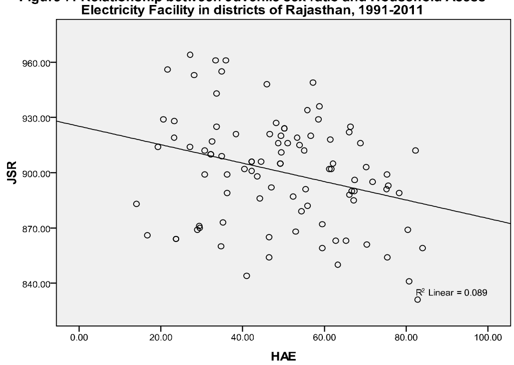
Sources: Census of India, 1991, 2001 & 2011

Figure 6: Relationship between Juvenile sex ratio and Female Literacy rate in districts of Rajasthan, 1991-2011



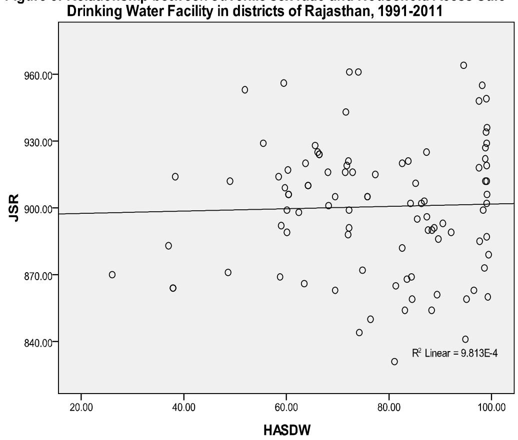
Sources: Census of India 1991, 2001 & 2011

Figure 7: Relationship between Juvenile sex ratio and Household Acess Electricity Facility in districts of Rajasthan, 1991-2011



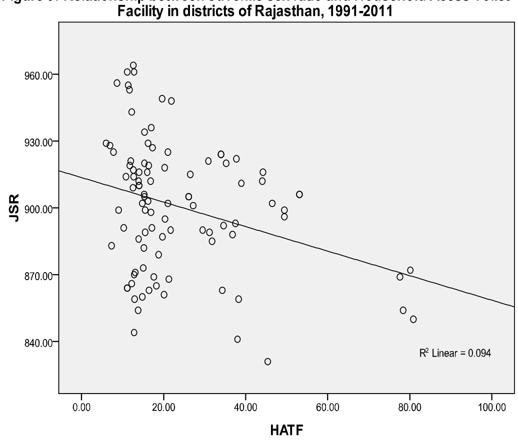
Sources: Census of India, 1991, 2001 & 2011 DLHS 2 & 3

Figure 8: Relationship between Juvenile sex ratio and Household Acess Safe Drinking Water Facility in districts of Rajasthan, 1991-2011



Sources: Census of India, 1991, 2001 & 2011 DLHS 2 & 3

Figure 9: Relationship between Juvenile sex ratio and Household Acess Toilet Facility in districts of Rajasthan, 1991-2011



Sources: Census of India, 1991, 2001 & 2011 DLHS 2 & 3