Women's Literacy Rate, Sex Ratio, and Women Work Participation in Punjab: A Granger Causality Analysis

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Abstract

This paper has focused on the relationship between women's literacy rate, sex ratio, and women work participation. This paper focuses on gender discrimination found in Punjab. A Granger-causality analysis was carried out in order to assess whether there is any potential predictability power of one indicator for the other. The conclusion that can be drawn from the present study is that with an increase in women's literacy rate, there has been no significant impact on improvement in the sex ratio and women's work participation in Punjab.

Keywords : **women work participation, literacy rate, sex ratio, status of women**

JEL Classification : J70, J71, J710

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Gender discrimination has been, by and large, a universal phenomenon in human history from time immemorial. In the Indian society, particularly, the low status of women is very conspicuous. On account of her biological constitution, social taboos, and scriptural sanctions, the social position of women has always been considered as inferior and subordinate to men in society. Since ages, India is struggling to improve the status of women, but still faces serious challenges for further improvement. Like rest of the country, the social evils against women are rampant in Punjab. Gender injustice in all perceivable areas is found in Punjab, though the state is one of the richest states in the country. Gender discrimination in access to right to life, health and nutrition, education and economic resources is there for anyone to see. Violence against women ranges from foeticide, dowry deaths to rape, and sexual exploitation (Nagaich, 2011).

Preference for sons is a common feature in almost all countries of South Asia. India has a strong "male fixation" tradition, particularly in its northern and central states. The southern states comparatively do not follow such anti women values, because of traditional matrilineal societies in the past. Punjab, Haryana, Rajasthan, and Western Uttar Pradesh figure more prominently in their obsession with the son-fixation syndrome. The presence of the male child is more established among the *Jats*, who constitute a majority of the population in these states. The Punjabi culture celebrates masculinity and puts a high premium on having a male child. The growing demand for dowry too puts a lot of pressure on parents to prefer a male child over daughters. While in earlier times, it was the practice of female infanticide that kept the sex ratio in favour of the male sex; in contemporary times, it is the practice of selective abortion (the female foeticide).

Women's status in society among her own peers is measured not by what she is and what she does, but if she has at least one male child. So strong is this need to 'belong' to the society and community, that women themselves perpetuate the custom of son preference. In this paper, we have tried to find out whether there has been an improvement in the status of women in the last forty years or not. Three indicators - literacy rate, sex ratio, and work participation rate - were considered to judge the status of women.

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Methodology

Our approach follows Granger (1969) who proposed a time-series data based approach in order to determine causality between economic variables. A question that frequently arises in time series analysis is whether or not one economic variable can help forecast another economic variable. In the Granger-sense , therefore, a time series *x* is a cause of *y* if it is useful in forecasting *y*. More precisely, variable *X* is said to Granger-cause another variable, *Y*, if the current value of *Y* (y_t) is conditional on the past values of *X* (x_{t-1}, x_{t-2}, ... , x_0) and thus, the history of *X* is likely to help predict *Y* (Konya, 2004). This refers to causality for one period ahead and was generalized by Dufour and Renault (1998) to causality *h* periods ahead, and to causality up to horizon *h*, where *h* is a positive integer that can be infinite. They showed that in a bi variant system, no causality for one period ahead implies no-causality at, or up to, any horizon. The advantage of a bi variant system over a tri variant system, (*X*, *Y*, *Z*) is that in the latter case, causality between *X* and *Y* can arise via the auxiliary variable which needs to be captured using an appropriate methodology. In the tri variant system, *X* might cause *Z* one period ahead, which in turn might cause *Y* at a subsequent period. This indirect, two-period ahead causality might exist even if there is no direct, one-period ahead causality between *X* and *Y*. However, if there is no causality between *X* and *Y* for two periods ahead, then there is no causality between them at, or up to, longer horizons either. This difference between a bi variant and tri variant systems implies that they require different strategies to test for causality at horizons beyond one period. The empirical results presented in this paper are based on a pair wise Granger causality test between the variables. The following sets of bidirectional hypotheses to be tested are as follows :

➲ **Hypotheses**

➲ **H01 :** Past is not a Granger cause of the future.

➲ **H02 :** Literacy rate is not a Granger cause of work participation and vice versa.

➲ **H03 :** Literacy rate is not a granger cause of sex ratio and vice versa.

➲ **H04 :** Sex ratio does not Granger cause work participation.

Analysis and Results

➲**Sex Ratio In Punjab :** Sex ratio is a sensitive indicator of status of women in a society at a given point of time. Among the Indian states, historically, Punjab and Haryana in the Northwest have had the most imbalanced sex ratios. Scholars, academicians, and policy makers have noted the low and continuously declining proportion of women in India's population and the highly masculine sex ratio with concern. A highly masculine sex ratio has been one of the most significant characteristics of India throughout the 20th century. Sex ratio in Punjab has remained unfavorable for the women folk. It is clear from the Table 1 that there was a decrease in the sex ratio in 2001 to 876 females per 1000 males as it was 879 in 1981 and 882 in 1991. However, the Census 2011 has offered a ray of hope that the sex ratio will improve in the future; as for Punjab (as per Census 2011), the sex-ratio was 893 females per 1000 males, which is 14 points higher than what it was in 2001 (Primary Census Abstract - Punjab, 2011).

This increase has not only reversed the registered decline in 2001, but the sex ratio is also higher than what it was in the previous decades. This, however, is offset by the decline in the sex ratio of children in the 0-6 years age group, which portends the trend for the future. National ranking of Punjab in terms of sex-ratio is now 27th (India Registrar General, Census of India: 2011, Provisional Population Totals, Punjab). It would not be out of context to mention that the sex ratio at birth should be somewhere between 943 to 952 girls per 1000 boys. The better physiological strength of the girl child, which ensures better survival chances, should bring the sex ratio closer to unity. However, this is not the case in India, and the sex ratio in most of the Indian States is adverse to females, and Punjab is no exception.

It is clear from the Table 1 that Hoshiarpur and Jalandhar (Shahid Bhagat Singh Nagar) have the highest sex

Table 1. Sex Ratio in Punjab : An Overview

S. No.	State /District	1981	1991	2001	2011	Change in sex ratio over the time
	Punjab	879	882	876	893	14
1	Amritsar	871	881	890	888	17
2	Bathinda	864	884	870	865	1
3	Faridkot	882	884	887	892	10
4	Firozpur	884	900	885	893	9
5	Gurdaspur	907	903	890	895	-12
6	Hoshiarpur	915	946	935	962	47
7	Jalandhar	893	905	901	934	41
8	Kapurthala	898	904	888	912	14
9	Ludhiana	859	854	824	869	10
10	Patiala	863	894	865	880	17
11	Rupnagar	861	887	866	896	35
12	Sangrur	860	876	874	880	20

Source : Ministry of Home Affairs, Government of India. (2011). Primary census abstract data - Punjab. Retrieved from http://www.censusindia.gov.in/2011census/hlo/pca/PCA_pdf/PCA-CRC-0300.pdf

Table 2. Sex Ratio - Rural and Urban Areas

Year	Total	Rural	Urban
1981	879	884	865
1991	888	895	870
2001	876	890	849
2011	893	906	872

Source : Ministry of Home Affairs, Government of India. (2011). Primary census abstract data - Punjab. Retrieved from http://www.censusindia.gov.in/2011census/hlo/pca/PCA_pdf/PCA-CRC-0300.pdf

Table 3. Pair Wise Granger Causality Tests (Sex Ratio)

Sample: 1 13

Lags: 1

Null Hypothesis:	Obs	*F*-Statistic	Probability
1981 does not Granger Cause 1991	12	1.89459	0.20196
1981 does not Granger Cause 2001	12	0.25806	0.62367
1981 does not Granger Cause 2011	12	5.11066	0.05012
1991 does not Granger Cause 2001	12	0.01937	0.89238
1991 does not Granger Cause 2011	12	2.4891	0.14909
2001 does not Granger Cause 2011	12	0.55388	0.47572

ratio in Punjab, that is, 962 and 934 females per 1000 males respectively. Bathinda and Ludhiana have the lowest sex ratio, that is, 865 and 869 females per 1000 males respectively. It is clear from the Table 1 that in thirty years, the state of Punjab has witnessed only a 14 point increase in the sex ratio. The highest improvement in sex ratio has been observed in Hosiarpur and Jalandhar, that is, 47 and 41 points ; Bathinda is at the same position even after thirty years. However, in Gurdaspur, the sex ratio has decreased by 12 points. Rural-urban differentials also exist

Table 4. Literacy Rate - Rural and Urban Areas

Year	Rural			Urban		
	Male	Female	Total	Male	Female	Total
1991	60.71	43.85	52.77	77.26	66.12	72.08
2001	71	57.7	64.7	83	74.5	79.1
2011	77.92	66.47	72.195	87.28	79.62	83.45

Source : Ministry of Home Affairs, Government of India. (2011). Primary census abstract data - Punjab. Retrieved from http://www.censusindia.gov.in/2011census/hlo/pca/PCA_pdf/PCA-CRC-0300.pdf

Table 5. Literacy Rates in Punjab and its Districts 1981-2011

State/ District code	Districts	Males				Females			
		1981	1991	2001	2011	1981	1991	2001	2011
	Punjab	53.33	65.66	75.20	81.50	38.37	50.41	63.40	71.30
1	Amritsar	53.20	65.07	70.90	78.30	39.37	50.10	58.75	67.85
2	Bathinda	38.80	50.55	67.80	75.30	23.31	34.51	53.70	62.90
3	Faridkot	44.86	56.43	67.17	74.70	30.73	41.50	54.60	64.07
4	Firozpur	45.29	56.88	68.70	76.70	28.06	38.11	51.70	62.20
5	Gurdaspur	57.21	69.56	79.80	85.90	41.06	53.33	67.10	75.70
6	Hoshiarpur	65.45	79.31	86.40	89.90	46.35	61.48	75.30	80.80
7	Jalandhar	61.90	74.87	82.70	86.15	47.80	61.33	71.30	76.30
8	Kapurthala	51.26	70.03	79.00	84.60	43.14	55.83	68.30	75.40
9	Ludhiana	62.79	72.47	80.30	86.30	49.91	61.23	71.90	78.20
10	Patiala	52.48	65.93	76.8	82.95	38.45	50.3	65.4	73
11	Rupnagar	62.73	76.45	83.05	89.05	44.18	58.54	70.10	78.60
12	Sangrur	40.05	53.37	63.43	71.90	25.77	37.86	50.90	61.13

Source : Ministry of Home Affairs, Government of India. (2011). Primary census abstract data - Punjab. Retrieved from http://www.censusindia.gov.in/2011census/hlo/pca/PCA_pdf/PCA-CRC-0300.pdf

in case of sex ratio in the state. The rural sex ratio improved marginally during the year 1981-2011 from 884 to 906 as shown in the Table 2, but the urban ratio has deteriorated considerably over the period of time and improved in 2011 as compared to 2001. It is surprising to note that with an increase in urbanization, the sex ratio got deteriorated instead of improving.

➲ **Pair Wise Granger Causality Test (Sex Ratio) :** The Table 3 portrays the findings of the Granger causality test. This test was applied to find whether pervious trends in sex ratio are affecting the future or not, or we can say whether the past is helpful to forecast the future or not. The test shows that no variable is a cause of another variable as per the probability value given in the table for all the variables. And in all the cases, the probability level has been observed to be greater than 0.05. Thus, the null hypothesis H01 is accepted.

➲ **Literacy Rate :** An important social item like education / literacy status has an influence on many fields such as social taboos, injustice, health conditions, and so on. Literacy rate is defined as the number of literate population per hundred eligible populations. Persons aged 7 years and above, who can read and write in any language, are treated as literate. Female literacy rate in Punjab has increased with every decade. As shown in the Table 4, in 1981, female literacy rate was only 34.35%, which was 16.88% lesser than the male literacy rate. In 2011, the female literacy rate went up to 71.3 % from 34.35% in 1981, and male literacy rate rose to 81.5% in 2011 from 51.23% in 1981 (Primary Census Abstract - Punjab, 2011). No doubt, the rate of rise in female literacy has been greater than the male literacy rate, but still, women are lagging behind men by 10.2%.

Table 6. Pair Wise Granger Causality Tests (Literacy Rate)

Sample: 1 13

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Probability
1981 does not Granger Cause 1991	12	0.01323	0.91094
1981 does not Granger Cause 2001	12	2.05922	0.18511
1981 does not Granger Cause 2011	12	1.88954	0.20251
1991 does not Granger Cause 2001	12	5.94182	0.03751
1991 does not Granger Cause 2011	12	4.7343	0.05756
2001 does not Granger Cause 2011		0.64418	0.44288

Disparities in literacy rates widen further if we consider these on the rural and urban basis. According to the 2011 Census, in Punjab, District Hoshiarpur had the maximum female literacy rate, that is, 89.90% for males and 80.80% for females. In Sangrur district, the literacy rates were 63.43% for males and 61.13% for females. Punjab literacy rates from 1981 to 2011 increased by 28.17% for males and 32.93% for females. But the gender gap with respect to literacy rate is still very wide in Punjab, that is, 10.20%. Punjab has been able to cover only 4.76% gender gap in literacy rate in thirty years. The Table 5 shows that the highest improvement in female literacy rates was observed in Bathinda, that is, 39.59%, and minimum improvement in female literacy rate was in Ludhiana and Amritsar, that is, 28.4%. Highest gender gap was covered by Hoshiarpur, that is, 10.10%. However, the situation in Kapurthala is quite bad. In this district, the gender gap with respect to literacy rate increased by 1.08% from 1981. However, the highest gender gap with respect to literacy in 2011 was found in Firozpur, that is, 14.50%. Hence, from the Table 5, it can be concluded that no doubt female literacy rate has increased over the years, but still, a wide gender gap with respect to literacy rate prevails in every district in Punjab.

➲ **Pair Wise Granger Causality Test (Literacy Rate) :** The Table 6 portrays the findings of the Granger causality test. The test shows that 1991 does Granger cause 2001. As the probability level observed in these cases is less than

Table 7. Work Participation Rate in Punjab and its Districts

State/ District	Districts	Male WPR				Female WPR			
		1981	1991	2001	2011	1981	1991	2001	2011
	Punjab	53.76	53.34	54.10	55.15	6.61	6.78	18.70	13.91
1	Amritsar	53.97	54.25	53.20	54.49	4.53	6.01	16.30	14.11
2	Bathinda	56.65	56.08	54.90	57.36	10.81	8.02	26.05	22.61
3	Faridkot	55.80	55.51	56.33	56.53	8.81	9.56	23.17	13.82
4	Firozpur	56.06	54.50	53.60	55.65	7.78	7.50	18.50	16.74
5	Gurdaspur	49.68	48.52	51.90	52.58	3.20	7.35	12.70	11.01
6	Hoshiarpur	49.84	49.60	51.00	50.99	6.93	5.53	17.30	11.23
7	Jalandhar	51.21	52.56	54.85	55.09	4.75	5.70	22.65	12.14
8	Kapurthala	52.39	53.73	53.40	55.26	4.34	7.93	14.10	12.50
9	Ludhiana	54.65	54.12	55.90	56.41	5.03	5.38	15.70	14.18
10	Patiala	53.97	51.65	54.60	55.90	4.68	8.13	17.95	11.92
11	Rupnagar	51.88	52.99	53.80	52.91	5.64	5.56	23.80	14.95
12	Sangrur	57.60	55.98	54.90	55.68	8.55	5.68	24.10	10.99

Source : Ministry of Home Affairs, Government of India. (2011). Primary census abstract data - Punjab. Retrieved from http://www.censusindia.gov.in/2011census/hlo/pca/PCA_pdf/PCA-CRC-0300.pdf

Table 8. Pair Wise Granger Causality Tests (Work Participation)

Sample: 1 13

Lags: 1

Null Hypothesis:	Obs	*F*-Statistic	Probability
1981 does not Granger cause 1991	12	3.15896	0.10923
1981 does not Granger cause 2001	12	0.06709	0.80145
1981 does not Granger cause 2011	12	0.1731	0.68711
1991 does not Granger cause 2001	12	0.01444	0.907
1991 does not Granger cause 2011	12	0.51305	0.49199
2001 does not Granger cause 2011	12	0.07492	0.79048

0.05, thus, the null hypothesis H01 is rejected for this case. For the remaining cases, the probability value given in the table for all the variables and in all the cases has been observed to be greater than 0.05; thus, the null hypothesis H01 gets accepted in all the cases.

➲ **Work Participation :** In Punjab, women are relatively invisible in workforce statistics. Restrictive definitions of 'work,' mostly based on economic concepts of productivity, have reduced women to economic non-entities. This is because women's labour, in most cases, does not directly produce marketable goods or services. This gendered notion of work has hugely undermined women's contribution to the economy, resulting in the non recognition of women as important economic entities. Although women work for longer hours and contribute substantially to the family income, quite often, they are the major earners as the work performed by them is non- monetized; they are not perceived as workers by either the women themselves or by the data collecting agencies and the government itself. This is a resultant of the non-recognition of the multi-dimensional functions which women perform both as productive and reproductive labour. The cause of low participation rate of women is repeatedly acknowledged in terms of the invisibility of women's work, domestic chores, and other tasks, which are viewed as part of a cultural/traditional attitude where man is considered as the primary bread-winner. Punjab has the lowest female workforce participation rate in the country. The majority of women are included in the category of non-workers, which is evidence of the invisibility of women's workers.

According to the Table 7, work participation of males was 55.15%, and it was 13.91% for female workers. Highest female work participation was in Bathinda, that is, 22.61% and Sangrur had the lowest female work participation, that is, 10.99% (Primary Census Abstract - Punjab, 2011). It can be concluded from the afore-mentioned discussion that almost in each district, female work participation has decreased and gender gap has also increased.

Table 9. Pair Wise Granger Causality Tests (1981)

Sample: 1 13

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Probability
LR does not Granger Cause SR	12	0.00333	0.95522
SR does not Granger Cause LR		5.94862	0.03743
WR does not Granger Cause SR	12	1.93026	0.19814
SR does not Granger Cause WR		1.13824	0.31381
WR does not Granger Cause LR	12	1.0258	0.3376
LR does not Granger Cause WR		1.08976	0.32375

Note : LR - Literacy Rate, WR - Work Participation, SR - Sex Ratio

Table 10. Pair Wise Granger Causality Tests (1991)

Sample: 1 13

Lags: 1

Null Hypothesis:	Obs	*F* - Statistic	Probability
SR does not Granger cause LR	12	3.86205	0.08096
LR does not Granger cause SR		0.50593	0.49493
WR does not Granger cause LR	12	0.02817	0.87041
LR does not Granger cause WR		3.96191	0.07774
WR does not Granger cause SR	12	0.51406	0.49158
SR does not Granger cause WR		8.99043	0.015

Note : LR - Literacy Rate, WR - Work Participation, SR - Sex Ratio

Table 11. Pair Wise Granger Causality Tests (2001)

Sample: 1 13

Lags: 1

Null Hypothesis:	Obs	*F* - Statistic	Probability
WR does not Granger cause SR	12	4.31828	0.06748
SR does not Granger cause WR		0.43619	0.52551
LR does not Granger cause SR	12	0.0018	0.96709
SR does not Granger cause LR		3.87694	0.08047
LR does not Granger cause WR	12	0.08442	0.77798
WR does not Granger cause LR		0.0526	0.82373

Note : LR - Literacy Rate, WR - Work Participation, SR - Sex Ratio

Table 12. Pair Wise Granger Causality Tests (2011)

Sample: 1 13

Lags: 1

Null Hypothesis:	Obs	*F*-Statistic	Probability
WR does not Granger cause SR	12	0.66246	0.4367
SR does not Granger cause WR		0.45673	0.51614
LR does not Granger cause SR	12	0.29845	0.59813
SR does not Granger cause LR		1.65107	0.2309
LR does not Granger cause WR	12	0.35835	0.56418
WR does not Granger cause LR		0.2948	0.60035

Note : LR - Literacy Rate, WR - Work Participation, SR - Sex Ratio

➲ **Pair Wise Granger Causality Test (Work Participation):** The Table 8 portrays the findings of the Granger causality test. In all the cases, the probability value given in the table for all the variables and in all the cases has been observed to be greater than 0.05. Thus, the null hypothesis H01 is accepted in all the cases.

➲ **Granger Causality Between Literacy Rate, Sex Ratio, and Work Participation Rates :** For the year 1981, the Granger causality test depicted in the Table 9 shows that only sex ratio does Granger cause the literacy rate. As the probability level is observed to be less than 0.05, thus the null hypothesis H03 is rejected in this case. In all the remaining cases, the probability value given in the table for all the variables and in all the cases has been observed to be greater than 0.05. Thus, the null hypotheses H02 and H03 are accepted in all the cases. The Granger causality test was applied to find whether the literacy rate, sex ratio, and work participation rate caused changes in one

another or not. Similarly, for the year 1991, the Table 10 portrays that the sex ratio does Granger cause work participation. Rest, in all cases, the probability value given in the table for all the variables and in all the cases has been observed to be greater than 0.05. Thus, the null hypothesis H04 is accepted in all the cases.

The Tables 11 and 12 portray the findings of the Granger causality test for 2001 and 2011. The test shows that no variable is a cause of another variable, and the probability value given in the table for all the variables and in all the cases has been observed to be greater than 0.05. Thus, the null hypotheses H02 and H03 are accepted in all the cases.

Conclusion

The literacy rate, sex ratio, and work participation of women in Punjab are less as compared to their male counterparts, and it varies from one region to another. The major finding of the paper is that the WPR and sex ratio did not increase with an increase in the level of education. There was no single district in Punjab where WPR of females was higher than that of the males. This means that in the Indian society, women are considered less important than men. Participation of women in the rural sector is always greater than what it is by the male members of the society. This is because of the low mobility of women from the villages, and due to religious and social restrictions. On the supply side, reproductive work and domestic roles prove to be significant variables in influencing female labour force participation. If this trend of the highly skewed sex ratio continues for some more time, there will be serious repercussions for the society for generations to come. It can be concluded that increase in literacy rate alone cannot help to uplift the status of women in Punjab. There is need to change the mindset of the people and the society needs to treat women at par with men and grass root level social reforms are needed to improve the position of women in the Indian society.

Research Implications, Scope for Further Research, and Limitations of the Study

Increase in civilization, education, and modernization have failed to uplift the status of women in the Indian society. Women comprise of half of the population in our country. In Punjab, as per the 2011 Census, the total population of Punjab was 27,743,338 people, of which males and females were 14,639,465 and 13,103,873 respectively. So, half of the population of Punjab is suffering from the evil of violence and has been struggling for making their place in the society from ages. Studies like the present study statistically depict the magnitude of the skewed sex ratio both in urban and rural areas. Future research studies can present solutions that can help to increase work participation of women in both rural and urban areas. In addition, how our education and social system can support the increased work participation of women can be examined in detail in future studies. The major limitation of the study is that it is only based on secondary data (Census reports of Punjab) and no primary data were collected to support the arguments presented by us in this paper.

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