High Female Literacy, Low Child Population

Is There a Threshold Effect?

SATISH B AGNIHOTRI

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This paper examines the relationship between rural female literacy and the size of the child population (0-6 years) using block level data from the population census of 1991 for West Bengal. Its purpose is to find out if there is any threshold level of female literacy associated with a rapid decline in the size of the under-6 population. The analysis is done separately for three social groups; the tribals, the scheduled castes and the rest or the 'general' population. The results have an important bearing on policy while processes behind these are of considerable significance to researchers. Further validation of these patterns using 2001 Census data and similar analysis for states is indicated.

Satish B Agnihotri

I

The primary motivation for this analysis came from a report prepared by the IIM Kolkata on primary education in the state of West Bengal. The draft report highlights, among other aspects, the existence of a strong negative correlation between rural female literacy and the size of the under-6 population at the sub-district and even at the village level. The findings are important no doubt. Yet, from a policy perspective, these leave some interesting issues unanswered. Is the relationship linear or non-linear? Are there early gains that taper off later? Or are the gains sluggish to begin with and pick up after a 'critical mass' is attained? Do diminishing returns set in and if so at what level? These questions are critical to policy formulation and design of intervention strategies.

The positive effects of female literacy on fertility, child mortality and, consequently, on small family norm, has been discussed in the received literature. We have on the authority of Mari Bhat (2000), that the association between female literacy and female fertility is one of the most widely discussed topics. However, the idea of threshold levels of female literacy rates beyond which rapid decline in female fertility sets in, has not found much favour. Based on an analysis of district level data Visaria and Visaria (1994) and James (1999) even rule out the existence of such a threshold effect. Why another attempt then, to look for a 'threshold level'?

It was felt that the search for a threshold effect needs 'fine tuning' of both the unit of analysis and the composition of population. Districts in India are often large sized and hide considerable variation within their boundaries. As such the data at district level may be too aggregated to reveal such 'threshold' effect. Second, the dynamics behind such social effects may differ from one social group to another. The 'critical mass' of literate females that may be needed to accelerate a decline in fertility or child mortality or improving access to health care system or modern methods of contraception may differ among communities. Hence, it is useful to look for such an effect at sub-district level and separately so for three social groups, i e, the tribals, the scheduled castes and the rest or the 'general' category of the population.

The usefulness of separate analysis of social indicators among the three social groups is amply demonstrated in my analysis of the sex ratio patterns in the country [Agnihotri 1996, 2000]. However, data on many items like fertility rates or even child mortality levels are not available for these social groups at district level nor are these available at sub-district level even for the overall population.

On the other hand, disaggregated data on the age group composition of population are available at sub-district levels for social groups thanks to the census data. The size of the under-6 population, i e, 0-6 popualtion as a percentage of the overall population, is a good surrogate for the acceptance of the small population norm.

It was therefore decided to analyse the block level data of the 1991 Census for rural West Bengal and see if any threshold effect was discernible. The results are described in the next section.
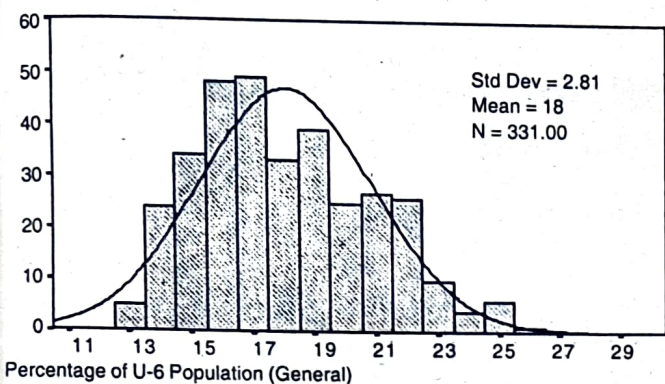
II

During the 1991 population census, West Bengal had 337 community development blocks in 17 districts. Primary Census Abstracts (PCA) data for these blocks in respect of the total population, the SC population and the tribal population were collected from the Regional Census Directorate. These abstracts contain information on the total male and the female population in the community development (CD) block, the male and female population in the 0-6 years age group and the literate male and female population. Using these, the proportion of the U-6 population in the total population and the literacy rates among females in the age group of seven years and above were calculated for the three social groups separately.
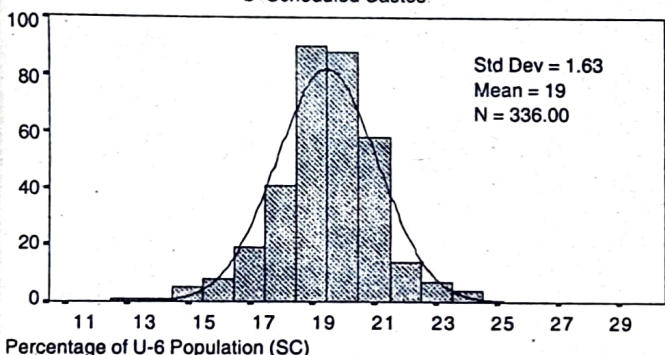
Figures 1a to 1c give the distribution of the proportion of the under-6 population (Pct06) among the three social groups. Figures 2a to 2c provide this information in respect of rural female literacy rates (Rflr). For the ST population, blocks with less than 500 ST male children have been excluded.

The distribution of both child population size (Pct06) and the rural female literacy rates (Rflr) differ significantly among the three social groups. The mean

Figure 1: Percentage of 0-6 Age Group to Total Population: Rural West Bengal – Block Level Data 1991
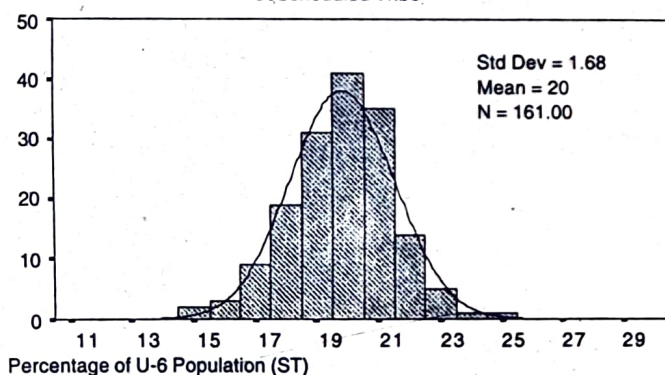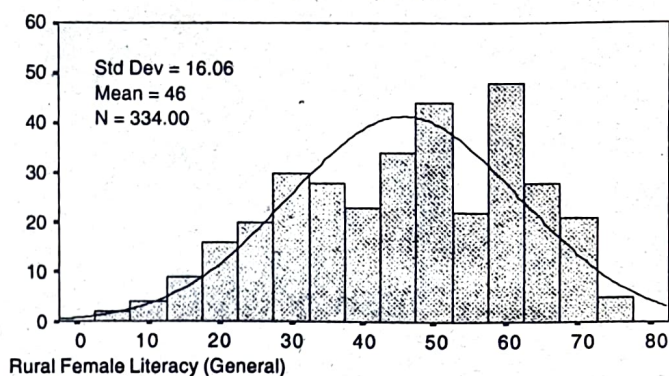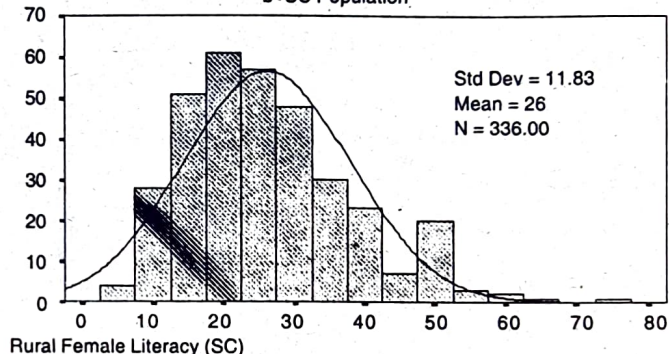
a: Non-SC/ST Population

Std Dev = 2.81
Mean = 18
N = 331.00

Percentage of U-6 Population (General)

b: Scheduled Castes

Std Dev = 1.63
Mean = 19
N = 336.00

Percentage of U-6 Population (SC)

c: Scheduled Tribe

Std Dev = 1.68
Mean = 20
N = 161.00

Percentage of U-6 Population (ST)

Figure 2: Female Literacy Rates: Rural West Bengal – Block Level Data 1991

a: Non-SC/ST Population

Std Dev = 16.06
Mean = 46
N = 334.00

Rural Female Literacy (General)

b: SC Population

Std Dev = 11.83
Mean = 26
N = 336.00

Rural Female Literacy (SC)

c: ST Population

Std Dev = 10.06
Mean = 13
N = 161.00

Rural Female Literacy (ST)
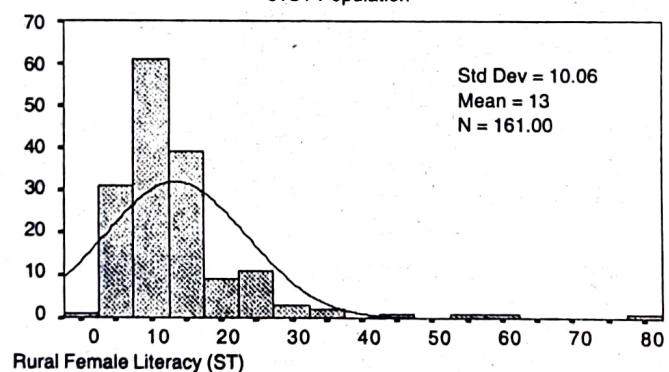
value of Pct06 for the general population is 18 per cent in a block (six outliers have been excluded), while it is 19 per cent and 20 per cent for the SC and the ST population. Paired t-test indicated that Pct06 differs significantly between the general and the SC categories (t = 6.9) and between general and the ST category (t = 8.9) at 1 per cent level. Between the SC and the ST population this difference is significant at 5 per cent level (t = 1.87). The distribution of Pct06 is quite close to a normal distribution among the SC and ST population and has low standard deviation of 1.63 and 1.68 per cent. For the 'general' category the standard deviation is rather large, (2.81 per cent) and the distribution

spreads over a wider range. This population appears to be less homogeneous compared to the SC and the ST population.

Lower literacy rates among the tribal females are strikingly apparent. The mean literacy rates are 13 per cent with a standard deviation of about 10 per cent. Among the scheduled castes, the literacy rates are higher, the mean being 26 per cent with a standard deviation of about 12 per cent. It is among the general category that the rates are the highest with the mean being 46 per cent. The standard deviation is once again high, 16 per cent. The shape of the distribution again suggests less homogeneity compared to the SC and the ST population.

The spatial distribution of the two variables provides certain striking patterns. Figures 5a and 5b provides blockwise maps of literacy rates and the size of the under-6 population among scheduled castes. The congruence between the two maps is quite clear. Low levels of female literacy and higher size of the under-6 population seem to go hand in hand. The converse also holds except in certain pockets in the south-western part.

The maps for the general category of the population, Figures 3a and 3b show similar congruence. Once again a strong negative correlation between female literacy rates and the size of the under-6 population is brought out. Among tribals however,

Figure 3a: Percentage of under-6 Population (General)
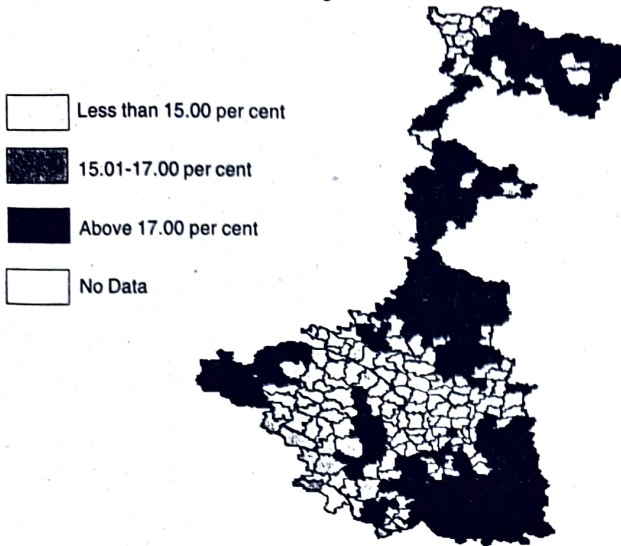West Bengal - 1991

Less than 15.00 per cent

15.01-17.00 per cent

Above 17.00 per cent

No Data

Figure 3b: Rural Female Literacy Rate (General)
West Bengal - 1991

Less than 46.00 per cent

46.01-60.00 per cent

Above 60.00 per cent

No Data
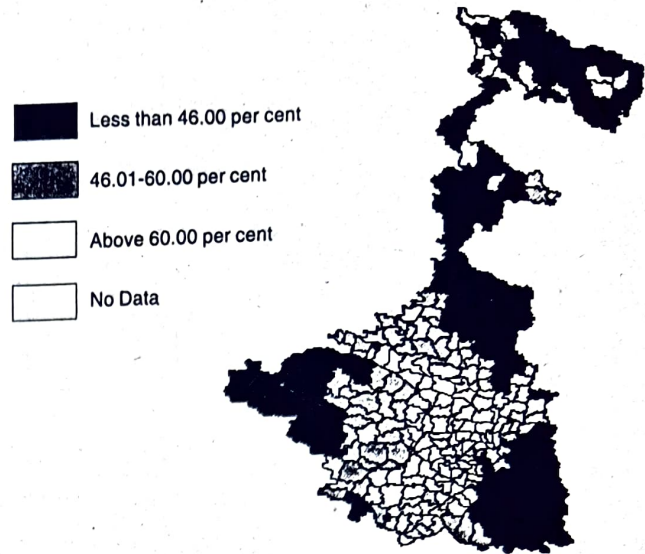
Figure 4a: Percentage of under-6 Population (ST)
West Bengal - 1991

Less than 19.00 per cent

19.01-22.00 per cent

Above 22.00 per cent

No Data or Pop <5000
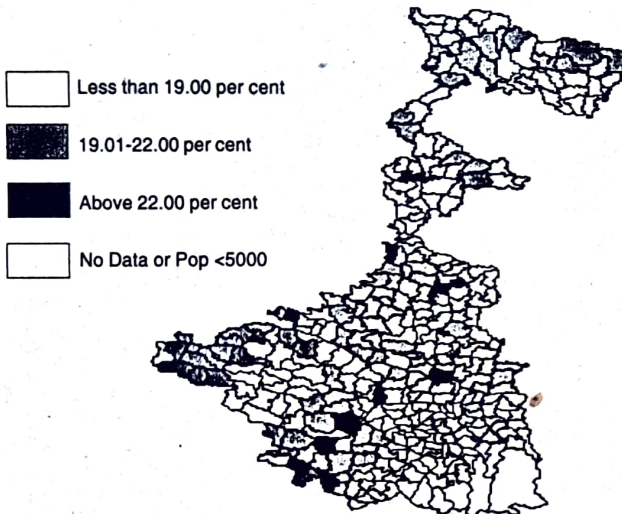
Figure 4b: Rural Female Literacy Rate (ST)
West Bengal - 1991

Less than 8.00 per cent

8.01-20.00 per cent

Above 20.00 per cent

No Data or Prop<5000
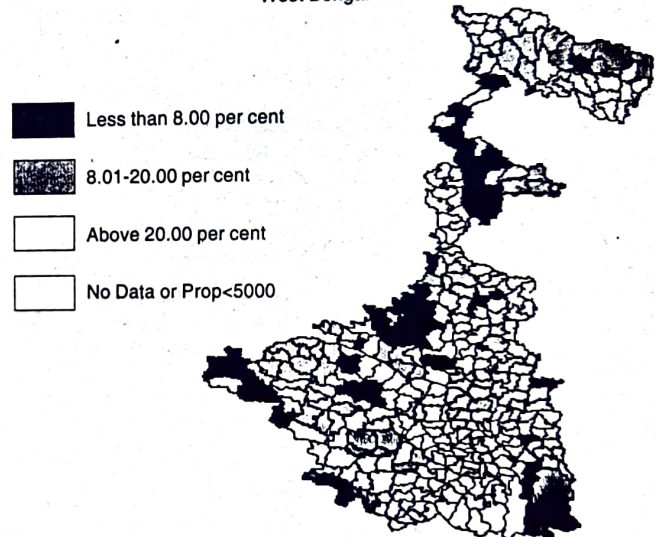
Figure 5a: Percentage of under-6 Population (SC)
West Bengal - 1991

Less than 18.29 per cent

18.29-19.80 per cent

Above 19.80 per cent

No Data
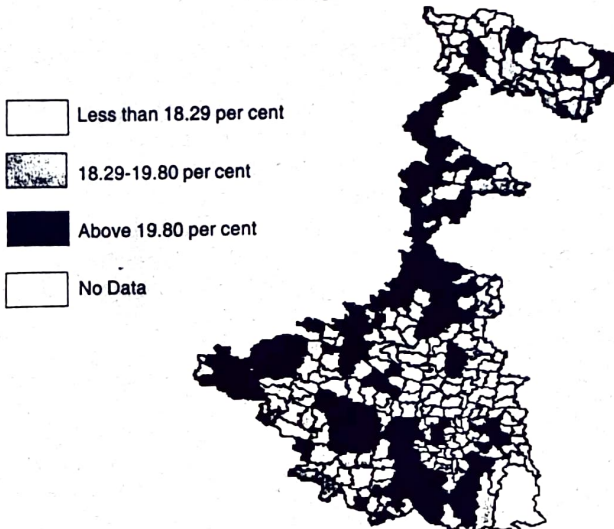
Figure 5B: Rural Female Literacy Rate (SC)
West Bengal - 1991

Less than 21.00 per cent

21.00-32.00 per cent

Above 32.00 per cent

No Data
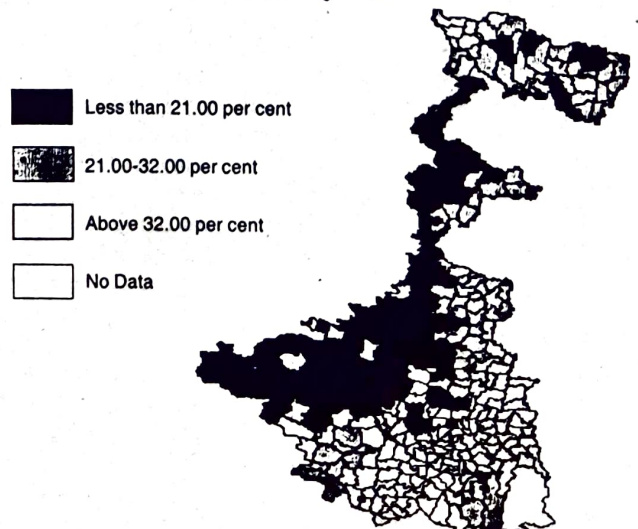
such clear correlation is not seen (Figures 4a and 4b). Lower size of the under-6 population can be noticed even in pockets of low literacy.

The strong negative correlation between the two variables was checked further through a scatter diagram. Figure 6b gives the scatter for the SC population. A locally weighted sum of squares (LOWESS) curve drawn provide a clear evidence of a 'threshold effect'. The size of the under-6 population is lesser in the blocks with higher female literacy no doubt, but the effect is pronounced once a level of about 30 per cent literacy rate is crossed. A similar effect can be seen for the 'general' category of the population (Figure 6a). The threshold literacy level is once again around 30 per cent. But one can also notice a plateau between the literacy level of 50 per cent to 60 per cent after which there is another zone of significantly lower size of under-6 population (less than 16 per cent).

The reason why a clear-cut pattern does not emerge among the tribals (Figure 6c) is not far to seek. In most of the blocks, the tribal female literacy rates are well below the 30 per cent level. In a few blocks where the rates are high, the size of the under-6 population is low. But this number is too small to draw any definite conclusions.

III

What are the implications of above findings? First, it is clear that there is a threshold effect in the way literacy rates affects the child population size. It is also clear that such effect can be discerned by looking at the sub-district data be it at the level of the CD block, the tehsil or the thana. Further, this effect could differ between different social groups. As such, it is necessary to disaggregate the data appropriately. That the threshold levels of female literacy rate are quite similar among the scheduled castes and the general category, could well be fortuitous. It is necessary to examine if this pattern holds in other states as well.

The implications of above findings for the policy are obvious. It shows that the adoption of small family norm need not be 'scalpel driven' alone. Blackboard can be an equally effective tool for this purpose. This can bring the health and family welfare sector and the mass education sector together to create a synergy. The National Literacy Mission may find these results useful for advocacy purposes and can

Figure 6:
(a) Rural Female Literacy (General): West Bengal 1991
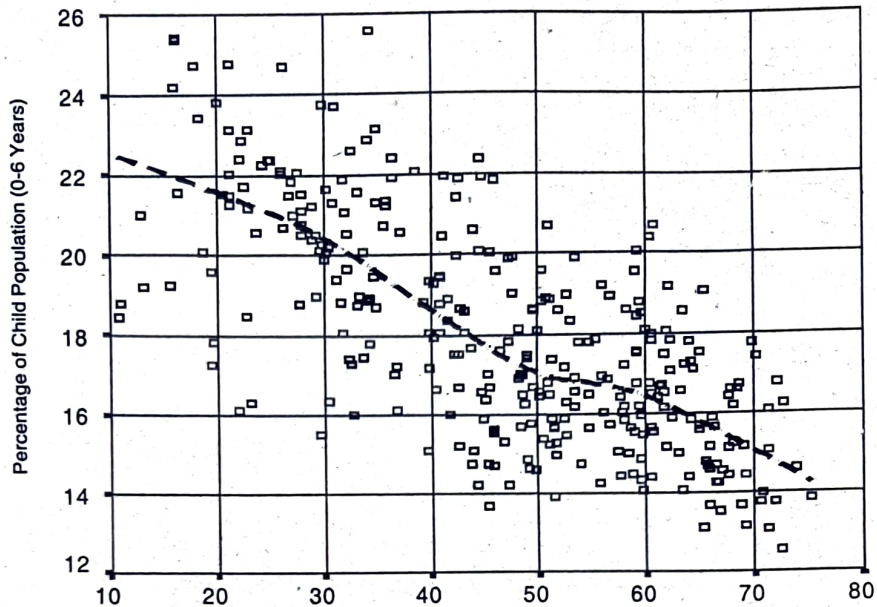
(b) Rural Female Literacy (SC): West Bengal 1991
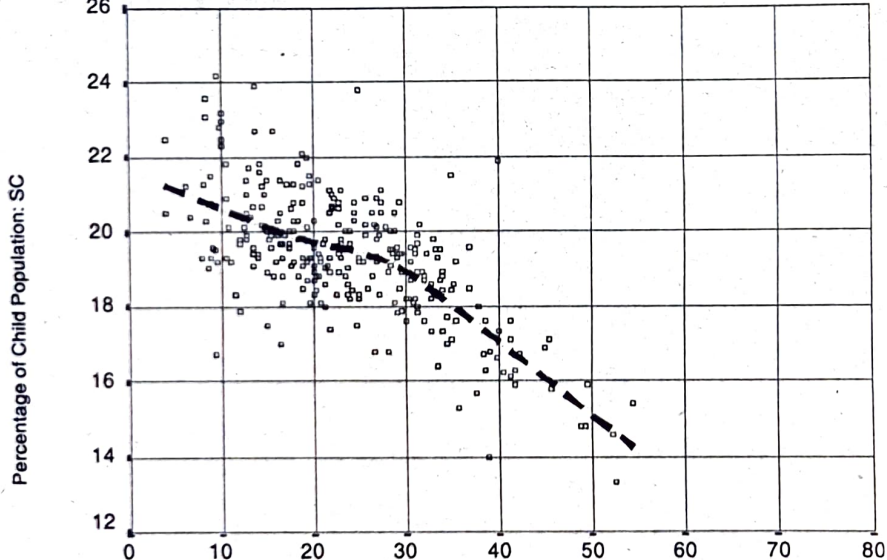
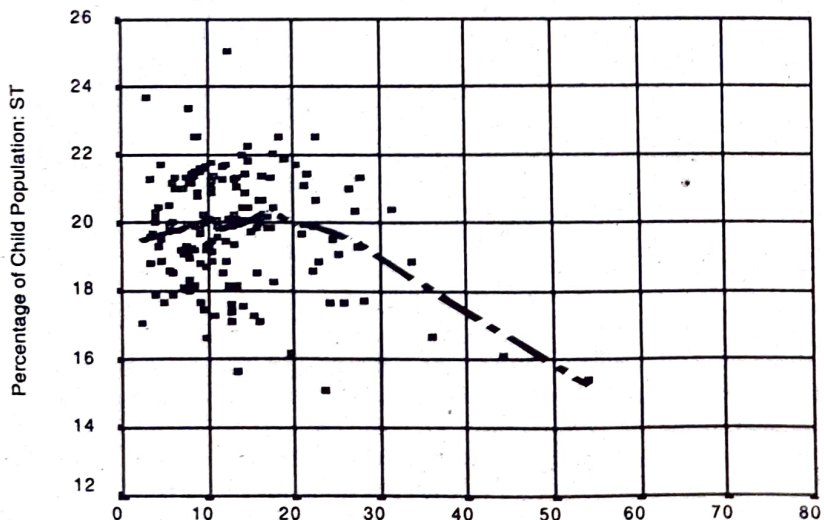(c) Rural Female Literacy (SC): West Bengal 1991

Figure 7: Female Literacy – Child Population Size: West Bengal 2001
(Block Level Data Excluding Certain Outliers with 06 Pct>22 Per Cent

(a) Rural Female Literacy 2001

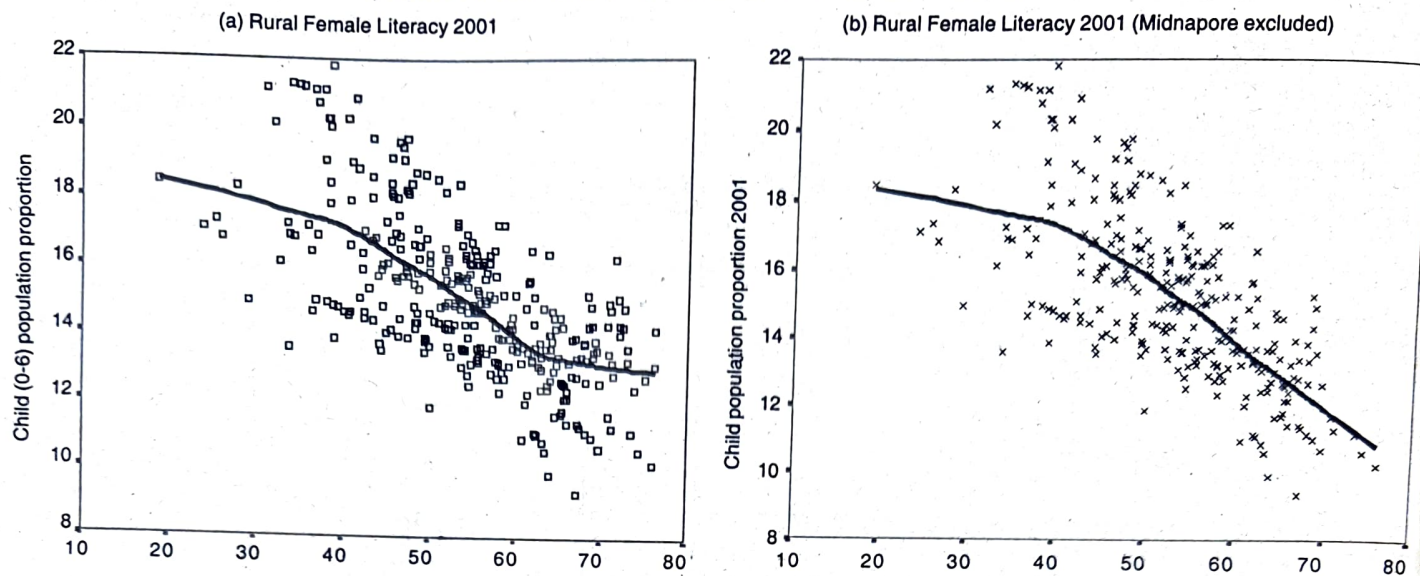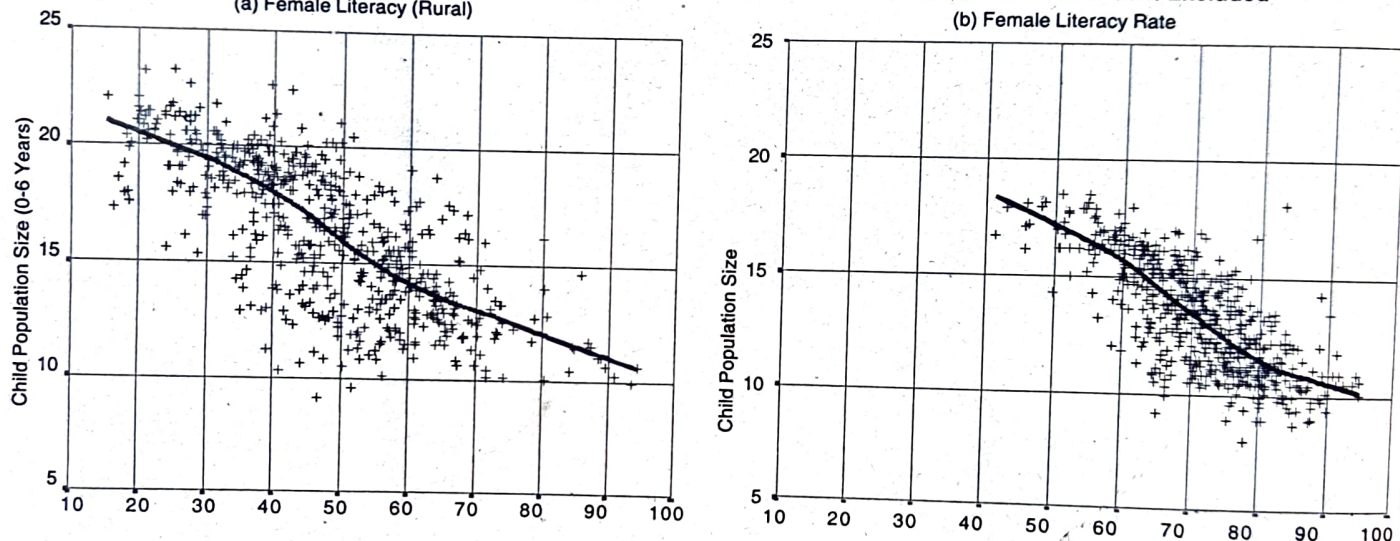(b) Rural Female Literacy 2001 (Midnapore excluded)

Figure 8: J and K, Mizoram, Meghalaya and Values of Flr < 10 Per Cent and Pct06 < 5 Per Cent Excluded

(a) Female Literacy (Rural)

(b) Female Literacy Rate

perhaps support block level literacy campaigns. Identification of the threshold levels allows a more efficient use of the available resources. The benefits of crossing the first threshold are clear and need to get first priority when it comes to spreading female literacy. It will make sound socio-economic sense to step up efforts of spreading literacy in the blocks below the threshold level. Funds under tribal sub-plan and special component plan could be earmarked for this purpose for the ST and the SC population.

It is necessary to flag a couple of issues here. The scatter diagrams exclude Midnapore district as an outlier. The reported literacy levels for Midnapore were quite high during the 1991 Census. The size of the under-6 population was not correspondingly low in different blocks of the district. Two plausible explanations

can be offered for this. First, that the literacy figures may have been inflated in the wake of the literacy campaign undertaken in the district in late 1980s. Less charitably, one could expect a 'time lag' between the spread of literacy and its effect on the under-6 population. Disaggregated data from 2001 Census may throw more light on this issue.

The relatively lower size of the child population among tribals given abysmally low female literacy level, suggests that female literacy may not be a proximate variable in influencing the size of the child population. It may actually be creating a situation conducive to providing more space to women in terms of autonomy in personal decision-making, information and access to health care system. Among tribals, women certainly enjoy more freedom in personal decision-making and this may

have a bearing on the lower size of the child population. An increase in female literacy may contribute to this by way of a better access to the health care system. But one has to await the results of the 2001 Census to opine further on this.

The threshold levels discussed above, should not be confused with the threshold in terms of an individual's educational level. Mari Bhat (2000) has dealt with the question of a threshold effect in terms of years of schooling completed by the mother and has concluded that there is no such affect. The threshold level discussed here is in terms of a 'critical mass' of literate females at the community level. When this critical mass is reached the child population size does show a fast decline. The dynamics of this process is related to diffusion of a new idea. Elaborating this is beyond the scope of the present analysis.

However, one could roughly trace three elements in the process. First, there is a shift in attitude at the individual level from a fate-oriented one-to-one with an element of choice in fertility related matters. To sustain this transition, a 'critical mass' of literate females in one's 'reference social group' is needed to endorse such an attitude. This would then lead to a willingness and better ability to access the health infrastructure.[1] A recent analysis of the NFHS–II data by Roy et al (2002) indicates sharp differences in exposure to media between illiterate and literate women. This may have a bearing on the dynamics outlined above.

One of the nagging doubts I had was whether the pattern observed above is a one-off case for West Bengal observable only for 1991 data. Fortunately, the 2001 block level data reveals similar trend even though it relates to the total population (Figure 7a). Interestingly, the Midnapore puzzle remains. Analysis that includes block level data from Midnapore show a 'tapering' effect on the child population size at higher literacy levels (Figure 7b) whereas exclusion of Midnapore indicates a continuous decline in child population size as the female literacy levels go up.

The 2001 district level data on an all-India basis corroborates this pattern further in both rural (Figure 8a) and the urban (Figure 8b) areas although the threshold levels are different. In a sense, it indicates that the effect is observable even with district level data.

The above analysis certainly suggests the need for a scrutiny of similar block level data from other states. This is currently in progress. If female literacy rate thresholds turn out to be quite similar across different states, it will raise intriguing questions about the dynamics of the process. If the threshold levels differ between different states and groups then it will provide an important methodological tool for the policy. Further, there is the issue of the dynamic aspects of the threshold. Does it move with the general literacy levels or is independent of these? A trend analysis based on the 1981, 1991 and 2001 data may provide rich insights to scholars interested in seeking answers to these questions. **EPW**
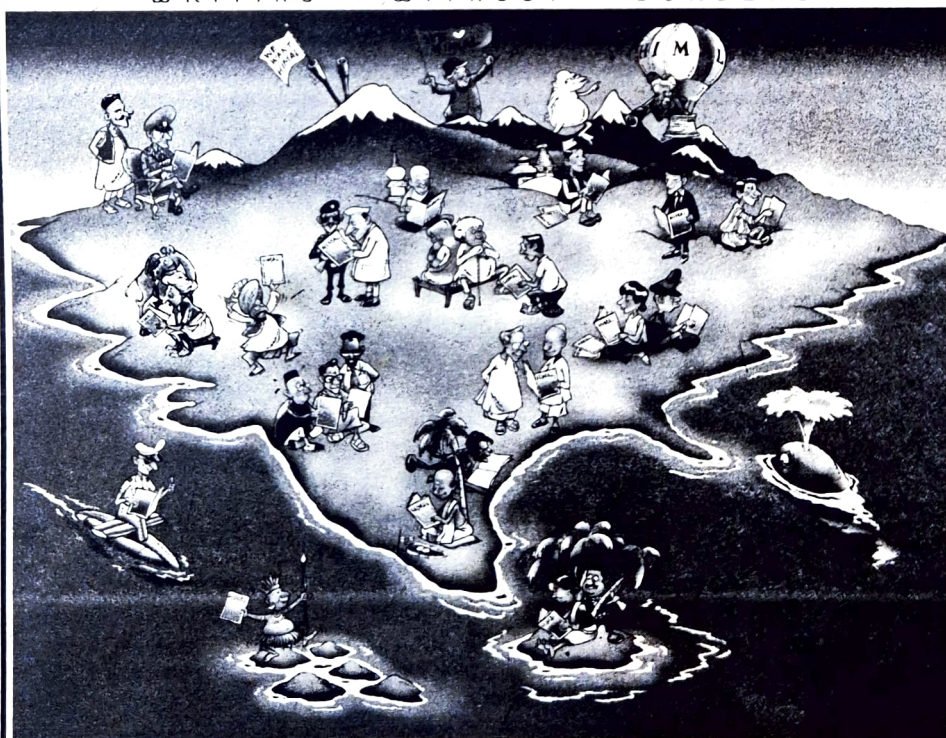
Note

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Indian Statistical System at the Crossroads

III: Modernisation Project – Centralisation Par Excellence!

The modernisation project was apparently the ultimate objective of the flurry of initiatives of the Department of Statistics (DoS). The paper in this part analyses the contents of the project and the philosophy, strategies and approach that shaped it, and brings out its serious implications for the Indian statistical system (ISS). The project is formulated with the short-term objective of meeting the requirements of Special Data Dissemination Standards (SDDS) of the IMF and for monitoring poverty. By design it does not address the problems and development of the ISS. Instead, it established the NSSs as an alternative system to ISS, and aims for a massive expansion of the NSSO and modernise its operations. The project covers only marginally the modernisation of other sub-systems, and where it does so it does not address the vital problem of collection of data and their quality. It requires the government of India to adopt measures that will centralise the statistical system of the country. The paper shows that the project, driven not by national needs but by international demands for data, and based on unjustified NSSO expansion, will lead to the neglect of ISS. The paper ends with broad suggestions for reformulation of the project, and a call to state governments to set their statistical house in order and to beware of the emerging tendencies to centralise the ISS.

S M VIDWANS

Introduction

The decentralised Indian Statistical System (ISS) has been deteriorating over the past decade. The main cause of its retrogression is the progressive failure of the administrative statistical system (AdSS), which is its mainstay and which is the responsibility of the state's statistical systems (SSSs). The failure has taken place at the very first stage of data collection, and therefore needs direct action to improve the AdSS by involving the state governments. The failure and the manner of its redress should be thus clear. But the Department of Statistics (DoS) of the government of India (GoI) saw it differently. In its perception, the cause of the failure is the ineffective lateral coordination between it and the GoI ministries, which in turn is the result of lack of control of DoS over the statistical activities of the ministries. But this was a self-inflicted weakness as the DoS itself had dismantled the main institutions of coordination, weakened the Central Statistical Organisation (CSO) by almost doing away with the post of the director general of the CSO (DGCSO), and erased the line of separation of itself, a purely administrative office, from the CSO, the highest statistical office of the country. Despite the void in statis-

tical expertise at the top of the CSO, but spurred by its designation as the nodal agency for real sector data categories of special data dissemination standards (SDDS) of the International Monetary Fund (IMF), the DoS took a flurry of initiatives from about 1998 ostensibly to remedy the ills of the ISS.

The first step of the DoS was to organise the modernisation workshop (September 1998). The second was to make a statement of its perception of the present ills of the ISS in the keynote address of its secretary to the workshop. We have analysed this statement in Part I, and seen that it wrongly made GDP estimation and SDDS requirements the touchstones of assessment, reflected a simplistic understanding of the underlying statistical issues and was not useful for effective corrective action. But the DoS used the same statement as a beacon to formulate the prescription for its remedial actions.

Its third step was its proposal to the National Advisory Board on Statistics (NABS) for the creation of a Statistical Authority in India (SAI). We saw in Part I that the measure would not be an ineffective remedy for the ills of the ISS. The fourth step was to appoint an expert committee to review the NSSO in the light of the new data requirements. The committee

recommended a massive expansion of the NSSs and the NSSO, which was thoroughly examined in the preceding part and shown to be unjustified. Based on the massive expansion of NSSO, the final step, the real objective of this flurry of initiatives, was the formulation of the modernisation project (referred to as project hereafter). As a parallel step it appointed the National Statistical Commission (NSC).

The Modernisation Project

The project is built on two pillars. The first is the massive (nearly fourfold) expansion of the NSS programme to generate the statistics needed for GDP estimation and SDDS requirements, and for monitoring the effects of the new economic policy. To meet the objective, the NSSO will conduct the present quinquennial subject surveys annually with a large enough sample size to provide quarterly estimates. The second pillar is the modernisation of the ISS, that is, computerisation of its operations and the application of information and communications technology (CICT) to it. Modernisation is mostly focused on NSSO and to some extent on CSO. Where ministries or states are concerned, it is to be injected on a 'pilot' basis.

Given the immediate compulsions of