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Lekha S Chakraborty and Samik Chowdhury

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Lekha Chakraborty[1]
Samik Chowdhury

Abstract

According to rational expectation hypothesis, information is scarce and the economic agents generally do not waste information and that expectations depend specifically on the structure of entire system. Fiscal marksmanship, the accuracy of budgetary forecasting, can be one important piece of such information the rational agents must consider in forming expectations. Using Theil's inequality coefficient (U) based on the mean square prediction error, the paper estimates the magnitude of errors in the budgetary forecasts of gender-related expenditure in India, in particular the education sector. The results showed that degree of errors in forecasting gender-related expenditure in education sector is relatively less compared to other sectors. However there is no specific trend in the forecasting errors, which reveals that budgetary estimates of gender-related expenditure are made not based on *adaptive expectations.* The applicability of rational expectations hypothesis in fiscal estimates of gender-related expenditure, in particular education sector, also has limited scope in India. Fiscal marksmanship deals more with the 'budget measures' rather than 'fiscal incidence' measures, but the paper has taken into account the fiscal incidence measure through a *gender disaggregated public expenditure benefit incidence analysis* of education sector.

Key Words: Fiscal Marksmanship, Rational Expectations, Gender Disaggregated Public Expenditure Benefit Incidence Analysis.

JEL Codes: E62, H22,H44,H52,H68,I2, C53, C49

Fiscal Marksmanship of Education Expenditure in India: Analyzing Forecast Errors through a Gender lens

According to rational expectation hypothesis, information is scarce and the economic agents generally do not waste information and that expectations depend specifically on the structure of entire system. Fiscal marksmanship, the accuracy of budgetary forecasting, can be one important piece of such information the rational agents must consider in forming expectations. It is all the more relevant in case of gender-related public expenditure in India, where there is significant deviation between actual expenditure from the forecasted budgetary magnitude. This could be an indicative of non-optimization or non-attainment of set objectives of fiscal policy in terms of gender. In this context, the role of budget estimates related to gender-related expenditure needs to be emphasized as *fiscal signals*.

Fiscal marksmanship, which provides the degree of accuracy between *estimates* and *actuals* of budgetary data, has been broadly analyzed at aggregate levels of revenue and expenditure across developed and developing countries. No studies have been conducted on the sector-specific fiscal marksmanship. In the backdrop of gender budgeting initiative across countries, where significant deviation between budgeted and actual expenditure on gender-related programmes have been identified, the analysis of fiscal marksmanship through a gender lens is equally important to understand the magnitude of forecast errors.

Education is one of the important sectors in which fiscal policy stance has evident impact on redressing capability deprivation across gender. The low level of educational attainment for females in India is primarily due to both demand and supply constraints. The demand constraints include the negative parental attitude towards investing in girl's education and educational costs. Poorer

families find it difficult to bear the direct and opportunity costs of investing in female education. The supply constraints include inadequate infrastructure at school such as not enough classrooms, no water and sanitary facilities. Shortage of single-sex schools and female teachers sometimes act as inhibiting factors. School location can be important as it is found that greater the distance, lesser the female participation in education. Child labour and a girl's work burden in the care economy are also demand side constraints in achieving universal primary education.

The low level trap of female educational attainment encompasses women's low earning potential, low nutritional status, high level of mortality, high TFR and low financial and functional autonomy within households[2]. Besides the positive impact on women's lives, women's education improves the human capital formation of the country and in turn enhances economic growth and development.   Therefore investing in education is one of the priorities in the budgetary allocation of Government of India.

Against this backdrop, the paper examines the accuracy of budgetary forecasts of gender-related public expenditure across sectors with special emphasis on education sector in India.   The paper is divided into four sections. Section 1 briefly explores the theoretical and empirical survey of literature, while section 2 deals with the methodology of evaluation. Section 3 interprets data and provides the estimates of fiscal marksmanship. Section 4 concludes.

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[2] Women's education has a positive impact on the health and well being of not only women but of household as well. Educated mothers provide more nutritious diet, ensure more effective diagnosis of diseases and timely health care. Empirical evidence shows that mother's education level is a significant determinant of low infant and child mortality rates.

1. THEORETICAL AND EMPIRICAL REVIEW OF LITERATURE

Fiscal marksmanship has been broadly analyzed at aggregate levels of revenue and expenditure across developed and developing countries. No studies on fiscal marksmanship have been done at disaggregated level and also in terms of gender-related expenditure. A review of literature on fiscal marksmanship at aggregate levels is briefly attempted in this section. Allan's (1965) was one of pioneering studies on errors in budgetary forecasts, which studied the accuracy of budget forecasts in the context of UK over the period of 1951-63. Davis (1980) extended Allan (1965) by covering the years 1951-78. These studies emphasized the need for accurate budget forecasts if fiscal policy was to be used to move the economy towards full employment without engendering excessive inflation. Analysis of the accuracy of budget estimates pertains to the impact of the economy on the budget rather than fiscal impact on the economy (Davis, 1980). Auld (1970) investigated the forecast errors in budgetary estimates in the context of Canada. In the context of India, the studies on the accuracy of budgetary forecasts are Asher (1978), Paul and Rangarajan (1974), Chakrabarty and Varghese (1982), Pattnaik (1990) and Bhattacharya and Kumari (1988). These studies are confined to the earlier decades and most of the studies has not looked into the sources of error components, but confined to the magnitude of errors.

Asher (1998) examined the errors in the budget estimates and revised estimates of both revenue and expenditures of the Central Government of India during the period 1967-68 to 1975-76. The study revealed that both revenues and expenditures were grossly underestimated and the error for expenditures had been greater. He emphasized the need to increase the technical sophistication of the forecasting process as it has wider implications not only for stabilization policy but also for the credibility of the political process and for the strategy of planned development itself. Chakrabarty and Varghese (1982) revealed that

revenues were underestimated; expenditures too were, more often than not, underestimated during the period 1970-71 to 1979-80. The study found that there was no specific trend in the forecasting errors and there was no reflection of these errors on the formulation of budgets. The study also made a policy recommendation that in order to reduce the significant errors in the estimates, forecasts should be linked to movements of exogenous variables in the economy. On revenue side, through fitting tax rate functions, Srivastava (1975) suggested a tax-revenue forecasting in a partial equilibrium framework and estimated non-corporate income tax revenue forecast in India for the period 1961-62 to 1972-73.

Bhattacharyya and Kumari (1988) revealed that actual receipts and expenditure were in general higher than budget estimates, but lower than revised budget estimates; on the other hand, expenditure was underestimated and in turn overall deficit financing was underestimated during 1961-62 to 1970-71. The study also noted that revised estimates overestimated expenditure more than receipts and in turn overestimated the deficit financing. Neither budget estimates nor revised estimates thus were based on rational expectations of forecasting during this period, and the estimates were not even unbiased predictors of actual receipts and expenditure. The biases in the forecasts worsened in seventies and eighties when compared to sixties, the study noted.

As mentioned, sector-wise study of fiscal marksmanship has not yet been attempted across countries. Gender budgeting initiative across countries made it compelling to analyse the fiscal marksmanship of gender-related expenditure to understand the magnitude of forecast errors. In the studies reviewed in this section, 'budget measures' rather than 'fiscal incidence' measures are analysed. The present study looks not only into the errors in the budgetary forecasts and also tries to analyse the 'fiscal incidence' through gender disaggregated public expenditure benefit incidence analysis in education sector.

2. DATA AND METHODOLOGY

Public expenditure data in India is published in three stages: (a) Budget Estimates (b) Revised Estimates and (c) Actuals. As there is considerable lag in the publication of *actuals* of women specific expenditure and as Revised Estimates are partly actual and partly forecast, we decided to analyse the fiscal marksmanship using budget and revised estimates. In other words, the predictability of budget estimates is examined by comparing the budget estimates figures with that of revised estimates of various ministries, which has women specific programme. In the context of our exercise this is important because it not only gives us the level of accuracy with which these estimates are made in general and in particular with respect to the women specific programme.

Data on public expenditure used are extracted from *Expenditure Budgets*, *Volume II,* Union Government Budget documents, Ministry of Finance, Government of India. The unit-utilized data for the gender disaggregated public expenditure benefit incidence analysis has been collated from *Selected Education Statistics*, published by the Ministry of Human Resource Development, Government of India.

In the paper, fiscal marksmanship has been evaluated using the following indicators:

a. *RMS (root mean square) forecast error*

$$rms\ error = \frac{1}{T} \sqrt{\sum_{t=1}^{T} \left(Y_t^s - Y_t^a \right)^2}$$

$Y_t{}^s$= forecasted value of Y_t. In our context $Y_t{}^s$ is the budget estimates of various expenditures.

$Y_t{}^a$ = actual expenditure. As the actual expenditure data is not available, it is the revised estimates of expenditure.

T= number of periods.

The rms error is a measure of the deviation of the simulated variable or the budget estimates from its actual values. The magnitude of this error can be evaluated only by comparing it with the average size of the variable in question.

b. *Theil's inequality coefficient or U -statistics*

$$u = \frac{\sqrt{\frac{1}{T}\sum_{t=1}^{T}\left(Y_t^s - Y_t^a\right)^2}}{\sqrt{\frac{1}{T}\sum_{t=1}^{T}\left(Y_t^s\right)^2} + \sqrt{\frac{1}{T}\sum_{t=1}^{T}(Y_t^a)^2}}$$

Theil's inequality coefficient is just the rms-forecast error but the scaling of the denominator is such that U will always fall between 0 and 1. If U=0, simulated or the budget estimates will be equal to the actual and would show that there is a perfect fit of the budget estimates and the actual. On the other hand, if the if U=1, the predictive performance of the model is as bad as it could possibly be. Thus, the Theil's inequality coefficient measures the rms error in relative terms.

3. INTEPRETING DATA AND ESTIMATING FISCAL MARKSMANSHIP

Fiscal marksmanship analysis may be one of the integral components of gender budgeting. It is relatively easy to identify the specifically targeted programmes

for women across ministries from the Expenditure Budgets. But it is to be noted that most public spending is not specifically targeted to either men or women, but it does not imply that they have a gender-neutral impact (Elson, 1999). Fiscal marksmanship analysis can be applied to the first categories of expenditure; while gender disaggregated public expenditure benefit incidence analysis can be applied to the second category.

In India, the analysis of Expenditure Budgets from a gender perspective revealed that only ten Ministries/Departments have specifically targeted programmes for women in India (NIPFP, 2003 and Chakraborty, 2003).

**Table 1: Specifically Targeted Programs for women (Rs crores)**

	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04
Women & Child Development excl.child welfare programs	148	162	190	186	134	263	163	365	471
Agriculture and Co-operation	3	3	2	1	0	0	0	0	0
Health	24	26	34	39	54	58	54	61	67
Family Welfare	279	394	530	713	825	917	1152	511	787
Education	**7**	**5**	**5**	**107**	**60**	**22**	**15**	**9**	**30**
Labour	38	44	41	38	38	37	63	71	0
Rural Development	149	135	109	126	137	73	0	0	0
Textiles	0	0	9	9	16	27	36	27	28
Tribal Affairs	4	4	4	8	12	7	8	7	12
Social Justice & Empowerment	8	8	9	29	59	10	19	20	20

Source: NIPFP, 2003 and Chakraborty, 2003

The expenditure in education sector has been relatively lower than that of other sectors. In absolute terms, the Department of Women and Child Development and Department of Family Welfare have higher budgetary allocations for women (Table 1).

The analysis of Union Budgets from a gender perspective revealed that the problem of proliferation of *too many programs with too little money* continued over the years. Despite the proliferation of women specific programmes, it is surprising to note that the amount allotted to specifically targeted programmes for women in Union Budget 2003-04 is Rs 3665 crores, which is only 0.84 per cent of total public expenditure in the Union Budget of the same year. The corresponding figure of share of specifically targeted programmes for women in total public expenditure was 1.02 per cent, 0.94 per cent, 0.88 per cent, 0.87 per cent and 0.82 per cent in the Budgets of 1998-99, 1999-2000, 2000-01, 2001-02 and 2002-03 respectively (Figure 1).

Figure 1: Trends in Budgetary Allocation for Specifically Targeted Programmes for Women in India (as per cent of Total Expenditure)
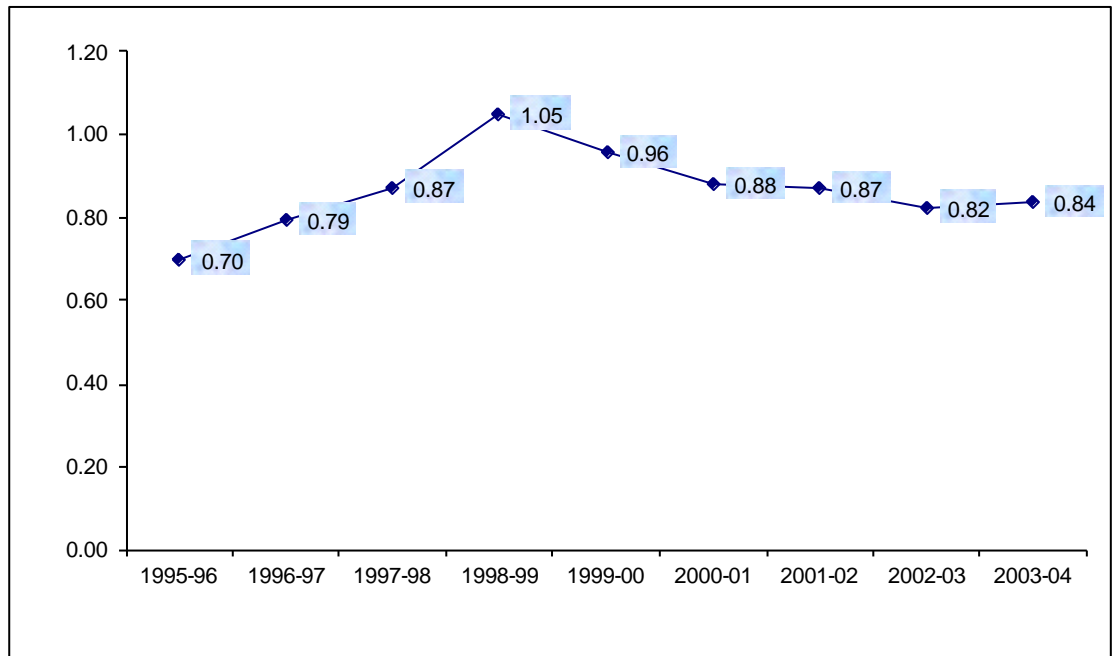
Source: Budget Documents (various years), Govt of India

Higher budgetary allocation per se does not necessarily translate into higher expenditure on women. There is a significant spread between the budget allocations and the revised estimates and in turn actual spending. The fiscal marksmanship of the programmes can be crudely measured through the ratio of RE to BE. Higher the ratio of RE to BE, greater the deviation between the budget estimate and revised estimates. The significant deviation of revised estimates from the budget estimates is noted for the women specific programmes (Table 2).

Table 2: Ratio of RE to BE of Gender-related Public Expenditure in India

	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03
Women & Child Development excl.child	1.08	1.00	1.18	0.75	0.76	0.82	0.84	0.90
Agriculture and Co-operation	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00
Health	1.16	1.08	1.14	1.05	0.91	0.93	0.83	0.93
Family Welfare	1.00	0.96	1.00	0.82	1.02	0.86	0.86	0.57
Education	1.00	0.94	0.79	0.95	0.34	0.12	0.59	0.24
Labour	0.94	0.69	0.51	0.72	0.94	0.99	0.91	0.00
Rural Development	2.29	0.64	0.71	0.67	0.82	1.00	0.00	0.00
Textiles	0.00	0.00	1.00	1.00	1.00	1.00	1.37	1.91
Tribal Affairs	1.00	1.00	0.95	1.00	1.00	0.58	0.71	0.58
Social Justice & Empowerment	1.00	1.00	0.03	0.11	0.93	0.94	1.01	1.00

Source: NIPFP, 2003 and Chakraborty, 2003

It is noted from the Table 2 that the ratio of RE to BE ranged from 0.03 per cent under Ministry of Social Justice and Empowerment in the year 1997-98 to 2.29 per cent under Department of Rural Development in the year 1995-96. Yet another finding of the study is that despite the plethora of programmes, the share of specifically targeted programmes for women under various Ministries has not shown any major increase. Moreover, the share of women specific programmes in certain Ministries/ Departments like education, agriculture, textiles, tribal affairs and social justice and empowerment constituted at most around one per cent of their total expenditure for most of the years. A

comparatively greater share of budgetary allocation for women was noted under Department of Women and Child Development and Department of Family Welfare. The share of Department of Health remained around 2 per cent while for Department of Labour fluctuated within a range of 4-9 per cent.

The root mean square error and Theil's coefficient U estimated for the total expenditure of specific Departments/Ministries and specific women component expenditure within the total expenditure of these Ministries/Departments are shown in the Table 3 and Table 4. It is interesting to note that, as per the root mean square error estimates, the average size of the error with respect to Department specific total expenditure is much lower than that of the expenditure for women specific components of respective Departments except for agriculture and co-operation and education.

Table 3: Predictability of Budget Estimates: The Root Mean Square Error

Departments/Ministries	Total Expenditure	Gender related expenditure
Women & Child Development	92.69	183.49
Agriculture and Co-operation	1806.30	41.39
Health	76.22	674.37
Family Welfare	184.04	552.31
Education	**841.47**	**48.52**
Labour	41.12	116.48
Rural Development	917.86	116.34
Textiles	194.98	6.85
Tribal Affairs	236.82	149.04
Social Justice & Empowerment	503.34	27.74

Source: (Basic data), Expenditure Budgets, various years, Ministry of Finance, Govt of India

Theil's inequality coefficient, which varies between 0 and 1, also revealed that error of deviation between budget estimates and revised estimates with respect to the expenditure on women specific component is much larger than that of the total expenditure.

Table 4: Predictability of Budget Estimates: Theil′s U (Inequality Coefficient)

Departments/Ministries	Theil's Coefficient	
	Total Expenditure	Gender-related expenditure
Women & Child Development	0.0006	0.1723
Agriculture and Co-operation	0.0159	0.1877
Health	0.0002	0.1734
Family Welfare	0.0005	0.1344
Education	**0.0028**	**0.0992**
Labour	0.0003	0.1030
Rural Development	0.0046	0.1516
Textiles	0.0034	0.0517
Tribal Affairs	0.0160	0.3546
Social Justice & Empowerment	0.0224	0.3119

Source: (Basic data), Expenditure Budgets, various years, Ministry of Finance, Govt of India

The fiscal incidence of mainstream expenditure in education sector can be analysed using gender disaggregated benefit incidence analysis. Gender disaggregated benefit incidence analysis of public spending reveals the distributional impact of budgetary policies. Such analysis to find out how public spending is distributed by sex requires the estimates of the cost of providing a public service and data on utilisation of public services by gender. Gender-disaggregated benefit incidence calculation involves the measurement of unit cost of providing a particular service and the number of units utilised by gender. The benefit incidence of public spending on women can be calculated by multiplying the unit cost of the particular service by the number of female beneficiaries. The paucity of gender-disaggregated data on services utilised constrains such benefit incidence analysis for a variety of public services in India. Furthermore, all public goods and services cannot be gender-partitioned.

Calculations showed that there is an increasing trend in the per capita share of girls in elementary education budget from around Rs.115 in 1996-97 to Rs. 323.48 in 2002-03 (Table 5). The increase is mostly on account of the quantum jump in the per capita allocation of the District Primary Education Programme (DPEP)

and nutrition support programme through mid-day meals. At the same time, it may be noted that the per capita allocation for nutritional support through mid-day meal programmes has decreased from Rs 112 in 1999-2000 to Rs.79 in 2002-03. The per capita allocation on non-formal education (NFE) has shown a significant decline to Rs. 7.15 in 2001-02 (RE) and Rs. 0.14 in 2002-03 BE as compared to Rs. 12 in earlier years. The Centrally Sponsored Programme of NFE was launched in 1979-80 to impart education to out of school children in the age group of 6-14 years. Expenditure was shared between the Centre and the States in the ratio of 60:40 in case of co-education centres and 90:10 in case of exclusively girl centres.

On the basis of the evaluation of Parliamentary Standing Committee on Human Resource Development and Programme Evaluation Organisation (PEO) of the Planning Commission, broad deficiencies of the NFE Scheme were found, viz. very low investment, poor community involvement and problems of release of funds. In the light of these evaluations, NFE was revised as 'Education Guarantee Scheme and Alternative and Innovative Education' (EGS&AIE). EGS & AIE is now a part of the overall program of Universalisation of Elementary Education, namely the Sarva Shiksha Abhiyan. The increased per capita allocation noted in 'others' category of elementary education budget of Rs. 125.54 in 2002-03 as compared to Rs. 4 in the late nineties and Rs. 16 in 2000-01 is due to the strengthening of the scheme *Sarva Siksha Abhiyan-* for universalizing elementary education.

Table 5: Fiscal Incidence of Elementary Education Budget

(*in Rs.*)

Elementary Education	1996-97	1997-98	1998-99	1999-00	2000-01(RE)	2001-02 RE	2002-03 BE
Operation Black Board	20.68	20.62	22.68	22.43	32.98	35.71	4.40
Teachers' Training Programme	5.58	5.26	9.43	11.96	14.83	13.53	14.00
Non-Formal Education	11.73	12.54	11.94	11.96	12.82	7.51	0.14
District Primary Education Programme	13.64	38.43	41.03	44.87	61.47	90.17	99.94
Nutritional Support	59.29	73.34	104.45	112.17	97.45	77.49	79.47
Free Education for Girl Child	NIL	NIL	17.16	NIL	NIL	0.00	0.00
Others	3.46	4.24	12.68	10.04	16.73	44.39	125.54
Total Elementary Education	114.37	154.45	219.37	213.44	236.28	268.80	323.48

Source: Expenditure Budget, 1996-97, 1997-98 1999-2000, 2000-01 2001-02 and 2002-03 and Selected Education Statistics, 1998-99 and 1999-2000, Ministry of Human Resource Development, New Delhi in NIPFP (2003).

All the major components of public spending on elementary education except the Teacher's Training Programme are gender-partitioned by using the enrolment figures. The incidence on women of public spending on Teacher's Training Programme has been calculated by using the proportion of females in total primary teachers. It is to be noted that estimates need to be adjusted for dropout rate to arrive at better estimates of benefit incidence across gender.

The gender disaggregated public incidence analysis of Central elementary education budget reveals that girls received only around 40 per cent of total public spending on elementary education as girl's enrolment in elementary education was less than that of boys. On a per capita basis, in 2002-03, the calculations worked out at Rs. 323.48 per girl of elementary school age and Rs. 388.91 per boy of elementary school age.

IV. CONCLUSION

Using Theil's inequality coefficient (U) based on the mean square prediction error, the paper estimates the magnitude of errors in the budgetary forecasts of gender-related expenditure in India, in particular the education sector. The results showed that degree of errors in forecasting gender-related expenditure in education sector is relatively less compared to other sectors. However there is no specific trend in the forecasting errors, which reveals that budgetary estimates of gender-related expenditure are made not based on *adaptive expectations.* The applicability of rational expectations hypothesis in fiscal estimates of gender-related expenditure, in particular education sector, also has limited scope in India. Fiscal marksmanship deals more with the 'budget measures' rather than 'fiscal incidence' measures, but the paper has taken into account the fiscal incidence measure through a *gender disaggregated public expenditure benefit incidence analysis* of education sector. The gender disaggregated public incidence analysis of Central elementary education budget reveals that girls received only around 40 per cent of total public spending on elementary education as girl's enrolment in elementary education was less than that of boys.

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