Educational Expenditure of Large States in India : A normative approach

Brahmachari, Deborshi

IGNOU, India

January 2016

Educational Expenditure of Large Indian States:

A relook at the normative view

Deborshi Brahmachari*

Abstract

Using the panel data for 15 large Indian states over the period of 3 years: 2005-2006 to 2007-08, this analysis employs pooled panel data models to estimate the average (normative) levels of expenditure on primary, secondary and higher education. Pooled panel data regression allows comparison between heterogeneous units. The inclusion of cross section data adds variability there by, reducing collinearity among variables and degrees of freedom are also enhanced.

Pooling of time series and cross section data helps estimation of average responses underlining a given relationship. *(Dielman, 1989; Rao 2000).* The paper proceeds from the supply side (cost) and attempts to estimate the average / normative expenditure levels.

The author is a Ph D scholar in IGNOU, New Delhi

1. Introduction

Education has been recognised as one of the major goals in recent years. It is a social obligation of the state. Universal primary education for all children has gained priority for every state in India and is preserved in the Directive Principle of State policy. It is included in concurrent list and is the subject of the state governments.

But the differences in enrolment, dropout rates and pupil teacher ratios across the states pose questions on the efficiency of the states with which they are performing this responsibility subject to the given goal. This may be argued using the fact that the proportion of revenue expenditure spent on education (across the 15 chosen states for this exercise) for the fiscal year 2007-2008 varies widely, as can be seen from the following table.

Education Expenditure as a percentage of total revenue expenditure (2007 Actuals)

States	Primary Education (%)	Secondary Education (%)	Higher Education (%)
Andhra Pradesh	4.9	3.3	2.3
Assam	11.7	6.2	3.4
Bihar	13.9	3.6	3.6
Gujarat	8.6	4.8	1.7
Haryana	6.8	5	3.3
Karnataka	9.9	5.4	2.1
Kerala	7.5	7	3.2
Madhya Pradesh	9.1	2.9	1.8
Maharashtra	9.4	8.4	2.8
Orissa	9.4	3.9	3.1
Punjab	2.4	7.6	1.3
Rajasthan	11	6	1.1
Tamil Nadu	6.7	6.3	1.9
Uttar Pradesh	11.3	4.3	1.4
West Bengal	6.8	7.8	2.4

Source: State Finances A Study of Budgets, RBI, 2010 and Analysis of Budgeted Expenditure on Education, Ministry of Human Resource Development, and Government of India. Various years[1].

The differences in allocation on expenditure may be due to unequal development and different priorities set by the respective state governments. Therefore, it may be necessary to take an average (which the authors Rao, et al term 'normative')

---

[1]http://www.rbi.org.in/scripts/AnnualPublications.aspx?head=State+Finances+%3a+A+Study+of+Budgets

approach to assess the extent of disparities in the states' expenditure on education-i.e., an average for every state that is set as a normative level of expenditure which the state must achieve to reach the objective goals on universal education.

In the absence of any yardstick, the actual expenditures on education is considered as proxy for relative emphasis laid upon the provision of education by state governments.

To enable comparison across states on the emphasis laid on the provision of education, this analysis attempts to estimate the normative expenditure levels with regards to expenditure on education for 15 large Indian states for the fiscal year 2007-2008. Normative expenditures (or average expenditures) are calculated using data related to the period of 3 years: 2005-2006 to 2007-08, for each of these states. The analysis also makes a comparison between normative and actual expenditures on education in 2007-08 and classifies states on the basis of relative emphasis laid upon the provision of education.

The analysis categorises expenditure on education into Primary (classes Upto -VIII), Secondary (classes IX to XII) and Higher Education[2] (classes above XII). The expenditure considered in the study is the total revenue expenditure (plan + non-plan revenue expenditure) on education across states, under these three categories.

2. Methodology

Using the panel data for 15 large Indian states over the period of 3 years : 2005-2006 to 2007-08, this analysis employs pooled panel data models to estimate the average (normative) levels of expenditure on primary, secondary and higher education. Pooled panel data regression allows comparison between heterogeneous units. The inclusion of cross section data adds variability there by, reducing collinearity among variables and degrees of freedom are also enhanced.

Pooling of time series and cross section data helps estimation of average responses underlining a given relationship. *(Dielman, 1989; Rao2000).* The paper proceeds from the supply side (cost) and attempts to estimate the average / normative expenditure levels.

The variation in expenditure on education across states, as discussed above is also due to the variation in quality and quantity of service delivery of educational services in these states. It is desirable to reduce the interstate variation in expenditure on education for better delivery and achieving social goals with respect to education. To study the variation across states, a standardised yardstick is necessary. However a choice of standard measure of comparison is not easy. One way of simplifying the

---

[2] Includes expenditure on technical education.

issue is to take average level of expenditure as a proxy for state's emphasis and efficiency in providing educational services.

The dependent variable in the cost functions for primary, secondary and higher education, in this analyses is taken as *per pupil expenditure* in the respective categories; while the independent variables consist of a vector of cost determinants like *enrolment*, *drop out ratio, pupil-teacher ratio, literacy rates of states, price differences across states* etc. The analysis estimates normative expenditure levels by expressing   public services as expenditure per beneficiary. Different set of specifications were attempted for each category by introducing other variables like percentage of SC/ST enrolment in higher education, Net State Domestic Product (NSDP), share of agriculture in NSDP as a proxy for development etc . The following three model specifications were finally chosen on the basis of the significance level of parameters and results of LR test which are mentioned in the Appendix 1.

Primary Education

$$ln(pcprimaryed)_{it}$$
$$= \alpha_0 + \alpha_1 ln(prienrol)_{it} + \alpha_2 ln(pridropout)_{it} + \alpha_3 ln(literacy)_{it}$$
$$+ \alpha_4 (priptratio)_{it} + \alpha_5 (pricediff)_{it} + \varepsilon_{it}$$

Secondary Education

$$ln(pcsecondaryed)_{it}$$
$$= \alpha_0 + \alpha_1 ln(secenrol)_{it} + \alpha_2 ln(secptratio)_{it} + \alpha_3 ln(literacy)_{it}$$
$$+ \alpha_4 (pricediff)_{it} + \varepsilon_{it}$$

Higher Education

$$ln(pchighered)_{it}$$
$$= \alpha_0 + \alpha_1 ln(highenrol)_{it} + \alpha_2 ln(highptratio)_{it}$$
$$+ \alpha_3 ln(literacy)_{it} + \alpha_4 (pricediff)_{it} + \alpha_5 + \varepsilon_{it}$$

In the above models a's represent the parameters and ε_{it}'s are the error terms. The variables are described in the following table

Variable Description

Variable name	Variable description
Pcprimaryed	Per pupil Expenditure on Primary Education
Pcsecondaryed	Per pupil Expenditure on Secondary Education
Pchighered	Per pupil Expenditure on Higher Education
Pridropout	Primary Drop out ratio
Prienrol	Enrolment in Primary Education

Secenrol	Enrolment in Secondary Education
Highenrol	Enrolment in Higher Education
Priptratio	Pupil teacher ratio in Primary Education
Secptratio	Pupil teacher ratio in Secondary Education
Highptratio	Pupil teacher ratio in Higher Education
Literacy	Literacy rate
Pricediff	Price differential across states (Average CPI
Secscst	SCST Secondary (%)

These three models are then estimated, one for each category using pooled data. Using the parameter estimates obtained from panel data regression, an forecasting of normative expenditure levels for fiscal year 2007-08 is done for 15 states with regard to the three categories, primary, secondary and higher education. That is using the values of parameters, predicted value of dependent variable is forecasted for 2007-08 across 15 states. The predicted value of dependent variables in these three regression models mentioned above, are considered as normative expenditure for each state. Finally to facilitate comparison, the ratio of actual expenditures to normative expenditures levels are calculated.

Results

The estimates of the three models for primary, secondary and higher education are presented in the following table. Since all variables are in natural logarithm, the coefficient may be interpreted in terms of elasticity.

Regression Results

Dependent Variable		Independent Variables					
	constant	prienrol	Pridropout	literacy	Priptratio	pricediff	
pcprimaryed	6.604468	-0.3242776*	-0.0897464	0.0150062	0.1339924	-0.1307089	
t value	0.83	-2.47	-0.55	0.02	0.56	-0.13	
	constant	Secenrol	Secptratio	literacy	Pricediff	secscst	
pcsecondaryed	-0.492741	0.4298072*	1.470214*	1.867141*	-0.0625035*	-9.485592	
t value	-1.88*	-4.36	2.44	3.67	2.48	-0.78	
	constant	highenrol	Highptratio	literacy	pricediff		
Pchighered	4.965158	-0.2908956*	-0.4192477*	0.1833162	0.2782074		
t value	1.11	-3.45	-2.81	0.52	0.43		

Note : * significant at 5% level

In the primary education model, the enrolment in primary education is the only significant variable. Per pupil expenditure in primary education has an inverse relationship with enrolment. Dropout rate, literacy rates and pupil- teacher ratio in primary education model are insignificant. This may signify excess capacity for low enrolment

In the case of secondary education expenditure, Per pupil expenditure or expenditure per beneficiary is positively related to enrolment . This may signify that the capacity is inadequate or over capacity utilisation in secondary education sector. Per pupil expenditure on secondary education is positively related to literacy rates and price difference. Proportion of SC ST enrolment is the only insignificant variable in this model.

As for higher education sector, enrolment is inversely related to expenditure per beneficiary. Per pupil expenditure in higher education bears significant direct relation with people teacher ratio.

To facilitate comparisons actual expenditure levels are expressed as proportion of the normative expenditure levels for 15 large Indian states under the categories, primary, secondary and higher education. The figures are presented in the table below. Karnataka, Maharashtra and Bihar seems to have emphasised on primary education, while Maharashtra and Punjab has emphasised on secondary education. In the higher education sector, West Bengal, Bihar and Maharashtra seem to have emphasised in recent years. West Bengal, Punjab and Madhya Pradesh spent much less than the normative expenditure in primary education. Madhya Pradesh and Uttar Pradesh spent less than the normative expenditure in secondary education, while Rajasthan lacks emphasis in higher education.

Proportion of Actual Expenditure Levels to Normative expenditure levels, 2007-2008

States	2007-2008 (Our analysis,2014)			1997-1998 (Rao et al, 2000)			% Change in actual to normative ratios		
	Primary	Secondary	Higher	Primary	Secondary	Higher	Primary	Secondary	Higher
Andhra Pradesh	1.02	0.94	1.07	1.01	1.22	1.7	0.01	-0.23	-0.37
Assam	1.18	1.04	1.09	1.19	0.91	0.87	-0.01	0.14	0.25
Bihar	1.22	0.84	1.24	0.65	0.36	0.85	0.88	1.35	0.46
Gujarat	1.21	0.97	1.06	1.67	1.02	0.88	-0.28	-0.05	0.20
Haryana	1.13	0.85	1.11	0.91	1.01	1.33	0.24	-0.16	-0.16

Karnataka	1.55	1.11	0.97	1.11	1.15	1.16	0.40	-0.03	-0.16
Kerala	1.14	0.95	1.16	0.98	0.96	0.94	0.16	-0.01	0.23
Madhya Pradesh	0.41	0.51	0.91	1.03	0.46	0.86	-0.60	0.11	0.06
Maharashtra	1.40	1.25	1.19	1.5	1.19	0.92	-0.07	0.05	0.29
Orissa	1.14	0.86	1.11	0.84	0.63	0.122	0.35	0.36	8.08
Punjab	0.49	1.13	0.89	0.76	2.04	1.49	-0.36	-0.45	-0.40
Rajasthan	1.11	1.12	0.79	1.19	0.98	0.94	-0.07	0.14	-0.16
Tamil Nadu	1.10	1.04	0.89	0.96	1.01	0.87	0.14	0.03	0.02
Uttar Pradesh	1.05	0.72	0.87	0.61	0.63	0.72	0.72	0.14	0.21
West Bengal	0.85	1.11	1.22	0.7	1.18	1.04	0.21	-0.06	0.18

In the last part of the analysis we attempt a comparison between our estimate with that of the estimates by Rao et al (2000). We do this by calculating percentage change in the ratio of actual expenditure to normative expenditure on the sub three sectors of education. The figures marked in red in table above, depict the states in which this ratio has decreased in last 10 years. In Punjab the decrease in the ratio of actual expenditure to normative expenditure has decreased in all the three subsectors, primary, secondary and higher. Compared to the analysis done by Rao et al(2000), Assam, Gujarat, Madhya Pradesh, Maharashtra and Rajasthan have also spent less than the normative expenditure in primary education. While Andhra Pradesh, Haryana, Karnataka have spent less than normative expenditure on secondary and higher education.

Conclusion

Karnataka, Maharashtra and Bihar have fared well. Bihar seems to have improved its position since the last analysis was done using the same data. Punjab and Madhya Pradesh has deteriorated in primary education since then. Andhra Pradesh has deteriorated in secondary and higher education. The results bear testimony to the fact that the drive towards education has impacted few low income states positively since the last study was carried. However, in primary education many states lack the emphasis that the sector demands.

References

Rao, M G and V Aggarwal (1992): 'Inter-governmental Fiscal Transfers in India: Some Issues of Design and Measurement', Indian Economic Review, Vol 26, pp 13-34

Rao, M G, Roy Allen and B. Kamaiah (2000) : " Educational Expenditure of Large States: A Normative View", Economic and Political Weekly, Vol. 35, No. 17 (Apr. 22-28, 2000), pp. 1465-1469

Baltagi, B H (1995): Econometric Analysis of Panel Data, John Wiley and Sons.

Dielman, T E (1989): Pooled Cross-Sectional and Time Series Data Analysis, Marcel Dekker, New York

Data sources

PC Expenditure on Primary Education	~Same as above~
PC Expenditure on Secondary Education	~Same as above~
PC Expenditure on Higher Education	~Same as above~
Drop out ratio	Selected Educational Statistics, Ministry of Human Resource Development, Government of India. Various years.
Enrolment in Primary Education	~Same as above~
Enrolment in Secondary Education	~Same as above~
Enrolment in Higher Education	Selected Educational Statistics, Ministry of Human Resource Development, Government of India. Various years. Statistics of Higher and Technical Education , Ministry of Human Resource Development, Government of India. Various years
Pupil teacher ratio primary	Selected Educational Statistics, Ministry of Human Resource Development, Government of India. Various years.
Pupil teacher ratio secondary	~Same as above~
Pupil teacher ratio higher	Selected Educational Statistics, Ministry of Human Resource Development, Government of India. Various years. Statistics of Higher and Technical Education , Ministry of Human Resource Development, Government of India. Various years
Literacy rate (2001 census)	2001 Census, Office of the Registrar General, Government of India.
Price Differential across states (Average CPI for all labourers)	Labour Bureau, Government of India
SCST Secondary (%)	Selected Educational Statistics, Ministry of Human Resource Development, Government of India. Various years.

Tests for checking Heteroscedasticity, Multicollinearity and Autocorrelation

Model 1 : Primary Education

Checks for Heteroscedasticity

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of pcprimaryed

chi2(1)   =   0.08

Prob > chi2 = 0.7714

Checks for Autocorrelation

. xtserial pcprimaryed prienrol pridropout literacy   priptratio pricediff

Wooldridge test for autocorrelation in panel data

H0: no first order autocorrelation

F(1,   11) =   0.230

Prob > F =   0.6406

Checks for Multicollinearity

. vif

```
  Variable |     VIF     1/VIF
-------------+----------------------
   literacy |    1.70   0.588021
 pridropout |    1.59   0.630145
```

```
  priptratio |    1.41   0.710039
    prienrol |    1.27   0.786498
   pricediff |    1.10   0.905523
-------------+----------------------
    Mean VIF |    1.41
```

Model 2: Secondary Education

Checks for Heteroscedasticity

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

     Ho: Constant variance

     Variables: fitted values of pcsecondaryed

     chi2(1)   =   2.41

     Prob > chi2 = 0.1204

Checks for Autocorrelation

. xtserial pcsecondaryed secenrol secptratio literacy pricediff secscst

Wooldridge test for autocorrelation in panel data

H0: no first order autocorrelation

   F(1,   14) =   0.123

      Prob > F =   0.7307

Checks for Multicollinearity

vif

```
    Variable |     VIF     1/VIF
-------------+----------------------
   secptratio |    1.50   0.664513
     secenrol |    1.45   0.688361
      secscst |    1.05   0.954993
```

```
     pricediff |     1.01   0.986355

      literacy |     1.01   0.989492

-------------+----------------------

     Mean VIF |     1.21
```

Model 3 : Higher Education

Checks for Heteroscedasticity

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

    Ho: Constant variance

    Variables: fitted values of pchighered

    chi2(1)   =   0.00

    Prob > chi2 =   0.9829

Checks for Autocorrelation

xtserial pchighered highenrol highptratio literacy pricediff

Wooldridge test for autocorrelation in panel data

H0: no first order autocorrelation

   F(1,   14) =   2.113

       Prob > F =   0.1681

Checks for Multicollinearity

. vif

```
   Variable |     VIF     1/VIF

-------------+----------------------

 highptratio |     1.31   0.764547
```

```
  highenrol |    1.23   0.810607

   literacy |    1.07   0.937211

  pricediff |    1.02   0.982690

-------------+----------------------

   Mean VIF |    1.16
```

LR Tests for Model Specifications

Primary Education

lrtest old new

| Likelihood-ratio test | LR chi2(3) =   3.85 |
| (Assumption: new nested in old) | Prob > chi2 =   0.2787 |

Secondary Education

lrtest old new

| Likelihood-ratio test | LR chi2(2) =   5.45 |
| (Assumption: new nested in old) | Prob > chi2 =   0.0656 |

Higher Education

lrtest old new

| Likelihood-ratio test | LR chi2(1) =   0.92 |
| (Assumption: new nested in old) | Prob > chi2 =   0.3375 |