Dundee Discussion Papers in Economics 280

Chatterji, Monojit; Mohan, Sushil; Ghosh Dastidar, Sayantan

Publication date:
2014

Dundee Discussion Papers
in Economics

Determinants of public education expenditure: Evidence from Indian states

Monojit Chatterji, Sushil Mohan &
Sayantan Ghosh Dastidar

Department of
Economic Studies
University of Dundee
Dundee
DD1 4HN

Working Paper
No. 280
April 2014

ISSN: 1473-236X

Determinants of public education expenditure: Evidence from Indian states

Monojit Chatterji
Sidney Sussex College, University of Cambridge, UK
Email: mc722@cam.ac.uk

Sushil Mohan
University of Brighton, UK
Email: S.Mohan@brighton.ac.uk

Sayantan Ghosh Dastidar[1]
University of Dundee, UK
Email: s.ghoshdastidar@dundee.ac.uk

Abstract

Public education expenditure varies significantly across Indian states. Using data on sixteen Indian states from 2001-2010, the paper tries to identify the determinants of per capita education expenditure of state governments in India. The econometric findings indicate that richer states spend more on education compared to the poorer states. A lower share of child population (0-14 years) is found to significantly enhance education expenditure at the state level. We do not find any evidence that political factors such as political ideology of the ruling party and level of corruption affect education expenditure of state governments.

Keywords: public education expenditure; public policy; Indian states; panel data

JEL Classification: H52, H72, J11, J18

1. Introduction

Education has long been regarded as one of the prime drivers of growth. Over time, many economic growth theories and models (such as Romer, 1990 and Lucas, 1988) have developed relating education and economic growth. The justification for higher government expenditure on education is based on its impact on economic growth and long-term increase in the expected income of individuals (see Levine and Renelt, 1992; Mankiw et al., 1992; Barro and Sala-i-Martin, 1995; Duflo, 2001; Mukherjee, 2007). From the perspective of education as a fundamental right, the case for public intervention in the education sector becomes even stronger, especially for developing countries like India.

India is a federal republic with 28 states and 7 union territories. After independence, the Constitution of India recognised education as a state subject. Though it was transferred to

[1]Corresponding Author.
We wish to thank Prof. Hassan Molana, Dr. Grigorios Emvalomatis and seminar participants at Economic Studies (University of Dundee) for helpful comments. The usual disclaimer applies.

concurrent list (i.e. concurrent with the central government or centre) in 1976, yet the main responsibility of financing education still rested on the state governments.

Table 1: Share of Centre's and States' Expenditure in Total Public Expenditure on Education

Year	Share of States	Share of Centre
1990	88.3	11.7
1995	85.7	14.3
2000	87.3	12.7
2005	81.1	18.9
2010	77.8	22.2

Source: Analysis of Budgeted Expenditure on Education (Various Issues), Ministry of Human Resource Development, Government of India.
Note: Includes both Plan and Nonplan expenditure[2]

However, there is a lot of disparity within states in terms of expenditure on education by the respective state governments. In Table 2, we rank the 16 Indian states used in our econometric analysis according to their respective per capita public education expenditure (Column 3) and Net State Domestic Product (NSDP) per capita (Column 5) in 2010. Hypothetically speaking, we would expect that richer states spend more on education compared to the poorer states. Overall, the rankings achieved by the states conform to that belief. High-income states such as Haryana, Kerala and Maharashtra have some of the highest investments in education in India. But, there are exceptions too. Assam, despite being a low-income state (ranked 13th out of the 16 states) ranks very high in terms of education spending. Himachal Pradesh ranks 1st in terms of per capita spending but does not come even among the richest five states.[3]Some of the richest states like Tamil Nadu and Gujarat register a mediocre performance when it comes to state spending on education.

[2] Plan expenditure is that part of the total budgeted expenditure which is meant for financing various education schemes and programmes proposed under Five year plans. It indicates the direction of changes in the education sector. Nonplan expenditure is the expenditure on operating and maintaining existing education infrastructure.
The central government, over time, came to play an increasingly dominant role in shaping the country's education system. This led to a steady rise in the central government's Plan expenditure share, from around 40% in the early 1990s to around 63% in 2003. This, in turn, explains the increase in its share in total public education expenditure from 18.9% in 2005 to 22.2% in 2010. The state governments are primarily concerned with the Nonplan expenditure in the education sector which implies that it is the policies of the centre which shapes India's education system. See De and Endow (2008) for more details.
[3]It is possible that Assam and Himachal are exceptions because of their size and it is easy for these states to spend more than the larger states because of their low population. Himachal Pradesh is the least populated state (ranked 16th) among all the 16 states included in the study and Assam is ranked 13th (Census of India, 2011).

Table 2: Ranking the States by Per Capita Public Education Expenditure and NSDP per capita in 2010-11

State	Per Capita Public Education Expenditure (INR)	Rank	Real NSDP per capita (INR)	Rank
Top five states in terms of education expenditure (Ranks 1-5)				
Himachal Pradesh	2314.4	1	36327.66	6
Haryana	1543.6	2	49945.90	1
Maharashtra	1479.2	3	39602.34	4
Assam	1404.9	4	18734.02	13
Kerala	1163.3	5	41203.87	2
Middle Ranked States (Ranks 6-11)				
Karnataka	1097.5	6	29279.9	9
Punjab	1056.6	7	36287.7	7
Tamil Nadu	1048.3	8	36417.6	5
Orissa	1047.9	9	18935.4	12
Gujarat	1015.3	10	40244.1	3
Rajasthan	984.4	11	23304.3	11
Bottom five states (Ranks 12-16)				
West Bengal	929.4	12	28486.34	10
Andhra Pradesh	896.4	13	30719.32	8
Uttar Pradesh	723.6	14	15501.40	15
Bihar	625.9	15	12068.39	16
Madhya Pradesh	621.4	16	16739.98	14

Source: Authors' own calculations based on data from State Finances (Various Issues), Reserve Bank of India.
Note: Assigned ranking is based on the performance of the sixteen states included in the sample. NSDP per capita is at 1999 constant prices and per capita public education expenditure is at 2001 constant prices.

Over the span of a decade (2001-2010), the ranking of the states on the basis of education expenditure have not changed substantially; the only exception being Haryana which jumps from the 8th position in 2001 to 2nd position in 2010 (see Table 3). However, Haryana was also the richest Indian state in 2010. Among the low-income states, only Orissa (with a NSDP per capita only higher than Bihar, Uttar Pradesh and Madhya Pradesh in 2010) does slightly better to move up from the worst performers' group into the middle category (ranks 6th-11th). The worst performing states of West Bengal, Bihar, Uttar Pradesh and Madhya Pradesh continued to remain at the bottom of the ranks.

Table 3: Ranking of states by Per capita Education Expenditure in 2001 and 2010

State	Edurank_2001	Edurank_2010
Himachal Pradesh	1	1
Assam	2	4
Kerala	3	5
Punjab	4	7
Maharashtra	5	3
Tamil Nadu	6	8
Gujarat	7	10
Haryana	8	2
Karnataka	9	6
Rajasthan	10	11
Andhra Pradesh	11	13
West Bengal	12	12
Orissa	13	9
Uttar Pradesh	14	14
Bihar	15	15
Madhya Pradesh	16	16

Note: Authors' own calculations based on data from State Finances (Various Issues), Reserve Bank of India. EDURANK refers to ranking assigned on the basis of education expenditure per head by the state governments.

So, in this paper, we ask: what are the factors that determine the level of education expenditure by state governments? We focus on the state level because a) as seen in Table 1, the majority of the investments in education in India are carried out by the state governments; and b) education policies differ between states and hence a study at the aggregate level will miss the dynamics at work at the sectoral level.

The rest of the paper is structured as follows. Section 2 reviews the relevant literature. Section 3 discusses the econometric models used in the study and Section 4 presents and interprets the results. Section 5 concludes.

2. Overview of the literature

A review of the existing literature reveals that determinants of public education expenditure go beyond the economic factors; demographic and political determinants too play a significant role.

2.1 Economic Factors

The public expenditure-economic growth link was first postulated by the German political economist Adolf Wagner (Lamartina and Zaghini, 2010)**.** Wagner's Law (also known as the law of increasing state spending) states that the growth in real income would lead to an increase in public welfare expenditure (which includes education expenditure). Wagner hypothesises that demand for services by the citizens is income-elastic and hence, as economic conditions improve, the demand for social and cultural goods also rises. Economic factors are also important because they represent some of the budget constraints that a government faces while allocating resources.

The positive effect of economic factors on public education expenditure in India is well-documented in the previous studies. Using panel data for 15 Indian states from 1992-93 to 1997-98, Roy et al. (2000) attempts to estimate the determinants of public expenditure on primary, secondary and higher education. The paper finds that rich states spend more on education compared to poorer states. Chakrabarti and Joglekar (2006) explore the government financing of education over a span of 1980-81 to 1999-2000 across 15 major states of India and found that states with higher per capita income spent more on education.[4]

2.2 Demographic Factors

The effect of demographic characteristics on education expenditure is slightly ambiguous.[5]Mehrotra (2004), in India's context, states that even if some backward states attach high priority to education, larger number of school-going children probably reduces their per capita spending on education. However, it can also be the case that a state with a larger child population is spending more on education than a state with ageing population because the former has the incentive to reap the benefits of a potential demographic dividend.

[4] Chhibber and Nooruddin (2004) report a similar relationship between per capita state income and developmental expenditure for Indian states.

[5] See Cutler et al. (1993) for a detailed discussion on the theoretical relationship between demographic characteristics and public spending.

The international literature on the issues of demographic characteristics and public education expenditure can be broadly categorised into two groups. One group of papers analyse the potential competition between the elderly and younger segments of the population for public resources. The other group examines the link between size of the young population and education finance (Grob and Wolter, 2005).

2.2.1 Intergenerational Conflict in the context of Public Education Expenditure

It is generally assumed that an individual's preference for a public service is determined by whether that person is likely to be a direct user of the service. This implies that different groups of voters compete for shares of the public budget and a rising share of elderly voters in the population should hypothetically lead to a fall in public education expenditure. That is because the needs of elderly people differ from that of the younger population and, consequently, the former will prefer higher investments in areas (other than education) which benefit them directly.

The international evidence is quite mixed on this issue. Using panel data for the states of the United States for 1960–1990, Poterba (1997) finds that an increase in the share of elderly residents in a jurisdiction is associated with a significant reduction in per-child educational spending. Harris et al. (2001) also find that a growing share of elderly at the state level tends to depress state spending on education in United States. Many European studies such as Borge and Rattsø (1995), Grob and Wolter (2005) and Borge and Rattsø (2008) report similar negative relationship for Norway, Switzerland and Denmark respectively. On the other hand, there are studies which refute this claim. Strömberg (1998) argues that altruism can reduce intergenerational conflicts. Duncombe et al. (2003) say that majority of studies on this issue have used aggregate data that do not provide specific evidence on preferences of elderly people, and assume that all elders are similar in their views. They find that elderly with grandchildren are more likely to support school spending than those without.

2.2.2 Size of Young Population and Public Education Expenditure

Most empirical studies find that it is a disadvantage to be part of a large cohort. This is understandable since cost of providing education increases with the increase in student population. The government has to spend more on building schools, employ additional teachers and give more aid. Using data on 48 US states from 1960-2000, She (2004) finds that percentage of young population (aged 5 to 17 years) has a negative impact on education spending. This finding is consistent with other major studies on US in this field such as Porterba (1997) and Fernandez and Rogerson (1997). This finding gets support in many

European studies as well. Heinesen (2004) finds a negative relationship between young population and public education spending for Denmark. Using a panel data model for 1989-1996, Borge and Rattsø (2008) show that education spending per child (7-15 years) is negatively correlated with the size of the population of that age group. Kempkes and Seitz (2005) report similar findings for western German states.

2.3 Political factors

Political factors are also regarded as important determinants of public spending on education. Many past studies show that factors such as the political ideology of the ruling party determine the level of government intervention in the economy and thus influence government decisions regarding expenditure on development (Hibbs, 1977; Alesina, 1987; Boix, 1998).[6] Besides political ideology, corruption can be another crucial determinant. Corruption affects the public provision of social services such as health and education (Gupta et al., 2000). The more the corruption in a particular state, the more the government in that state will be potentially inclined to spend in sectors such as infrastructure projects where corruption opportunities are abundant, rather than on education where the opportunities are much more limited (Shleifer and Vishny, 1993; Mauro, 1998).

Hence, we control for economic, demographic and political variables while assessing the determining factors for public education spending in Indian states. The econometric model used in the paper has been explained in the following section.

3. Model Specification and Variable Description

We conduct our analysis using data on 16 Indian states from 2001-2010. Other states could not be included because of data limitations. However, it should be noted that our sample includes all the major states of India and covers about 91% of the total population.

Per capita state expenditure on education has been used as the dependent variable in our model. We do not work with the absolute value of the education expenditure in order to control for the state size. For example, larger states like Uttar Pradesh and Madhya Pradesh spend more on education compared to smaller states such as Kerala and Himachal Pradesh in

[6]Boix (1998), for example, says that while social democrats and conservatives both seek growth, each adopts different policies. The "left" uses public investment in human and physical capital to achieve growth while the "right" reduces taxes and government involvement in the economy to boost private sector involvement for growth.

absolute terms. However, the picture is quite the opposite if we look at the per capita expenditure which, we believe, is a more effective indicator than aggregate values (see Table 2).

The initial econometric model used in this paper looks as follows:

$$LEDEXPpc_{it}=\beta_0+\beta_1 LEDEXPpc_{it-1}+\beta_2 LNSDPpc_{it}+\beta_3 LTAXpc_{it}+\beta_4 LGRANTpc_{it}+ \beta 5 LOANpc_{it}+\beta_6 RIGHT_{it}+\beta_7 LEFT_{it}+\beta_6 REGIONAL_{it}+\beta_7 TREND+e_{it} \quad (1)$$

where, in state i and year t,

'EDEXPpc' is education expenditure per capita by state government (2001 constant prices), 'NSDPpc' is Net State Domestic Product per capita at 1999-2000 constant prices, 'TAXpc' is state's own tax revenue per capita (2001 constant prices), 'GRANTpc' and 'LOANpc' are respectively grants per capita and loans per capita received from central government (2001 constant prices).[7]We initially used 'Ideological competition' as the political control in our model. Our classification of parties along the line of ideology is broadly based on Chhibber and Nooruddin (2004). The Indian National Congress (INC) party has been classified as a 'CENTRIST' party. Any state ruled by the communist parties or Bharatiya Janata Party (BJP) has been coded as 'LEFT' or 'RIGHT' respectively. A state ruled by any of the regional parties is coded as 'Regional'. Classification of the states in this manner enables us to see the comparative impact of the different types of ideological competition on the public expenditure on education. The "Ideological Competition" enters our model as dummy variables called 'CENTRIST', 'LEFT', 'RIGHT' and 'REGIONAL' where 'CENTRIST' is the control category which takes the value of 1 if the Congress party is in power and 0 otherwise. Similarly, the other dummy variables can be defined.

A 'CENTRIST' or a 'LEFT' party can be hypothetically expected to invest more in education (more pro-poor policies and hence higher expenditure on social sectors) compared to a 'RIGHT' party. Also, since independence, Congress has been in the power for most of the time so it may be expected that when the other parties (BJP, left parties and regional parties) come to power they may want to expand their influence over the state bureaucracy. Such behaviour then should possibly lead to allocation of more funds towards administration, in

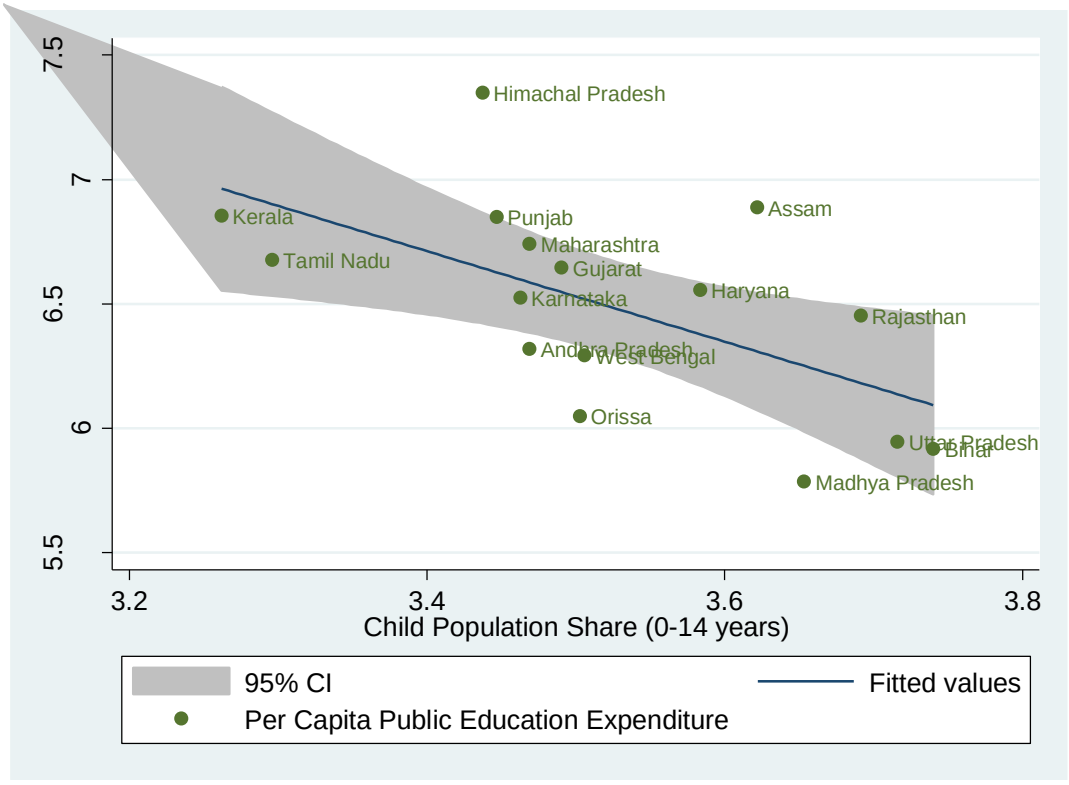
[7]'LOANpc' can also be regarded as a political variable because loans are often negotiated politically between Centre and state and repayment is sometimes waived. The variable is defined as gross loans from Centre minus repayment of loans to the Centre.
See Table 7 in the Appendix for data sources.

turn, lowering developmental expenditure (Chhibber and Nooruddin, 2004). Hence, given Congress or 'CENTRIST' is the control category, we expect the coefficients on 'RIGHT', 'LEFT' and 'Regional' to be negative. We also include a time trend ('TREND') in our model.

All the economic variables are expressed in their natural logarithms apart from 'LOANpc' since this variable takes the value of zero for some states in some years. So we kept the variable in levels to avoid losing observations. The estimation results of Equation 1 are reported in Table 5.

We also wanted to use child population share (defined as % of total population below 14 years) as a control for the demographic features of a state in Equation 1. But this variable could not be included because data is not available for all years (Population Census is conducted every ten years in India). However, a scatterplot analysis reveals that there might be a negative correlation between child population and per capita education spending in India.

Figure 1: Child Population and Per Capita Public Education Expenditure Scatterplot



Note: Authors' own calculations. Per capita public education expenditure is the Y variable and percentage of population below 14 years of age is the X variable. Both variables are expressed in their natural logarithm. The year is 2001.

States which spend the least on education such as Bihar, Uttar Pradesh and Madhya Pradesh are also among the most populous states. The high-performing states such as Kerala, Himachal Pradesh and Punjab have some of the lowest child population shares in the sample.

Table 4: Ranking the States by Child Population and Per Capita Public Education Expenditure (EDEXPpc) in 2001-02

State	Child Population	Poprank	EDEXPpc	Edurank
Bihar	42.1	1	371.2	15
Uttar Pradesh	41.1	2	381.9	14
Rajasthan	40.1	3	634.3	10
Madhya Pradesh	38.6	4	325.7	16
Assam	37.4	5	981	2
Haryana	36	6	702.7	8
West Bengal	33.3	7	541.2	12
Orissa	33.2	8	424.2	13
Gujarat	32.8	9	770.2	7
Andhra Pradesh	32.1	10	554.9	11
Maharashtra	32.1	10	846.6	5
Karnataka	31.9	11	681.8	9
Punjab	31.4	12	943.2	4
Himachal Pradesh	31.1	13	1554.4	1
Tamil Nadu	27	14	794.4	6
Kerala	26.1	15	948.9	3

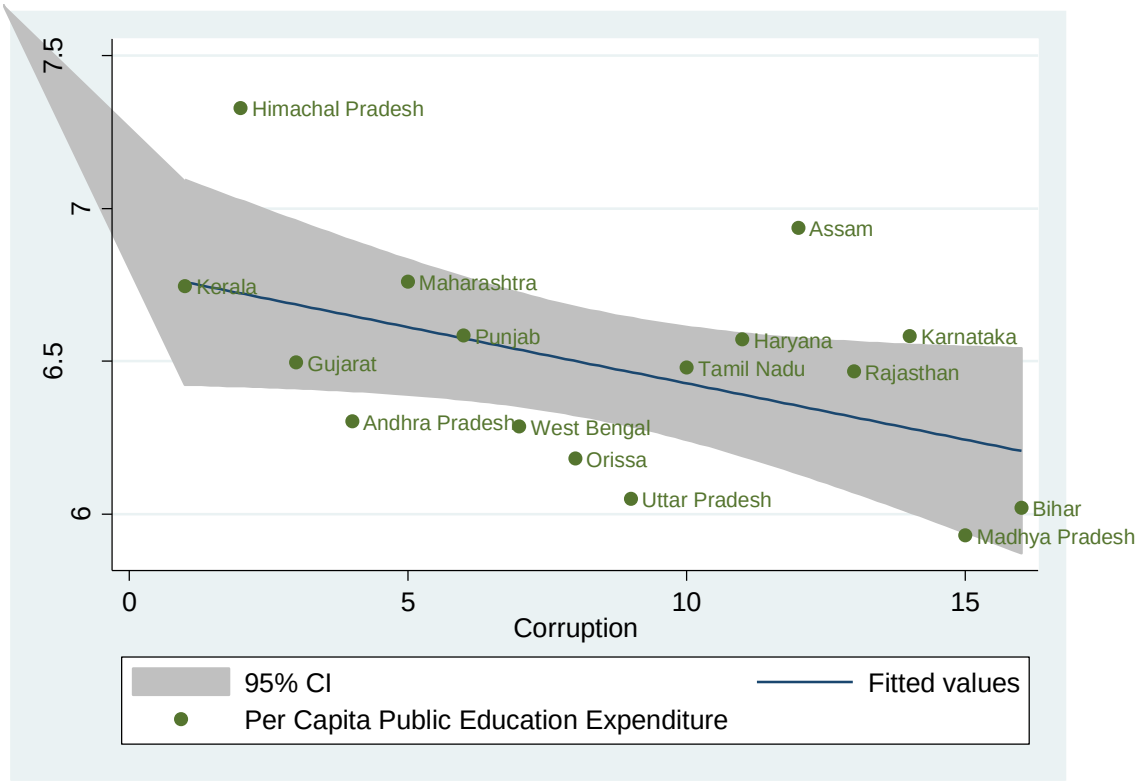
Note: Data on Child Population is obtained from Census of India, 2001. Poprank and Edurank refer to the ranks assigned to states according to the size of child population and per capita public education on expenditure respectively. A lower rank means a larger child population.

However, based on these one year statistics, we cannot comment on causality. Similar problems occurred when we tried to include 'corruption' as a political or institutional control in our econometric model. To our knowledge, the only available corruption index for Indian states was constructed by Transparency International for the year 2005.[8] We still wanted to include this variable in our analysis because corruption is a significant problem in India and its level varies significantly from state to state.[9] For example, states such as Bihar and Madhya Pradesh are amongst the most corrupt states. Conversely, Kerala and Himachal Pradesh, who spend the highest on education, are the least corrupt states (see Figure 2).

[8] The study, covering a total of 14,405 respondents from 20 Indian states, aimed to capture the level of "petty corruption" that the common man faced in obtaining 11 different public services such as Education (up to 12th Std.), Police, Land Records & Registration, Electricity, Water Supply, Government Hospitals, Income Tax, Public Distribution System, Judiciary, Municipal Services and Rural Financial Institutions. The indices were constructed using both the perception of corruption and actual experiences of paying bribes for obtaining public services. The respondent's perceptions and experiences of corruption were assigned weights of 40 and 60 percent respectively. See Table 9 in Appendix for the ranking of Indian states by this study.

[9] In 2012, India was ranked at 94th position out of 176 countries (Corruption Perception Index 2012, Transparency International).

Figure 2: Corruption and Per Capita Public Education Expenditure Scatterplot



Note: The X variable, 'Corruption', stands for the Corruption Index constructed by the TI-CMS Indian Corruption Study (2005) for Indian states. Per capita public education expenditure has been expressed in natural logs. The year is 2005. Some state ranks in the graph may not match with the TI-CMS ranking. This is because the TI-CMS study works with 20 states but we have 16 of them in our sample. Accordingly, we modified the ranks keeping the relative positions of states fixed.

The only way that demographic characteristics and corruption could be included in our econometric model is by assuming that these are time invariant variables. We argue that this assumption will not be so unrealistic in the context of our analysis where the time period is just ten years. That is because factors such as demographic characteristics and level of corruption take time to change significantly and hence it could be safely assumed that the relative ranking of the Indian states on the basis on these two criteria will stay more or less the same over a span of a decade (ten years). However, with such time invariant variables in the model, the fixed effects method becomes ineffective. The random effects model also could not be used because it assumes that the individual (or, time invariant) effects are uncorrelated with other explanatory variables. If that assumption is not met, the estimator becomes inconsistent. An alternative approach is to add the group means of the independent variables (which vary within groups) to the model. This technique was proposed by Mundlak (1978) as a way to relax the aforesaid assumption in the random-effects estimator.

In a general form, a random effects model can be written as

$$y_{it}=\alpha_t+\beta x_{it}+c_i+u_{it} \qquad (2)$$

where, x_{it} is the explanatory variable, c_i is the time-invariant individual effect and u_{it} is the error term. A random effects estimation requires $Cov(c_i, x_{it}) = 0$ which is unlikely in our case since there is high probability that corruption level will be correlated with variables like state income. According to Mundlak (1978), if $Cov(u_{it}, x_{it}) \neq 0$ then

$$c_i= \Omega + \delta\bar{x}_i+ a_i \qquad (3)$$

where, $\bar{x}_i$= group mean of the explanatory variable.

Plugging (3) into (2), we get

$$y_{it}= \alpha_t+\beta x_{it}+ \delta\bar{x}_i+a_i+u_{it} \qquad (4)$$

where, Ω gets absorbed into the time intercepts.

So, we re-estimate our model using this approach in order to include controls for demography and corruption. Our final model is expressed as follows.[10]

$$LEDEXPpc_{it}= \beta_0 + \beta_1 LNSDPpc_{it} + \beta_2 LTAXpc_{it} + \beta_3 LGRANTpc_{it} + \beta_4 LOANpc_{it} + \beta_5 Mean\_LNSDPpc_i + \beta_6 Mean\_LTAXpc_i + \beta_7 Mean\_LGRANTpc_i + \beta_8 Mean\_LOANpc_i + \beta_9 LPOP_i + \beta_{10} CORRUPTION_i + e_{it} \qquad (5)$$

where, 'LPOP' and 'CORRUPTION' stand for child population share (0 to 14 years) and TI-CMS Corruption Index for Indian states respectively.

4. Results and Discussion

4.1 Initial Model Estimation (Equation 1)

We start by checking whether Random Effects model (REM) or Fixed Effects model (FEM) should be used. The Hausman test ruled in favour of the FEM. But we detected the problem of first order autocorrelation in our FEM estimation results so we do not draw any inference from our FEM results and instead we re-estimate the model using Feasible Generalized Least Squares (FGLS) method. FGLS method allows estimation in the presence of first-order

[10] We do find any evidence that political ideology of the ruling party influences education spending by state governments (see results in the next section) and consequently we drop it from the final model, Equation 5.

autocorrelation within panels, heteroskedasticity or cross-sectional correlation across panels. However, there can be potential reverse causality bias in our FGLS results if there is a causality running from state education expenditure towards economic growth. In that case, NSDPpc will not be exogenous anymore and the results obtained will not be reliable for drawing any inference. So, we also estimate an Instrumental Variable Regression using two-stage least squares (2SLS) method to control for the potential reverse causality. The econometric results are presented below.

Table 5: Panel Model Estimation Results: 2001-2010

Independent Variable	**Fixed Effects Model (I)**	**Feasible GLS Regression (II)**	**IV(2SLS) Regression (III)**	**IV(2SLS) Regression (IV)**
LEDEXPpc(-1)	0.17***	0.35***	0.35***	0.37***
LNSDPpc	0.28	0.34***	0.91**	0.93***
LTAXpc	0.07	0.03	-0.21	-0.13
LGRANTpc	0.08	0.21***	0.06	0.07
LOANpc	0.00**	0.00	0.00*	0.00*
RIGHT	0.02	-0.02	-0.02	
LEFT	-0.13***	-.02	-0.12	
REGIONAL	-0.02	0.00	0.01	
TREND	0.03*	0.01	0.01	
CONSTANT	1.43	-0.78**		
	Hausman Test H_0:REM preferred P-value=0.00 **Woolridge Test for Autocorrelation** H_0: No first-order autocorrelation P-value=0.01 **Pesaran's Test of cross-sectional independence** H_0:No cross-sectional dependence P-value=0.30		LSDPpc is instrumented using own 1st and 2nd year lagged values. **Underidentification test** H_0: Model is underidentified P-value=0.00 **Hansen's J test** H_0:Instruments are valid P-value=0.13	**Joint Test of Significance (from III)** H_0: RIGHT=0 LEFT=0 REGIONAL=0 P-value=0.57 **Underidentification test** H_0:Model is underidentified P-value=0.00 **Hansen's J test** H_0: Instruments are valid P-value=0.12

Note: Dependent Variable: Education Expenditure per capita by the state government.
Number of observations is 159 in FEM and FGLS estimation and 128 in IV estimation.
A trend variable has been included in the model. Heteroskedasticity-robust standard errors are used for FEM and IV estimation. According to Variance Inflation Factor (VIF) estimates, our model does not suffer from the multicollinearity problem.
***, ** and * represent statistical significance at 1%, 5% and 10% level respectively.

Education expenditure by the state governments increases with an increase in state income (NSDPpc). Loans from centre also come out to be a statistically significant determinant of education expenditure however the effect seems to be negligible. The effect of political ideology seems to be fragile in expenditure decisions which are consistent with Chhibber and Nooruddin (2004) who also try to assess whether political ideologies matter in the context of spending decisions by state governments in India. We find some evidence that "LEFT" parties-led state governments spend less than Congress-led state governments on education but the result is sensitive to different estimation methods. The political ideology variables jointly also came out to be statistically insignificant in IV estimation and were consequently dropped from the final model (see Equation 5).

A major drawback of these methods (FEM, FGLS and IV 2SLS) is that we could not include controls for demographic characteristics and corruption in our model. Therefore, we refrain from deriving any conclusion from the results presented in Table 5 since there is ample international evidence, as discussed in the previous section, that factors such as demographic characteristics play a significant role in determining public spending.

4.2 Final Model Estimation (Mundlak's Approach)

We incorporate child population share and TI-CMS corruption index as proxies for demography and corruption respectively in our model and re-estimate using Mundlak's approach (see Equation 5 above).[11]

[11]See Table 10 in the Appendix where we re-run the Mundlak model using elderly population share as an alternate proxy for demographic characteristics. In case of Indian states, elderly population share does not exert any influence on public education expenditure.

Table 6: Final Model Estimation Results: Mundlak's Approach

Independent Variable	**Coefficient**
LNSDPpc	0.50***
LTAXpc	0.31**
LGRANTpc	0.11**
LOANpc	0.00***
Mean_LNSDPpc	-0.28
Mean_LTAXpc	-0.00
Mean_LGRANTpc	0.23***
Mean_LOANpc	-0.00***
LPOP	-0.76*
CORRUPTION	0.00
CONSTANT	2.82
Joint Test of Significance H_0: LMNSDPpc, LMTAXpc, LMGRANTpc and LMLOANpc are jointly equal to 0 P-value=0.00	

Note: Dependent Variable: Education Expenditure per capita by the state government. LPOP and CORRUPTION are the time invariant variables. ***, ** and * represent statistical significance at 1%, 5% and 10% level respectively.

The finding, NSDP per capita is a significant determinant of public education expenditure, is robust to different model specifications and estimation methods. Other economic variables such as tax revenue and grants received from centre also increase spending on education significantly. There is a negative association between per capita education expenditure and share of child population. In other words, a larger share of children (0 to14 years) in total population is one of the reasons why states like Bihar, Uttar Pradesh, Madhya Pradesh and Rajasthan spend less on education compared to the rest of the Indian states. As we saw earlier in Table 2, these states are lagging behind most of the other states in terms of economic growth too. Based on these findings, it can probably be asserted that the future of India's demographic dividend looks dim. That is because the population of the rich states are slowly aging and the fastest growth in the working age population is going to take place in Uttar Pradesh, Bihar and Madhya Pradesh after Haryana over the next two decades. Uttar Pradesh, Bihar and Madhya Pradesh will have roughly one-third (around 31.3%) of India's working population in 2026 (Thakur, 2012).[12] Further investment in education is needed in these states to reap the benefits of this growing working age population.[13] This, in turn, will translate into higher human capital stock and ensure faster economic growth in future.

[12] See Table 8 in the Appendix.
[13] Kumar (2010) also highlights this issue.

Corruption does not seem to affect education expenditure in Indian states. We tried to use administrative expenditure and expenditure on wage and salaries by state governments (each measured as percentage of total state expenditure) as alternate proxies for corruption because it can be presumed that more the corrupt a government, more will be its expenditure on unproductive investments. However, none of these two expenditure shares seem to have a statistically significant impact on public expenditure on education and were consequently dropped from the model. [14]

5. Concluding Remarks

The paper tries to identify the determinants of education expenditure in 16 Indian states for the time period 2001-2010 using panel model analysis. The econometric findings indicate that richer states spend more compared to the poorer ones. Other economic variables such as tax revenue and grants from the central government also exert a positive impact on education expenditure.

We do not find any evidence that political ideology of the ruling party affects education spending decisions in Indian states. The paper also considers other political factors like corruption which can be hypothetically expected to lower public welfare spending in areas such as education. A scatterplot analysis reveals a weak correlation between education spending and corruption. Bihar and Madhya Pradesh, who spend the lowest on education, are also among the most corrupt states. Conversely, the high performers like Kerala and Himachal Pradesh are the least corrupt states. However, our econometric analysis does not find evidence in support of this correlation.

There is a negative association between child population share (0-14 years, as percentage of total population) and education expenditure. The states with the largest share of child population in India are Madhya Pradesh, Bihar and Uttar Pradesh. These are also the poorest states in India with the most underinvested education sectors in the country. Over the next two decades, these states will experience the fastest growth in the working age population among all the Indian states. Given this scenario, it can be argued that the future prospects of India's Demographic Dividend look dim. The governments in those states need to implement

[14]We also wanted to use income inequality as a proxy for corruption. For a detailed discussion on how income inequality can lead to corruption in democratic states, see You and Khagram (2004). But Charron (2010) does not find inequality to be a significant determinant of corruption in Indian states. So, we do not include this variable in our study.

widespread reforms in the education sector to reap the benefits of this growing youth population.

One may argue that, in India's case, there is ample empirical evidence that private schools are more efficient than public schools in imparting learning (Desai et al, 2008; French and Kingdon, 2010; Pal and Kingdon, 2010). Hence the expected policy implication should be to let more private schools to be opened, instead of focusing on education expenditure by state governments. However, private schools charge a fee which families from poor economic backgrounds struggle to pay. Private schools, just like any other private enterprise, operate for profits and so it is unlikely that such schools will open in poor and backward areas of the country. It is not unusual when Pal (2010) finds that private schools are more likely to be present in villages with better off households and better infrastructural facilities. In a developing country like India, where, in 2010, 32.7% of the population was still below the poverty line[15] (World Development Indicators, 2012) and 26% of the children of lower secondary school age could not attend school (UNESCO Institute for Statistics, 2010) it is the government which has to ensure access to education for all. This will also help achieve "universal elementary education" (one of the Millennium Development Goals, MDGs) and ensure more inclusive growth in the long run.

Finally, we acknowledge the fact that increasing education expenditure per se will not guarantee an increase in human capital stock and a higher economic growth rate. The quality of education is equally important, which has to be ensured by providing sufficient number of qualified teachers in public schools, teaching aids, sufficient textbooks (with other learning aids) and other necessary amenities. But even to ensure good quality, raising the level of public expenditure in education is absolutely essential (Ghosh, 2011).

References

ALESINA, A. 1987. Macroeconomic policy in a two-party system as a repeated game. *Quarterly Journal of Economics*, 101, 651-678.

BANERJEE, A., and PANDE, R. 2007. Parochial Politics: Ethnic Preferences and Politician Corruption. Harvard University, Kennedy School of Government, typescript.

BARRO, R., and Sala-i-Martin X. 1995. Economic Growth (McGraw-Hill).

BOIX, C. 1998. Political parties, growth and equality: Conservative and social democratic economic strategies in the world economy. Cambridge, UK: Cambridge University Press.

BORGE, L-E., and RATTSØ, J. 1995. Demographic shift, relative costs and the allocation of local public consumption in Norway. *Regional Science and Urban Economics*, 25, 705-726.

[15] Here, poverty line is defined as $1.25 a day as per the World Bank definition.

BORGE, L-E., and RATTSØ, J. 2008.Young and old competing for public welfare services. *CESifo Working Paper No. 2223*, Munich.
CENSUS OF INDIA. 2001. New Delhi: Government of India.
CENSUS OF INDIA. 2011. New Delhi: Government of India.
CHAKRABARTI, A., and JOGLEKAR, R. 2006. Determinants of Expenditure on Education: An Empirical Analysis Using State Level Data. *Economic and Political Weekly*, 41(15), 1465-1472.
CHARRON, N. 2010. The Correlates of Corruption in India: Analysis and Evidence from the States. *Asian Journal of Political Science*, 18 (2), 177-194.
CHHIBBER, P., and NOORUDDIN, I. 2004. Do party systems count? The number of parties and Government Performance in Indian states. *Comparative Political Studies*, 37(2), 152-187.
CUTLER, D.M., ELMENDORF, D.W., and ZECKHAUSER, R.J. 1993. Demographic Characteristics and the Public Bundle, *NBER Working Paper No. 4283*.
DE. A, and ENDOW, T. 2008. Public Expenditure on Education in India: Recent Trends and Outcomes. *Research Consortium on Educational Outcomes and Poverty (RECOUP) Working Paper No. 18.*
DESAI, S. A., DUBE, V.R. and R. BANERJI. R. 2008. Private Schooling in India – A New Landscape.mimeo NCAER.
DUFLO, E. 2001. Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment. *American Economic Review*, 91(4), 795-814.
DUNCOMBE, W., ROBBINS, M., and STONECASH, J. 2003. Measuring citizen preferences for public services using surveys: Does a 'grey peril' threaten funding for public education? *Public Budgeting and Finance*, 23(1), 45-72.
ELECTION COMMISSION. Reports on state elections. New Delhi: Government of India.
FERNANDEZ, R., and ROGERSON, R. 1997. The Determinants of Public Education Expenditures: Evidence from the States, 1950–1990. *National Bureau of Economic Research Working Paper No. 5995*.
FRENCH, R. and KINGDON, G. 2010. The relative effectiveness of private and government schools in Rural India: Evidence from ASER data, mimeo, Institute of Education, University of London.
GHOSH, J. 2011. Public Spending on Education in India. *Frontline*, 28 (14).
GROB, U., and WOLTER, S.C. 2005.Demographic change and public education spending: A conflict between young and old? *CESifo Working Paper No. 1555*, Munich.
GUPTA, S., DAVOODI, H., and TIONGSON, E. 2000.Corruption and the Provision of Health Care and Education Services, IMF Working Paper No. 00/116.
Harris, A.R., EVANS, W.N., and SCHWAB, R.M. 2001.Education spending in an aging America. *Journal of Public Economics*, 81, 449-472.
HEINESEN, E. 2004. Determinants of local public school expenditure: a dynamic panel data model. *Regional Science and Urban Economics*, Volume 34, Issue 4, 429–453.
HIBBS, D. 1977. Political parties and macroeconomic policy. *American Political Science Review*, 71, 1467-1487.
KUMAR, U. 2010. India's Demographic Transition: Boon or Bane? A State-Level Perspective. *Economics Program Working Paper Series No. 10-03.*
LAMARTINA, S., and ZAGHINI, A. 2010.Increasing Public Expenditure: Wagner's Law in OECD Countries. *German Economic Review*, 12(2), 149–164.
MANKIW, N. G., ROMER, D., and WEIL, D. N. 1992.A Contribution to the Empirics of Economic-Growth. *Quarterly Journal of Economics*, 107, 407-437.
MAURO, P. 1995. Corruption and Growth. *Quarterly Journal of Economics*, 110 (3), 681-712.

MAURO, P. 1998. Corruption and the composition of government expenditure. *Journal of Public Economics*, 69, 263–279.
MEHROTRA, S. 2004. Reforming Public Spending on Education and Mobilising Resources: Lessons from International Experience. Economic and Political Weekly, 39 (9), 987-997.
Ministry of Human Resource Development, Analysis of Budgeted Expenditure on Education, Various Issues, Department of Education, Government of India.
MUKHERJEE, A. N. 2007. Public expenditure on education: A review of selected issues and evidence. *Financing Human Development Working Paper No. 1*, National Institute of Public Finance and Policy, India.
MUNDLAK, Y. 1978. On the Pooling of Time Series and Cross-sectional Data. *Econometrica*, 56(1), 69-85.
MUNSHI, K., and ROSENZWEIG, M. 2008. The Efficacy of Parochial Politics: Caste, Commitment, and Competence in Indian Local Governments. *Center Discussion Paper* No. 964, Yale University.
LEVINE, R. & RENELT, D. 1992.A sensitivity analysis of cross-country growth regressions. *American Economic Review*, 82, 942 – 963.
LUCAS, R. E. 1988. On the Mechanics of Economic-Development. *Journal of Monetary Economics*, 22**,** 3-42.
PAL, S. 2010. Public Infrastructure, Location of Private Schools and Primary School Attainment in an Emerging Economy. *Economics of Education Review*, 2010, 29 (5), 783-794.
PAL, S., and KINGDON, G. G. 2010. Can Private School Growth Foster Universal Literacy? Panel Evidence from Indian Districts. *IZA Discussion Paper* No. 5274.
PRATHAM. 2010. Annual Status of Education Report. New Delhi: Pratham Documentation Center: Pratham.
POTERBA, J. M. 1997. Demographic Structure and the Political Economy of Public Education. *Journal of Policy Analysis and Management*. 16(1), 48-66.
RESERVE BANK OF INDIA (RBI), State Finances, various years, RBI Database.
ROMER, P. M. 1990. Human Capital and Growth: Theory and Evidence. *Carnegie – Rochester Conference Series on Public Policy*, 40, 47-57.
ROY, A., KAMAIAH, B., and RAO, G. M. 2000. Educational Expenditure Needs of Large Indian States: A Normative View. *Institute for Social and Economic Change Working Papers Series* No. 55.
SHE, C. M. 2004. Determinants of Public School Expenditure in Elementary and Secondary Education. Mimeo, Indiana University.
SHLEIFER, A., and VISHNY, R.W. 1993. Corruption. *NBER Working Paper* No. 4372.
STROMBERG, D. 1998, Demography, voting, and local public expenditures: Theory and evidence from Swedish municipalities. Mimeo, Institute of International Economic Studies, Stockholm University, Stockholm.
THAKUR., V. 2012. The Demographic Dividend in India: Gift or curse? A State level analysis on differing age structure and its implications for India's economic growth prospects. *International Development Working paper Series 2012*,12-128, London School of Economics and Political Science.
WORLD DEVELOPMENT INDICATORS (WDI). 2012. World Bank.
YOU, J., and KHAGRAM, S. 2004. Inequality and corruption. *Hauser Center for Nonprofit Organizations Working Paper No.* 22; *KSG Working Paper No. RWP04-001*.

Appendix

State list

Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal

Table 7: Data Source

Variable	Source
Education expenditure by state governments	Reserve Bank of India (RBI) database
Net State Domestic Product	Reserve Bank of India (RBI) database
Grants and Loans from Centre	Reserve Bank of India (RBI) database
State's Tax Revenue	RBI publications, various issues
'Political Ideology' variables	Election Commission of India website
Demographic Variables	Census of India, 2001 and 2011
Corruption Index	India Corruption Study 2005, Transparency International India

Table 8: Distribution of India's Working Age Population (WAP) in 2026

State	Share of WAPas % of India's total WAP population
Uttar Pradesh	16.95
Bihar	8.11
Madhya Pradesh	6.22
Haryana	2.31
Himachal Pradesh	0.55
Maharashtra	9.74
Kerala	2.60

Source: Thakur (2012).

Note: Choice of states based on our ranking of states in terms of per capita education spending by state governments. No data is available for Assam.

Table 9: Ranking of States on Corruption

State	Rank
Kerala	1
Himachal Pradesh	2
Gujarat	3
Andhra Pradesh	4
Maharashtra	5
Chhattisgarh	6
Punjab	7
West Bengal	8
Orissa	9
Uttar Pradesh	10
Delhi	11
Tamil Nadu	12
Haryana	13
Jharkhand	14
Assam	15
Rajasthan	16
Karnataka	17
Madhya Pradesh	18
Jammu & Kashmir	19
Bihar	20

Source: TI-CMS Indian Corruption Study (2005).
Note: Higher rank denotes lower corruption and vice versa

Table 10: Mundlak Model Results with Elderly Population as proxy for demographic structure

Independent Variable	Coefficient
LNSDPpc	0.50**
LTAXpc	0.31**
LGRANTpc	0.11**
LOANpc	0.00***
Mean_LNSDPpc	-0.18
Mean_LTAXpc	-0.07
Mean_LGRANTpc	0.23***
Mean_LOANpc	-0.00***
LELDERLY	0.43
CORRUPTION	0.00
CONSTANT	-1.22
Joint Test of Significance H_0: LMNSDPpc, LMTAXpc, LMGRANTpc and LMLOANpc are jointly equal to 0 P-value=0.00	

Note:LELDERLY= Fraction of elderly population (aged above 60 years) in total population expressed in natural logarithm.Dependent Variable: Education Expenditure per capita by the state government.LELDERLY and CORRUPTION are the time invariant variables.
***, ** and * represent statistical significance at 1%, 5% and 10% level respectively.