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The Effectiveness of Government Higher Education Expenditure on Gross Enrollment Ratio in India

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ABSTRACT

This paper tries to synthesize the knowledge between public spending and enrolment into higher education. It has been well recognized that education has the positive relationship with the economic development. This study emphasizes on the relevancy of public expenditure on higher education. The evaluation of pooled/panel data of 28 Indian States (except Telangana) of the period 2001-02 to 2011-12 of dependent variable Gross Enrolment Ratio (GER) in higher education and explanatory variables such as GER at school level, per-capita expenditure on primary, secondary and higher education, expenditure on social services other then education and drop-out at school level attempts to demonstrate the effectiveness of these variables on GER at higher education. The utilization of OLS and Hausman random effect presented the result to analyze the effectiveness of explanatory variables. This study based on the secondary data, analysis of budget expenditure on education of MHRD and reports such as AISHE and UGC reports are the relevant sources for this study.

1. Introduction

The development of human resources in the World (both advanced and emerging economies) now plays a critical role in driving economic growth and development. The enlargement of education system is supported to economic development constantly through its expected contribution in income distribution, poverty eradication, technological advancement, research and innovation and in the building of more cultured, equitable and politically aware society. In India, where the degree of involvement of government sector in education is high as compared to private sector, the qualitative and quantitative expansion of education is highly depends on the government expenditure. In order to evaluate the role and effectiveness of public expenditure, there are number of researches has been done by economist and educationist at the national and international level.

Gross Enrolment Ratio (GER) is a statistical measure used by the United Nations to measure education index of a nation. In the context of higher education, it measures the total population of all ages enrolled in different education programs to the total population of the country in the age group of 18 to 23. The enrolment rate (GER) for Higher Education which has risen from 0.7 percent in 1950-51, 1.4 percent in 1960-61 and nearly 8 percent in early 2000. As on 31.03.2016, the GER reached to 24.5, while in the year 2014-15 developed counties like US recorded 87, Australia 90, France 64, Germany 65, even developing countries like Brazil and China has achieved 49 and 39 GER respectively which is so high compare to India. (data.worldbank.org, 2017). In India, the number of Universities had gone up to 753 universities – (47 Central, 345 State, 235 State Private, 123 Deemed to be Universities, 03 Institutions established under State Legislation) and 41,435 colleges in the Higher Education sector. (So far as the number of universities in states is concerned, Rajasthan tops the list with 71 universities, followed by Uttar Pradesh (64), and followed by Gujarat (52) and Tamil Nadu (52). According to recent estimates total enrolment in higher education reached to 34.6 million and gross enrolment ratio which estimated for 18-23 years age group reached to 24.50 in the year 2015-16 (AISHE, UGC-2015-16).

In year 2013 the public expenditure on education as the percentage of GDP of India stood at 3.84 percent even lower than world average 4.68 while Brazil spent nearly 6 percent. On the other hand USA and UK spent 4.94 and 5.6 on education as percentage of GDP. In 2016-17, the India's government expenditure on education stood at 3.65 per cent of GDP, and within expenditure on higher education the highest fund allocated for the purpose of enhancing aggregate access followed by the expenditure on quality and excellence. The government still not accomplishes its targeted to allocate 6 percent of GDP on education. On the other hand, the share of public funded education, in general and higher education in particular in the total outlay is decreasing gradually.

2. Previous researches

There have been a numbers of studies available on the area of public spending on education which provides ample inputs to this study. The importance of public spending has been realized after the pioneer work of Wagner & Tolison (1876) they recommend that with an increase in economic growth continues, the share of public sector in the economy will rise as a result of the strengthening of existing activities and expansion of new activities, this is what later has been turned the "law of increasing state activities after that

Wiseman and Peacock (1961), gave three major effect which are responsible to rise in public expenditure, Displacement effect, Concentration effect and Inspection effect. Further, Vaizey (1962) Borcherding and Deacons, (1972), Musgrave (1984), etc, had a view on the role of public spending in education sector. some of recent studies found that public expenditure on education, 'is held not only to be necessary for the development of education, but also as a desirable form of providing education, because markets cannot provide the socially optimum quantities and qualities of education, as markets do not captive externalities, Tilak (1997). Kaur and Misra (2003), in a State level empirical analysis by Kaur and Misra found the impact of public spending on primary, secondary and intermediate school enrolments, the panel regression of the 15 States of India from the period 1985-86 to 2000-01 indicated that the public spending on education has been generally more productive in the poorer States. In terms of outcomes, public expenditure has a greater effect on primary education than secondary education. The role of public funding decreases at higher stages of education. However, the estimates are not robust to alternative functional specifications and hold only for random-effect in the panels. These estimates therefore, may not be very reliable. some of studies focused on the impact of public spending on outcome of education like Bhakta, (2014), focused on impact of public spending on health and education of children in India, she used the panel data simultaneous equation model to find out the impact of public spending on education and health on their outcomes enrolment rate, drop-out rate and Infant Mortality Rate (IMR). The results suggest that per capita real expenditure on health by state governments does not have a significant impact on IMR but additional expenditure on SNP improves the health status significantly but at diminishing rate. On the other hand, per capita expenditure on elementary education has direct impact on the enrolment rate, but the impact of public expenditure on education has diminishing returns on GER. Checchi (2003), on the other hand examined the relationship between enrolment in education, which is a flow of human capital and public spending on education. He found that the aggregate amount of public resources expended on education has a positive and significant effect on higher education enrolment, further he found that increase in secondary level of education had a positive effect on higher education enrolment. A study conducted by Anuradha De, Tanuka E, (2008) found that public expenditure on education in current prices has been growing at the compound annual growth rate CAGR of 13.4 per cent p.a. for the period 1990-91 to 2003-04 the rate of growth has slowed down in the present decade. Moreover their study indicates that expenditure in constant prices shows a much lower CAGR of only 6.5 percent for the same period. Though the expenditure has almost doubled between 1990-01 to 2000-01, it had stagnated and even decline since then. As a proportion of GDP the share of public expenditure on education has been less than 4 per cent. Mitra (2015) on inter-state variation of public expenditure on higher education found that with the advent of reforms the social sector including education did experience a financial squeeze with the higher education sector receiving the harshest blow. In the second decade of reforms, the proportion of GDP spent on higher levels of education registered a decline from decade one. Inadequacy in funding has been brought to the fore by a lower growth rate of per capita expenditure as compared to the growth rate figures of public expenditure.

3. Data and econometric model

In order to identifying the factors that govern the enrolment into higher education, this study will be based on secondary data from various resources like Analysis of state budget expenditure, MHRD, educational survey, data from ministry reports and statistics, articles and books. Data will be collected of Indian States and Union-Territory all 28 states except Telangana and the time period of study will be 2001-02 to 2015-16. Econometric model is applied in which Gross Enrolment Ratio (GER) in higher education is dependent variable and the independent variables are as follows:

Table 1; Specification of dependent and independent variable

Dependent Variable	Independent Variables
Gross Enrolment Ratio (GER) state wise	Gross enrolment ratio at secondary level (gersl)
	Per capita spending on Elementary (pcexee)
	Per capita on secondary and higher education (pcexshe).
	Expenditure on social services (exss).
	Drop-out rate at secondary level (drop)

In order to identifying the effectiveness of public spending on higher education enrolment, this study is based on secondary data from various resources like educational survey, data from ministry reports and statistics, articles and books. Data has been collected of Indian States and Union-Territory for all 28 states and 7 UTs.

3.1 Data source

Data sources are one of the important organs of the study, without data sources the study could not be collected and analyzed.

Table 2; Sources of variables of the study

S.No	Variables	Sources
1	Gross Enrolment Ratio (GER) (State-wise)(Dependent variable)	UGC Report, AISHE, MHRD, EPW research foundation
2.	GER at secondary level (I-XII)	Statistics of school education, MHRD, EPW research foundation
3	Per-capita expenditure on elementary, secondary and higher education	Analysis of budget expenditure of various year, MHRD reports, EPW research foundation.
4	Expenditure on social services	Ministry of finance, Department of economics and statistics, EPW research foundation.

3.2 Analysis procedure

As mentioned in the introduction, goal of this study is to determine the economic and educational factors which govern enrolment into higher education and to examine the

effectiveness of government expenditure on higher education enrollment.

(a) Analysis begins with the youngest approach and tests whether or not total public expenditure on education and income per capita matter for enrolment in higher education
(b) Multiple Regression model will be applied in which Gross Enrolment Ratio (GER) (State-wise) in higher education is dependent variable and the independent variables are already discussed above:
(c) State-wise time series analysis from the period of (2001-02 to 2015-16) to analyze the effectiveness of public spending on higher education enrolment.

4. Empirical results

As discussed above the main objective of this study is to demonstrate the effectiveness of public spending on higher education enrolment i.e., GER. The explanatory variables such as Gross Enrolment Ratio (GER) at school level, per-capita expenditure in primary education, per-capita expenditure in secondary and higher education, expenditure on social services other then expenditure on education as a percentage of total expenditure and dropout rate at secondary education, tries to reveal their effectiveness on GER at higher education level. the study begins with VIF test to in order to check the degree of collinearity, after this, study reflects the result of Ordinary Least Square (OLS) method, flaws in OLS method, introduction of Hausman model (fixed and Random effects), finally comparing the result of both OLS and random effect GLS method.

4.1 VIF test to check the degree of colinearity

VIF stands for variance inflation factor, as a rule of thumb, a variable who's VIF are greater than 10 may merit further investigation. Tolerance, defined as 1/VIF, is used by many researchers to check on the degree of colinearity. a tolerance value lower than 0.1 is comparable to VIF of 10, it means that the variable could be considered as a linear combination of other independent variables.

Table 3; VIF test to check degree of colinearity

Variables	VIF	1/VIF
GERSL	1.08	0.94
PCExEE	3.15	0.31
PCExSHE	2.95	0.33
DROP	1.21	0.82
ExSS	1.20	0.83
MEAN VIF	1.92	

In the above result, the VIF is less than 10 in all cases and the mean value is also less than 10. so outcome clearly reflected that there is no problem of multicolinearity in this ananlysis.

4.2 Ordinary Least Square Method

The Ordinary least-squares (OLS) regression method is a technique of generalized linear modelling which may be used to model a single response variable which has been recorded on at least an interval scale. The OLS technique may be applied to single or multiple independent variables and also categorical explanatory variables that should be appropriately coded.

The technique of OLS regression model can be estimate with multiple explanatory variables. It can be extended to include multiple explanatory variables by simply adding additional variables to the equation. The form of the model with multiple explanatory variables can be written as variable (Y) which is dependent variable and multiple explanatory variables, (X1 to X5).

$$Y = \alpha + \beta1X1 + \beta2X2 + \beta3X3 + \beta3X4 + \beta3X5$$

The functional relationship between dependent variable and explanatory variables of the study is as follows:

ger = f (gersl, pcnsdp, pcexee, pcexshe, exss, drop)

Y=ger, X1=gersl, X2=pcexee, X3=pcexshe, X4=exss, X5=drop

$$Y\ (ger) = \alpha + \beta1\ (gersl) + \beta2\ (pcexee) + \beta3\ (pcexshe) + \beta3\ (exss) + \beta3\ (drop)$$

4.3 Flaws in OLS regression method

The OLS regression technique is widely acceptable regression analysis in socio-economic studies. Unfortunately, there is presence of number of flaws and pitfalls of applying OLS method such as presence of outlier in the data set it means when at the some points in the training data have excessively large or small values of explanatory variables compared to rest of training data could provide inappropriate result. the reason behind for this is that since the OLS technique is concerned with the minimizing the sum of the squared error any training point that has a dependent value that differ a lot from the rest of the data will have a disproportionally large effect on the resulting constants that are being solved for. The second most significant flaws in OLS method is the non-linearity, because in practicality most systems are not linear in nature. Thirdly, large numbers of variables (explanatory variables) in the data set is another problem of the using OLS regression technique. the OLS method can sometimes lead to provide inappropriate predictions when subset of the explanatory variables fed to it are significantly correlated to each other and the problem behind these circumstances is that there are a numbers of different solutions to the regression problem that the model considers to be almost equally appropriate result, but unfortunately many of these nearly equal solutions will lead to a very bad predictions that is inappropriate performance of the testing set. The wrong choice of error functions and problem of heterosckedasticity are the some other flaws in the OLS regression technique. The below table 6.3 shows the result of OLS method.

4.3.1. Ordinary Least Square (OLS) regression result

Table 4; Dependent variable: Gross Enrolment Ratio (GER) in higher education (%)

Independent variables	OLS
Gross enrolment ratio (GERSL) at secondary level	0.169* (.019)
Per capita expenditure on elementary education	0.00030* (.000)
Per capita expenditure on	4.64 (8.34)

secondary and higher education	
Drop-out rates at primary and secondary level	-0.0730* (.0176)
Expenditure on social services as a % of total expenditure on social services	0.5385* (.177)
Methods: OLS, No. of observation = 280 R squared = 0.41, Adjusted R-squared = 0.39 *Standard errors in bracket *, **, *** imply significance at 90, 95 and 99% confidence interval*	

The above table 4, reflects the outcome of ordinary least square (OLS) regression analysis of dependent variable Gross Enrolment Ratio (GER) with explanatory variables Gross Enrolment Ratio at secondary level (GERSL), Per-Capita Expenditure on Elementary (PCEXEE), Per-Capita Expenditure on Secondary and Higher Education (PCEXSHE), Drop-Out rates at primary and secondary level and Expenditure on Social Services other than expenditure on education as a percentage of total expenditure on social services (EXSS). The (R squared) value is 41 percent and the number of observation is 280. In order to provide first explanation of the effect of public expenditure on Gross Enrolment Ratio (GER) in higher education, this study has been separated the effect of per capita expenditure on education into two parts first, per capita expenditure on elementary education and per-capita expenditure on secondary and higher education. The outcome of the study are as follow, one percent increase in per-capita expenditure on elementary education would increase 0.00003 percent in GER, the figures of combined per-capita expenditure of secondary and higher education not showing significant values and the most significant effect on GER in higher education showed by the expenditure on social services as a percentage of total expenditure on social services other than expenditure on education. The one percent increase in EXSS would increase 0.53 percent change in GER; on the other hand the drop-out rate as expected shows the negative coefficient that one per-cent increase in drop-out at secondary level would reduce GER in higher education by 0.07 percent. The explanatory educational variable GERSL reveals the positive effect which says one percent increase in GERSL would increase GER in higher education by 0.169 percent.

4.4 Justification of using Hausman Test (random and fixed effects)

The outcome of OLS regression method as shown in the above table 6.3 does not reveals the appropriate prediction of the study. The most important flaws are that it does not shows the satisfactory outcome of explanatory variable per capita expenditure on secondary and higher education, which is theoretically and empirically most significant explanatory variable of dependent variable GER in higher education. Since OLS regression result has not been found appropriate this study further attempts some test such as Breusch and Pagan lagrangian multiplier test for random effects to select the appropriate model in between OLS and Hausman random effects. The below 6.4 table reflects the result of Breusch and Pagan lagrangian multiplier test.

Table 5; Breusch and Pagan lagrangian multiplier test for random effects

	Var	Sd=sqrt(var)
Ger	41.96	6.47
E	17.28	4.15
U	10.34	3.21

test: Var(u)=0 chibar2(01)=45.04 prob>chibar2=0.000

The LM test helps to decide between a random effects regression and a simple OLS regression. The null hypothesis in the LM test is that variances across entities are zero it implies, no significant differences across units (i.e. no panel effect).

Here, we failed to reject and have to accept alternative hypothesis and reject null hypothesis and conclude that random effects is appropriate and OLS is not appropriate in this dataset, if the test statistics has a p value below a appropriate threshold (e.g., p<0.05) then the null hypothesis of homoskedasticity is rejected and heteroskedasticity assumed.

4.5 Hausman test

Hausman (1978) introduced a test based on the difference between the RE and FE estimates. The Hausman specification test more technically Durbin-Wu-Hausman (DWH) test in a regression analysis deals with endogenous variables which are determined by explanatory variables. The Hausman test is useful when the OLS technique does not give appropriate result in a panel data set. Further, Hausman test helps to select between fixed or random effects, if the null hypothesis is the preferred model for random effects (RE) then the alternative hypothesis will be fixed effects (FE). The null hypothesis is that there is no correlation between two. The relevant consideration to compare fixed effects and random effects estimators is whether the unit effects are correlated with any of the explanatory variables and therefore the random effects estimates biased. In 1994 Newey and McFadden present ample conditions of Hausman test, which are met by the fixed effects and random effects estimator. in respect to find out the appropriate estimator between fixed and random there is need to take null (Ho) and alternative (H1) hypothesis. The fixed effects estimator is consistent under both the null-hypothesis and the alternative hypothesis, on the other hand the random effects estimator is inconsistent under the alternative but more appropriate under the null. When the p-value is smaller than 0.05 then the null is rejected and alternative hypothesis accepted, it implies random estimator is appropriate as compared to fixed estimator, significant effect (Mundlak 1978, Hausman 1978, Hausman and Taylor 1981, Chamberlain 1982, Wooldridge 2002). Wooldridge points to some caveats of the general Hausman-test. The Hausman test has very favorable asymptotic properties (Baltagi 2005). This study therefore emphasizes on the small sample performance of this test under different conditions.

4.6 Hausman Test (fixed and random effect) result

Table 6. Dependent variable: Gross Enrolment Ratio (GER) in higher education (%)

Independent variables	Random effect GLS regression
Gross enrolment ratio (GERSL) at secondary level	0.169* (.0245)
Per capita expenditure on elementary education	0.00038* (.000)
Per capita expenditure on secondary and higher education	0.0000175** (9.14)
Drop-out rates at primary and secondary level	-0.121* (.028)
Expenditure on social services as a % of total expenditure on social services	0.5125*** (.127)
Methods: Random effect GLS regression No. of observations = 280 R squared = 0.39 *Standard errors in brack *, **, *** imply significance at 90, 95 and 99% confidence interval*	

The above table shows the result of random effect GLS regression analysis of dependent and explanatory variables. The number of observation is again 280 and R-square value is 39 percent. However the result is not showing the significant change as compare to OLS method but the most significant change that, the per-capita expenditure on secondary and higher education shows the significant value, the one percent increase in secondary and higher education would increase 0.0000175 percent in GER which is less effective than per-capita expenditure on elementary education which shows 0.00038 and the most effective again showing the variable EXSS. Drop-out at primary and secondary shows negative coefficient -0.121, it means one percent increase in drop-out would reduce 0.121 percent in GER in higher education.

Table.7 Dependent variable: Gross Enrolment Ratio (GER) in higher education (%)

Independent variables	Fixed effect GLS regression
Gross enrolment ratio (GERSL) at secondary level	0.141* (.0278)
Per capita expenditure on elementary education	0.00041* (.000094)
Per capita expenditure on secondary and higher education	0.0000277* (.0000102)
Drop-out rates at primary and secondary level	-0.194* (.0411)
Expenditure on social services as a % of total expenditure on social services	0.269*** (4.215)
Methods: Fixed effect (within) GLS regression No. of observation 280 R squared 0.35 *Standard errors in bracket *, **, *** imply significance at 90, 95 and 99% confidence interval*	

The above table shows the result of fixed effect (within) GLS regression analysis of dependent and explanatory variables. The number of observation is again 280 and R-square value is 35 percent. However the result is not showing the significant change as compare to OLS method, but the most significant change that, the per-capita expenditure on secondary and higher education shows the significant value. One percent increase in secondary and higher education would increase 0.0000277 percent in GER which is less effective than per-capita expenditure on elementary education which shows 0.00041. The most effective again showing the variable EXSS which shows 0.269 percent. Drop-out at primary and secondary shows negative coefficient -0.194, it means one percent increase in drop-out would reduce 0.194 percent in GER in higher education.

Table 8. Hausman fixed random

	Fixed(b)	Random(B)	Differnce(b-B)	Sqrt S.E
gersl	.141	.169	-.279	.013
pcexee	.00041	.00038	.0000376	.0000193
pcexshe	.0000277	.0000175	.0000102	4.44
drop	-.1942	-.1218	-.07238	.02939
exss	.2694	.5125	-.2431	.4800
b= consistent under Ho and Ha; obtained from xtreg B= inconsistent under Ha, efficient under Ho; obtained from xtreg Test Ho: difference in coefficient not systematic Prob>chi2 = 0.0858				

Table 8, reveals the Hausman fixed and random effect simultaneously of all dependent and explanatory variables. The above analysis is useful to identify the appropriate test in between fixed and random effects. according to theoretical evidence if the probability of Hausman fixed and random effect is less than 5 percent then fixed effect is appropriate because null hypothesis (Ho) difference in coefficient is not systematic Ho is rejected and H1(alternative hypothesis) is accepted. Prob>chi2 = 0.0858, it means it is above 5 percent it means random effects is appropriate. The below table 6.8 reveals the outcomes of OLS and random effect GLS regression simultaneously.

4.7 OLS and random effect GLS regression

Table 9; Dependent variable: Gross Enrolment Ratio (GER) in higher education (%)

Independent variables	OLS	Random effect GLS Regression
Gross enrolment ratio (GERSL) at secondary level	0.169* (.019)	0.169* (.0245)
Per capita expenditure on elementary education	0.00030* (.000)	0.00038* (.000)
Per capita expenditure on secondary and higher education	4.64 (8.34)	0.0000175** (9.14)
Drop-out rates at primaryand secondary level	-0.0730* (.0176)	-0.121* (.028)
Expenditure on social services as a % of total expenditure on social services	0.5385* (.177)	0.5125*** (.127)
Methods: OLS and Random effect GLS regression No. of observations R squared	 280 0.41	 280 0.39

*Standard errors in brackets *, **, *** imply significance at 90, 95 and 99% confidence interval*

The above table 9 reflects the result of OLS and Hausman random effect GLS regression. However, there is not much changes in the outcome of the variables such as GERSL, per-capita expenditure on elementary education, expenditure on social services other than expenditure on education as a percentage of total expenditure. The number of observation is 280 in both cases; the R-square value is 41 percent in OLS regression and 39 percent in Hausman random effect GLS regression. The significant difference in the result between the OLS and random effects GLS regression is that the expenditure variable i.e., per-capita expenditure on secondary and higher education showed significant in random effect but not in OLS regression analysis. One percent increase in PCEXSHE would increase 0.0000175 increases in GER, the result showing that the PCEXEE is more effective than PCEXSHE the value is 0.00038. Drop-out rate slightly change in random effect, in OLS regression one percent increase in drop out would reduce 0.0730 GER, while in Hausman random effect it is showing that one percent increase in drop-out would reduce 0.121 percent in GER in higher education.

5. Summary and conclusion

Education is one of the most essential factor to achieve the long-run sustained socio-economic growth and development of the country. India is biggest democratic and second most populace country in the world where public as well as private funding both plays a relevant role for the development of the country. The government is responsible to provide social services and provide financial resources for the maintaining equity and fairness in the socio-economic system. Fiscal policy plays the instrumental role to maintain fair and just socio-economic development.

The present study revealed the effectiveness of some explanatory variable on GER in higher education. The key challenges related to enrolments, public spending, demand supply gap and inclusion etc revealed that the situation of Indian higher education is not praiseworthy.

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