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Teacher Quality and Dropout Rates in Primary Education
The Case of Developing Countries

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Abstract. *Using a panel of 40 developing countries of the world, spanning the period 1997 to 2017, this study examines the role of the teacher in reducing dropouts in primary education. Controlling for the role of socio-economic and individual characteristics, this study finds that the reduction in class size through recruitment of an extra teacher is more effective in reducing dropouts in developing countries than the provision of organised training of teachers. Alternatively, the result indicates that increase in household income or wealth and parental education significantly reduce dropouts. While government developmental efforts such as alleviation of poverty could be catalytic in reducing dropouts, specific policies that increase parental education are likely to have important implications in reducing dropouts.*

Key words: Class Size, Household Income, Parental Education. Primary Education

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Introduction. Though teachers are perhaps the most important determinant of student achievement (Chu et al., 2015; Rowe, 2003), few studies relating to the teacher have examined those aspects that are conducive to encouraging school attendance or completion rate. Instead, most studies have focused on those aspects of the teacher explicitly linked with the improvement of learning outcomes or cognitive skills (see, for example, Appleton, 1995; Azam and Kingdon, 2015; Clotfelter et al., 2006; Hanushek and Rivkin, 2010 & 2012; Kingdon and Teal, 2010; Milanowski, 2004). However it appears that, in an early phase of a country's educational development the role of teachers is likely to depend more on factors that induce school attendance or completion rate than on factors linked to cognitive skills (Lloyd et al., 2000).

In most developing countries, where enrolment is not yet universal or where the dropout rate is substantial, an approach to measuring the role of teachers that is limited to factors affecting the learning outcomes of students would be missing an important part of the story. It seems that interventions in improving students' learning outcomes would be effective once children get into schools while maintaining attendance rates at relatively high levels and reducing dropout rates. More resources improve students' achievements only if they result in changes in children's daily experiences at schools (Ganimian and Murnane, 2016).

This study employs panel data models to reinvestigate the links between teacher and school dropouts across 40 developing countries covering 1997 to 2017.[1] The key finding is that teachers appear to be a strong source of influence regarding student's decisions to drop out of schools. Since almost all developing

[1] The data are drawn from World Development Indicators (WDI) managed and published by the World Bank. Countries are selected on the basis of availability of data and we have a panel dataset with 840 observations (See Table A.1). A total of 4.7 per cent missing data are filled up with the average of the two data points of the adjacent years.

countries are rightfully concerned about the problem of low school completion rate (Hanushek et al., 2008). Therefore the focus is on how the teacher affects the pupil's decision to drop out of schools. This is of particular importance for tweaking policy choices, specifically in getting all students through the early phases of schooling or to ensure universal primary education (UPE) in those countries.

Literature review. This section highlights some of the important literature which provide a basis of our study. There are a number of studies in the literature that empirically determine of the level of school quality and its determinants. Among those Bernal et al. (2016), Crispin (2014), Finn and Achilles (1999), Frisvold and Golberstein (2011) highlight the role of pupil-teacher ratio (PTR) or class size in determining school quality. Needless to say that a lower pupil-teacher ratio that is more number of teachers is required to enhance school quality.

However, all efforts to reduce PTR or class size may not be effective if, large unqualified teachers are hired to bring the class sizes down (Bohrnstedt and Stecher, 2000). Although it is not easy to assess the quality of teachers, a highly qualified or trained teacher can probably be an effective educator even with fewer resources, or can influence outcome variables like students' school attendance and continuance (Singh and Sarkar, 2015). Training of teachers promotes teaching skills and develops teaching proficiency, which in turn, helps in improving students' learning (Stronge et al., 2011) – a potential factor for reducing dropouts.

Examining the factors influencing school dropouts has been a focus of many empirical studies. Blue and Cook (2004) and Sabates et al. (2013) highlight the role household income or wealth in determining dropout behaviour school children. While household income is an important determinant of dropouts, household consumption is often used as a proxy for household income which is based on the assumption that higher income leads to higher consumption. This is, however, may not be true if poorer households have a tendency to consume more. Alternatively, Harma (2011) and Mehrotra and Panchamukhi (2006) observe that poor people always have a disadvantageous position in terms of educational achievement. One of the reasons is that poor peoples' opportunity costs of sending their children into schools are higher than the rich (Kane, 2004).Intuitively, the higher the share of poor people the higher will be the dropout rates. However, using household consumption and the share of poor people together in the analysis may lead to the problem of collinearity.

Other group of studies focuses on child specific factors while examining dropout behaviour. Andre (2009) and Sunny et al. (2017) observe that the grade repetition negatively affects on probability of being enrolled at schools the next year. Students with bad health conditions are also less likely to enroll in schools and even if they enroll in schools, there is less chance to complete a particular cycle of education. Bhakta (2014) examines the influence of child health on dropout behaviour and observe that bad health adversely affects students' learning outcome which in turn lead to more dropouts.

Contrary to these predictions, other studies examine the link between education variables and dropout of school children. There is much research evidence that parental education is negatively associated with dropout rates (Huisman and Smits, 2015; Moyi, 2012), that is, children from educated parents are less likely to dropout from schools. Alike, there are many cases where age of students influence dropouts (see, for example, Keng, 2004). Tafreschi and Thiemann (2016) in this case observe that both under-age and over-age students are typically related to grade repetition. It is noticeable that in case of under-aged students, although they tend to left schools early, there is a chance of re-enroll in a later period. But it is hard to re-enroll over-aged students once they left schools.

Although it is unlikely to have a comprehensive measure of the determinants of school dropouts, it is important to conceive of a framework that integrates teacher quality and other socio-economic factors in examining dropout rates in developing countries. The model consisting of factors including teacher quality that influence school dropouts would likely to provide useful complementary information for analysing the dropout behaviour of school children.

Objective. The basic burden of this paper is to suggest that school dropout is likely to differ depending on the level of teacher quality. It is thus imperative to examine the effect of teacher quality in reducing school dropouts in primary education across developing countries of the world.

Method. The study uses the following linear specification to estimate the role of teacher on dropouts.

$$\mathrm{pdr}_{it} = \alpha + \beta_1 \mathrm{ptr}_{1it} + \beta_2 \mathrm{tt}_{2it} + \beta_3 \mathrm{hfce}_{3it} + \beta_4 \mathrm{pp}_{4it} + \beta_5 \mathrm{grm}_{5it} + \beta_6 \mathrm{grf}_{6it} + \beta_7 \mathrm{mr5}_{7it} + \beta_8 \mathrm{lra}_{8it} + \beta_9 \mathrm{ger}_{9it} + \theta_i + \mu_t + \varepsilon_{it} \quad (1)$$

where, i indexes number of countries (where i = 1, 2, ……, 40); t indexes number of years (where t = 1997, 1998, ……, 2017); pdr is the dropout rate in primary education; ptr is thepupil-teacher ratio; ttis the share of trained teacher; hfceis the household final consumption expenditure per capita (in constant 2010 US$); pp is the share of poor people; grm is the share of male repeaters in primary education; grf is the share of female repeaters in primary education; mr5 is the mortality rate under 5 (per 1000 live births); lra is the adult (percentage of people ages 15 and above) literacy rate; ger is the gross enrolment ratio for primary education; $\alpha$is the intercept; $\beta_1, .. \beta_9$are the coefficients associated with the explanatory variables; μ_t is the time fixed effect; θ_i is the country-specific effect.

Although Hausman test prefers random-effect model, few points about the error terms are worth mentioning. First, it is unlikely that in many cross-sectional datasets the variances o the error terms are identical. Second, it is expected that for a relatively close time period data, error terms are dependent of each other. The diagnostic tests detect both heteroscedasticity and autocorrelation of order one AR(1) among the error terms. Since error terms are not independent and identically distributed (i.i.d.), we use generalised least square (GLS) estimates which allows estimation of parameters in the presence of autocorrelation within panels and heteroscedasticity across panels.

Finding. Results of the regression models are presented in Table 1. We start with a baseline model (Model 1) and successively add variables from each of the three categories so as to examine the robustness of the results. However to avoid collinearity, we drop some variables in each of the successive model. In all models, the results show that pupil-teacher ratio has statistically significant and positive impact on dropout rates. It suggests that reduction in class size is important to curb school dropouts. This result may have been driven by several factors. For example, smaller class size yields better student-teacher interaction (Blatchford et al., 2011; Wössmann and West, 2006), or students achievements improves with the reduction in class size (Finn and Achilles, 1999; Krueger, 1999), or smaller class enhances education quality (Bernal et al., 2016) – all are important factors for reducing school dropouts, especially for student belonging to poorer households (Krueger 1999; Mosteller et al., 1996).

There is some evidence that the increase in the share of trained teacher reduces dropout rates. We use the share of trained teacher which is the proportion of total teacher that have received the minimum organized teacher training required for teaching in a given country. That is, our result implies that the increase in the provision of minimum organized training of teachers in isolation may not always be effective in reducing dropouts, especially in cases where pupil-teacher ratio is reasonably high. Putting it in another way, we may say that reducing class size through recruiting extra teacher is more important to reduce dropouts than the increase in the provision of organized training of the existing teachers. However, additional training of teacher that further boosts teaching proficiencies or skills may have strong effect in reducing dropouts even with larger class size.

To see how household wealth or income influence dropouts, we include household final consumption expenditure and observe that increase in household consumption considerably reduce dropout (see, Model 2 – 4). This result may be because of the fact that increases in income or wealth allow households to exceed the income threshold needed for paying for their children's schooling. As stated earlier, using of household consumption expenditure as a proxy for household wealth or income may be misleading if poor people consume relatively higher share of income. We thus include the share of poor people instead of household consumption expenditure (see, Model 5 – 8). Our results are robust to the inclusion of the share of poor people, that is, higher the share of poor people higher will be dropout rates.

Table 1 Regression on school dropouts (40 countries, N = 840)

Independent variables ↓	1	2	3	4	5	6	7	8	9
Teacher quality									
Pupil-teacher ratio	0.792*** (0.054)	0.670*** (0.057)	0.561*** (0.057)	0.655*** (0.058)	0.621*** (0.056)	0.417*** (0.055)	0.332*** (0.057)	0.449*** (0.058)	0.386*** (0.060)
Share of trained teacher	-0.085*** (0.022)	-0.066*** (0.023)	-0.045** (0.021)	-0.068*** (0.023)	-0.055** (0.021)	-0.046** (0.018)	-0.026 (0.017)	-0.034* (0.020)	-0.023 (0.019)
Socio-economic and demographic									
Household final consumption expenditure (log)		-6.297*** (1.286)	-4.488*** (1.167)	-6.459*** (1.300)					
Share of poor people					0.208*** (0.030)	0.101*** (0.023)	0.049* (0.027)	0.057* (0.030)	
Individual									
Share of female repeaters			0.165 (0.206)				0.352*** (0.099)	0.073 (0.196)	0.063 (0.204)
Share of male repeaters			0.450*** (0.148)					0.327** (0.141)	0.272* (0.150)
Mortality rate, under 5 (per 1000 live births)							0.078*** (0.022)	0.114*** (0.022)	0.146*** (0.023)
Education									
Gross enrolment ratio				0.051* (0.026)	0.079*** (0.026)				0.083*** (0.027)
Adult literacy rate						-0.345*** (0.032)	-0.234*** (0.040)		
Wald chi-square	290.22***	347.48***	476.82***	339.18***	392.34***	563.48***	611.79***	565.31***	541.90***

Note: * p<0.1, **p<0.05, ***p<0.01; Figures within parentheses are robust standard errors; All models include a constant term that are not reported in the table.

Source: Authors' calculation based on secondary data

There is evidence that share of male repeaters, mortality rate (under 5) and gross enrolment ratio significantly increase dropouts, whereas the effect of adult literacy is negative and significant. Intuitively, the grade repetition negatively affects on probability of being enrolled at schools the next year (Andre, 2009). Surprisingly, a higher share of female repeaters does not always translate into higher dropout rates (Model 3, 8 and 9). One of the possible reasons of this result may be because the share of female repeaters in the sampled countries is around 20 percentage point lower than the male repeaters. Thus cautions should be taken while generalizing this result for all developing countries. In contrast, we have strong evidence that bad health (i.e., higher under 5 mortality) induces children to dropout from schools.

The result that the increase in gross enrolment ratio raises dropout rates is not counterintuitive. There is evidence that the increase in enrolment rate is associated with the increase in completion rate or reduction in dropout rate (Cameron, 2005). But an increase in enrolment alone cannot curb dropouts if, as was the case in Namibia during 1998 and 2005, increased enrolment is accompanied with high repetition rate. Alternatively, the higher the repetition rates more likely the primary school children will be overage which may lead to high dropouts causing overall enrolment to decline. Higher gross enrolment ratio also indicates the inclusion of both underage and overage students. That is, the result also implies that either underage or overage students are more likely to dropout than the age appropriate students. Our results also suggest that (Model 6 and 7) there is significant negative association between adult literacy or parental education and dropouts.

Discussions. Overall, the results indicate that the significant impacts of pupil-teacher ratio, household wealth or income, share of male repeaters, child health, parental education and gross enrolment ratio are robust to alternative specification of the regression model. In contrast, there is some evidence that the share of trained teacher reduces dropouts and the share of female repeaters tends to increase dropouts.

Using secondary data for 40 developing countries covering 1997 to 2017, this paper examines the impact of teacher in reducing dropout rates. The results indicate that reduction in class size is important in reducing dropout rates in developing countries. There is some evidence that higher provision of organised training of teachers reduce dropouts. Our results indicate that class size reduction is more effective in reducing dropouts in developing countries than the provision of organised training of teachers. This result is not counterintuitive. Since most developing countries are still experiencing a reasonably higher class size, and without reducing the class size an increase in the provision of organised training of existing teachers would have limited role in reducing dropouts. Alternatively, we have evidence the increase in household wealth and parental education significantly reduce dropout rates.

Suggestions. The results obtained in the study are not only informative to the policymakers of developing countries but also important for the donors for considering appropriate external fund for developing countries. While, in general, government's developmental efforts including alleviation of poverty or enhancing household income could be catalytic in reducing dropouts, specific policies that increase adult literacy rate are likely to have implications in reducing dropouts.

Although the study uses panel data models to analyse international indicators, many measurement issues relating to education outcome and socio-economic variables remain. The development and expansion of international indicators would be more fruitful for making deeper insights into education studies.

Appendix Table

Table A.1 List of selected developing countries

Armenia, Belarus, Benin, Bolivia, Cameroon, Colombia, Congo Democratic Republic, Costa Rica, Cote d'Ivoire, Croatia, Dominican Republic, Ecuador, El Salvador, Georgia, Ghana, India, Iran Islamic Republic, Kazakhstan, Kyrgyz Republic, Mauritius, Mexico, Moldova, Mongolia, Morocco, Mozambique, Namibia, Nepal, Nicaragua, Niger, Pakistan, Panama, South Africa, Sri Lanka, Tanzania, Togo, Tunisia, Ukraine, Uruguay, Uzbekistan, Vietnam

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