



# Measuring the holes of the ship: Global cost estimations of internal inefficiency in primary education



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## ABSTRACT

Using UNESCO-UIS data, this paper estimates the costs of internal inefficiency caused by dropouts and repetitions in primary education. Multiple imputation method is found essential to accurately estimate the costs of internal inefficiency. Globally, 8.1% of total public expenditure for primary education was wasted in 2011, a 3.4 percentage-point decrease from 2002. However, during the same period, total value of wastage increased by two billion USD to 32.6 billion USD, five times higher than total aid for primary education towards developing countries. Sub-Saharan Africa remains as the region with significant needs for improvement in internal inefficiency.

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## 1. Introduction

Access to quality education is internationally considered as a fundamental human right and a barometer of socioeconomic development. By improving the quality and competence of human capital, a country can efficiently foster peace and economic growth, while improving health and reducing poverty (United Nations, 2010). Launched in 1990 at the World Conference on Education for All in Jomtien, Thailand, the Education for All (EFA) movement has been consolidating global efforts to improve access to education.

Many developing countries have significantly increased their enrolment size over the past two decades, progressing towards universal primary education as part of Millennium Development Goals (MDGs) (UNESCO, 2015). However, in many developing countries, providing access to education for large masses are hampered by the constraints in education supply, including infrastructure, quality teachers, and financial resources, imposing challenges against the quality and efficiency of education systems. For instance, Sub-Saharan Africa (SSA) region experienced an increase in total dropout rate from 40% to 42% between 1999 and 2009 (UNESCO, 2012). In addition, countries that expanded enrolment during the last decade experienced high repetition rates as evidenced by SSA, where repetition rates of many countries exceeded 20% in 2010 (UNESCO, 2012).

Dropping out from primary school without completion provides children with only a partial extent of intellectual, social cultural and ethical knowledge and skills provided by primary education. As Fiske (1998) described, dropping out leads to “a state of near illiteracy” especially among early school dropouts, who are not able to acquire sustainable reading, writing and numerical skills. This also means that children do not gain the skills nor qualifications necessary for grasping better employment opportunities that require primary school completion. Thus, educational investments before dropping out are “wasted” as they do not result in significant benefit for children. Repetition, on the contrary, incurs additional costs that could have been spent on other investments in education, resulting in a different form of wastage. Additionally, a number of recent studies on developing countries highlight a strong link between repetition and dropout, as grade retention often precedes school dropout, thereby reducing the chances of school completion indirectly (Kabay, 2016; Sekiya and Ashida, 2016; Zuilkowski et al., 2016). In one early attempt to document financial cost of dropouts and repetition, Fiske (1998) estimated that a total of 6 billion USD was wasted due to grade repetition alone, which could have been used for increasing enrolment or improving the overall quality of education.

Dropouts and repetitions therefore hamper the efficiency of the education system and increases public costs through higher number of teachers employed, more classroom spaces, and so on. In the same study by Fiske (1998), it was found that around 15.8% of total public expenditure on education among developing countries was wasted due to incompleteness before Grade 5, incurring a minimum cost of 37.2 billion US dollars (USD) annually

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in 1995. In comparison, total aid to basic education was only 3.1 billion USD in 2002 (UNESCO, 2014).

Despite the significant financial costs of dropout and repetition, there has been a lack of comprehensive studies to estimate the global costs of internal inefficiency in primary education in a systematic manner since Fiske (1998) study. The main objective of our study is to estimate the global and regional costs of internal inefficiency in primary education through dropouts and repetitions as well as their relative shares of primary education expenditure. We also identify global trends, regional trends, and gender differences. The findings will fill the global knowledge gap in the financial impact of internal inefficiency and at the same time contribute to formulation of policies towards quality improvement of primary education.

## 2. Data and methodology

### 2.1. Dataset and variables

The main dataset used for this study was retrieved from UNESCO Institute of Statistics (UIS) database (UNESCO Institute of Statistics, 2015). Seven variables are included: enrolment in primary education, both sexes, dropouts from primary education as % of enrolment, both sexes, repeaters in primary education as % of enrolment, both sexes, and total public expenditure per primary student as calculated from % of GDP per capita at Purchasing Power Parity (PPP) in constant 2011 International Dollars (all references to expenditure in this paper are public expenditure). Primary education in this paper is defined by the International Standard Classification of Education 1997 (ISCED 1997) as programs that are “normally designed on a unit or project basis to give students a sound basic education in reading, writing and mathematics along with an elementary understanding of other subjects such as history, geography, natural science, social science, art and music” (UNESCO, 1997).

For preliminary dataset, chosen countries from 193 members of United Nations should (1) be outside of North America and Europe based on EFA regional categorization, (2) not be listed in the “Very High” Human Development Index Category, (3) not be a member of Organization for Economic Cooperation and Development (OECD), and (4) not be in International Monetary Fund (IMF)’s list of Advanced Economies. Based on these criteria, 134 countries were selected for this study, followed by the removal of the countries with extremely large amounts of missing data and/or volatile conditions such as military conflict and natural emergencies (Table A1). As a result, 123 countries remained in the dataset for wastage estimation.<sup>1</sup>

Lastly, in order to mitigate the missing data issue, some missing data of certain countries were manually imputed using available official statistics (Table 1). Manual data collection was applied to 7 countries, namely Bangladesh, Brazil, Democratic Republic of Congo, Indonesia, Saudi Arabia, South Africa and Thailand. Except for Brazil and Thailand, all the data points were imputed from EFA Global Monitoring Reports (GMRs). For Brazil, imputed data was based on the World Bank Education Statistics (Edustats). The repetition and dropout rates were only available at the national level and were assumed to be the same for both boys and girls. For Thailand, enrolment data was taken from GMRs while repetition and dropout data was based on interviews with government officials, where it was estimated that the repetition rates for both sexes of Thailand were equivalent to half of their respective dropout rates. A total of 70 data points were manually imputed.

<sup>1</sup> 14 from Arab States, 7 from Central Asia, 22 from East Asia and the Pacific, 30 from Latin America and the Caribbean, 6 from South and West Asia, 44 from Sub-Saharan Africa.

**Table 1**

Global results of total enrolment and wastage numbers by method.

| Method | Data coverage |            | Total enrolment (mil) |       | Dropouts + repeaters (mil) |      |
|--------|---------------|------------|-----------------------|-------|----------------------------|------|
|        | Total points  | % of Total | 2002                  | 2011  | 2002                       | 2011 |
| 1      | 5493          | 63.4       | 386.9                 | 402.3 | 49.5                       | 34.4 |
| 2      | 6784          | 78.9       | 408.1                 | 472.9 | 52.9                       | 39.5 |
| 3      | 8610          | 100.0      | 410.6                 | 473.2 | 55.4                       | 55.5 |

Source: Authors' calculation.

### 2.2. Method of wastage calculation

Among the three major methods of estimating internal inefficiency based on Fiske (1998) i.e., (a) True cohort method, (b) Apparent cohort method, and (c) Reconstructed cohort method, the study employed the Reconstructed cohort method as conducting the first two choices would require either an institutional arrangement or cooperation from multiple agencies. With the Reconstructed cohort method, only dropouts, repeaters and enrolment of each gender in primary education were required in order to calculate wastage ratio for each gender, country and region as follows:

$$\text{Wastage ratio} = \frac{\text{Total dropouts} + \text{Total repetitions}}{\text{Total enrolment}} \quad (1)$$

In order to calculate wastage, first we needed to calculate total expenditure per primary student by multiplying government spending per primary student as % of GDP per capita with GDP per capita at PPP in constant 2011 International Dollars.<sup>2</sup> By multiplying total government expenditure per primary student with the sum of dropouts and repetitions, total wastage for primary education was estimated for each gender, country and region, illustrated in the two equivalent formulas below:

$$\text{Total wastage} = \text{Wastage ratio} \times \text{Total expenditure per primary student} \quad (2)$$

$$\text{Total wastage} = \frac{\text{Total dropouts} + \text{Total repetitions}}{\text{Total enrolment}} \times \text{Total expenditure per primary student} \quad (3)$$

Finally, global wastage ratio was calculated by dividing the global sum of dropouts and repetitions by the global sum of enrolment, while global wastage was calculated by the global sum of total wastage, as in the following formulas:

$$\text{Global wastage ratio} = \frac{\sum_{i=1}^{123} (\text{Total dropouts}_i + \text{Total repetitions}_i)}{\sum_{i=1}^{123} \text{Total enrolment}_i} \quad (4)$$

$$\text{Global wastage} = \sum_{i=1}^{123} \text{Total wastage}_i \quad (5)$$

### 2.3. Treatment of missing data: three approaches

Global wastage calculation of this study required a total of 8610 data points<sup>3</sup>; however, the original data from UIS database and GMRs provided a total of 5455 data points, around 62% of required data. In order to address the missing data issue, the paper employed the following three step-by-step approaches.

<sup>2</sup> Data from the World Bank Development Indicators (The World Bank, 2015)

<sup>3</sup> 10 years multiplied by 7 variables multiplied by 123 countries.

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