

# Effects of State Expenditure on the Primary Completion Rate in Burkina Faso

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## Abstract

The purpose of the paper is to identify and analyze the effects of budget expenditures (operation, salary, and investment) on the completion rate of primary education. The annual education budgetary data from 1970 to 2013 collected in Burkina Faso were used to estimate a parametric education production function. The results show a positive effect of unitary investment expenditure and a negative effect of unit staff salaries and budgetary instabilities. Pay mechanisms in public administration should be redesigned to reward proven performance and skills. Moreover, the control of budget programming would lead to better results in the education sector.

## Keywords

Primary Completion Rate, Salary Unit Expenses, Burkina Faso

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## 1. Introduction

The effect of inflow resources in the education sector and the results obtained in the sector have been a permanent concern in developing countries. Indeed, it is commonly observed that important resources are made available to the education sector that do not generate tangible results. In fact, the results obtained in the education sector regarding mobilized financial resources are mixed [1] [2] [3]. The combination of inputs to obtain an educational product is a black-box process [4]. The inefficiency of financial resources to induce effective outcomes in the education sector is the argument most often cited to explain this situation [5]. Yet, the availability of resources is recognized as a necessary condition for achieving education goals [6]. However, examining the growth dynamics of public budget resources and the evolution of education indicators raises budgeted public spending [3] [7]. This is even more worrying for indicators of universal

primary enrollment. In 2015, the median share of the gross domestic product (GDP) devoted to education was 4.7% worldwide and public education expenditure of the total public expenditure was 14.1%. In contrast, the completion rate for primary education was 83% and 56% of students did not attain the minimum level of reading skills [6]. On the other hand, budget expenditures are likely to increase, and financial spending on education should adapt to the growth of the school-age population in developing countries and to changes in enrollment [8].

Sub-Saharan Africa spent 4.1% of its GDP and 16.9% of the total public expenditure on education, with a completion rate of 59% [6]. As for Burkina Faso, spending on education accounts for about 5.9% of GDP and 18.27% of the national budget [9] [10]. In addition, more than 60% of the education budget and 3.8% of the GDP were destined for primary education [4]. The completion rate was 57.6% in 2013. Education objectives pursued by the country will be difficult to achieve, despite the fact that it has additional financial resources in the context of free primary education.

An education production function is generally used to understand the relationship between resources and academic achievement. The inputs are usually a combination of education and financial variables. The overall budget of the education sector or the total expenditure per student is the commonly used financial variable. Budget expenditures are capital expenditures and operating expenses. In addition, operating expenses are subdivided into strict salary and operating expenses. Schools operate in a political environment that is almost always defined by governments that set programs, fund schools, regulate labor laws, and set rules for certification and the hiring of teachers. The analysis of the effects of expenditures on educational outcomes would be consistent in the relationship between public budget expenditure categories and educational outcomes at the national level. Since the educational process is cumulative, the primary completion rate is the indicator to consider. Completion of primary education is a prerequisite for sustainable literacy [11].

This study is part of the empirical research on the effect of public budget spending on educational outcomes in Burkina Faso. Few studies in Burkina Faso have analyzed the effect of financial resources on educational outcomes in Burkina Faso. Except the study by [4], most research has made a comparative statistical description of the evolution of educational outcomes or goals and mobilized financial resources [10] [12]. To date, no study has been only carried out on the causal relationship between state expenditure and the Primary Completion Rate in Burkina Faso. Yet, this type of analysis is necessary in the context of durable development goal in which the education sector is involved more money to have quality education in equity. This paper aims to fill this gap. Using the education production function approach estimated by OLS procedure at the macroeconomic level, this study empirically establishes the causal relationship between teacher productivity measurement mechanisms and salary remuneration to induce better educational results in Burkina Faso, and further elaborates on the

implications and possible forecasts for the new direction of the education policy. The purpose of the article is to identify and analyze the effects of budgetary expenditures on the completion rate of primary education. We assume that salary expenditures have a positive effect on the completion rate of primary education. In fact, salary expenditure is the largest part of the budget devoted to education. In Burkina Faso, the proportion of the budget for staff costs has always exceeded 65% of the primary education budget. Disaggregated data on budget expenditures covering the period 1970-2013 are used to for econometric estimates.

The article is organized as follows. Section 2 presents a brief literature review. Section 3 provides descriptive statistics of public expenditures in primary education. Section 4 outlines the methodology used in the study. Subsequently, Section 5 presents the empirical results of the research, while Section 6 provides a discussion of the results. The last section concludes the study.

## 2. A Brief Literature Review

The unexpected results found regarding the role of educational resources on student performance [13] led to the intensification of the analysis of the relationship between public spending and educational outcomes. Several arguments have been put forward to describe the effect of education spending on educational outcomes and have led to conflicting conclusions [3]. Even though the relationship between education expenditures and educational outcomes has been the subject of intense studies, economists are still unable to agree on the type of causal relationship existing between financial resources and student knowledge acquisition (**Table 1**). For example, while [5] found that financial resources do not influence student knowledge acquisition or have little effect on education indicators, [16] found that ordinary spending on education per student and total expenditures have negative effects on educational outcomes. Lee and Barro [18] also found that ordinary expenditures of education per student have no significant effect on the test scores of students. Similar results were found for China, Sri Lanka, Zimbabwe, Colombia, Ghana, and Senegal in the study by [22]. They found that ordinary public expenditures on primary education have no significant effect on education indicators in these countries. Regarding school enrollment rates, expenditures per pupil in primary school have significant negative effects on this indicator [15]. McMahon [19] used the ordinary least squares (OLS) method to assess the effects of expenditures on school indicators in the regions of Africa, Latin America, and Asia and in the Organisation for Economic Cooperation and Development (OECD). He found that ordinary public expenditure per elementary student has a significant negative effect on education indicators.

As stated above, few studies in Burkina Faso have analyzed the effect of financial resources on educational outcomes. Most research has performed a comparative statistical description of the evolution of educational outcomes and mobilized financial resources [10] [12]. The study by [4] analyzed the effects of budget

**Table 1.** Selection of studies on the relationship between education expenditures and educational outcomes.

Authors	Countries	Empirical Method	Results
Hanushek and Woessmann [14]	World Program for International Student Assessment (PISA) testing math, science, and reading	Least-squares regressions with instrumental variables in quasi-experimental research methods	Class size is a relevant variable only in settings with low teacher quality. Teachers are more closely related to student outcomes. Positive effect of student-teacher ratio.
Ouédraogo [4]	Burkina Faso	Ordinary least squares (OLS) in the error correction model	Short-term negative and long-term positive effect of percentage of qualified teachers. Long-term negative effect of overall repetition rate. Not significant in the short- and long-term positive effect on the literacy rate.
Al-Samarrai [15]	UNESCO countries	OLS	Negative effect of unit costs of budgetary public expenditure. Positive effect in the short- and long-term total operating expenditure. Positive effect of salary unit expenditure. Positive effect of unit investment expenditure.
Hanushek and Kimko [16]	Countries of the International Association for the Evaluation of Educational Achievement (IEA) and International Assessment of Educational Progress (IAEP)	OLS	Expenditure per pupil in primary school has a positive significant effect on the survival rate only up to Grade 5 and a negative significant effect on school enrollment rates. The other coefficients are not significant. Student-teacher ratio is not significant.
Wößmann [17]	United States of America, developing countries, OECD countries, East Asian countries	Weighted least squares	Ordinary spending on education per student has a negative effect. Total expenditure on education in percent of GDP has a negative effect. International differences in student performance are not caused by differences in schooling resources but are mainly due to differences in educational institutions. Class size has a positive effect.

**Continued**


expenditures on the completion rate of primary education from 1970 to 2009 and found that the unit salary and investment costs of the Ministry of Education positively influence the completion rate of primary education with the respective elasticities of 0.366 and 0.018. Dependent variables in this study were the GDP per capita to proxy individual wealth, education variables, investment expenditure, operating expenditure, and wage expenditure. Schultz [21] argued that remuneration of public teachers has a negative effect on the gross primary school enrollment ratio in Ghana, Côte d'Ivoire, Kenya South Africa, Nigeria, and Burkina Faso.

Difficulties of assessing the effect of resources on educational outcomes are related to methodological problems [23]. Most studies use the education production function or perform statistical analyses [5]. The conceptual framework considers that schools produce knowledge using educational resources and teacher characteristics as inputs. The acquired knowledge is influenced by the duration of schooling, school resources, characteristics of teachers and learners, characteristics of the household, and school inputs that are controlled by parents (textbooks, daily attendance, etc.). Frequently used independent variables are education facilities, teaching materials, characteristics of the teacher or the principal, school organization or management, incentives or motivations, competition between schools, and the amount of expenses per student. The dependent variable is the gross enrollment rate, number of years of schooling, or test scores [24]. An implicit assumption of homogeneity of skills is accepted over time and within countries.

The education production function approach is more microeconomic. Yet, current applications and interpretations go beyond this theoretical framework. In addition, the use of scores tests does not integrate the cumulative process of education. Moreover, budgeted public expenditures are rarely used in analysis of the effects of educational resources on educational outcomes, while the budget remains the main tool for the government education policy. The production function is an alternative education policy evaluation and an assessment of the effectiveness and efficiency of public service delivery education. Budgetary public expenditures in education are either operating expenses, salaries, or investments and equipment. The effects of these expenditures on educational outcomes could be differentiated according to these items.

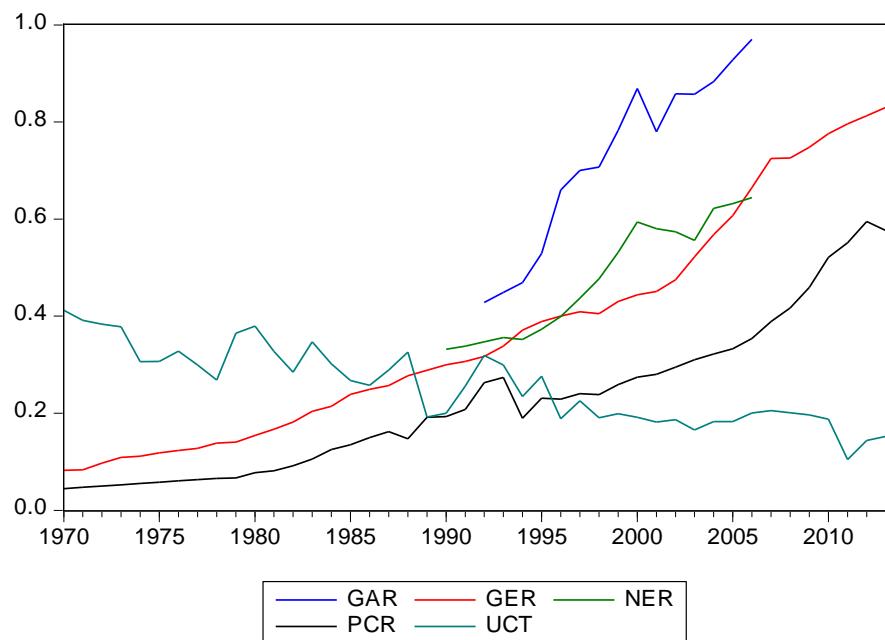
Most of salary expenditures consist of teacher payments. It is usually stipulated that the completion of primary education is hindered by the high costs of teacher salaries and generally, by the costs of operating expenses [9]. In doing so, the tendency is to reduce average teacher remuneration to the level of the reference value of 3.5 times the GDP per capita. The goal is to reduce relative wages in order to generate additional resources for the education sector [24]. There is a focus on the possibility of increasing the supply of education to achieve successful educational outcomes [25]. But what are the reality of the budgetary expenditures and the educational outcomes of primary education in Burkina Faso?

### 3. Descriptive Analysis of Budget Expenditures in Primary Education in Burkina Faso

Public effort for education in Burkina Faso shows an increase in public resources allocated to this sector. Budget allocations for education reached 5.46% of the GDP in 2014 against 0.83% in 1970. Thus, Burkina Faso is within the average of African countries in terms of the resources allocated to education today.

The effectiveness of the transformation of resources into educational outcomes is seen through expenditures carried out under the implicit assumption that resources provided for education were effectively devoted to the latter regarding the rules and principles of budget execution and control. **Figure 1** reveals an increasing trend of the gross enrollment ratio, net enrollment rate, primary completion rate, and gross admission rate. However, unit costs of total budget expenditures of the Ministry of Education are decreasing. Thus, the growth of education indicators is achieved simultaneously with a decrease in the unit costs of primary education. The disaggregation of the Ministry of Education total unit costs into unit expenditures yields similar results, as displayed in **Table 1**. In Burkina Faso, unitary operating and wage expenditures for primary education declined during the period 1970-2013. Yet, unitary investment spending was on a rising trend (**Table 2**).

The positive trend of internal indicators of primary education during the period 1970-2013 is accompanied by an increase in expenditure per student. In fact, the expenditure per pupil has risen from 9795 FCFA<sup>1</sup> to 46,567 FCFA



Source: Statistical yearbooks of primary education and financial regulation laws.

**Figure 1.** Evolution of the gross admission rate (GAR) gross enrollment ratio (GER), net enrollment rate (NER), primary completion rate (PCR), and unit costs of total budget expenditures (UCT).

<sup>1</sup>1 Franc CFA = 0.00152449 euros (fixed rate).

**Table 2.** Budgetary expenditure of Ministry of education from 1970 to 2013.

Libellés	1970	1980	1990	2000	2010	2013
Unit salary expenditure	0.372	0.305	0.187	0.150	0.125	0.048
Unit operating expenditure	0.037	0.065	0.006	0.029	0.024	0.058
Unit investment expenditure	0.003	0.009	0.007	0.012	0.039	0.047
Unit costs	0.412	0.379	0.200	0.191	0.188	0.152

Source: Statistical yearbooks of primary education and financial regulation.

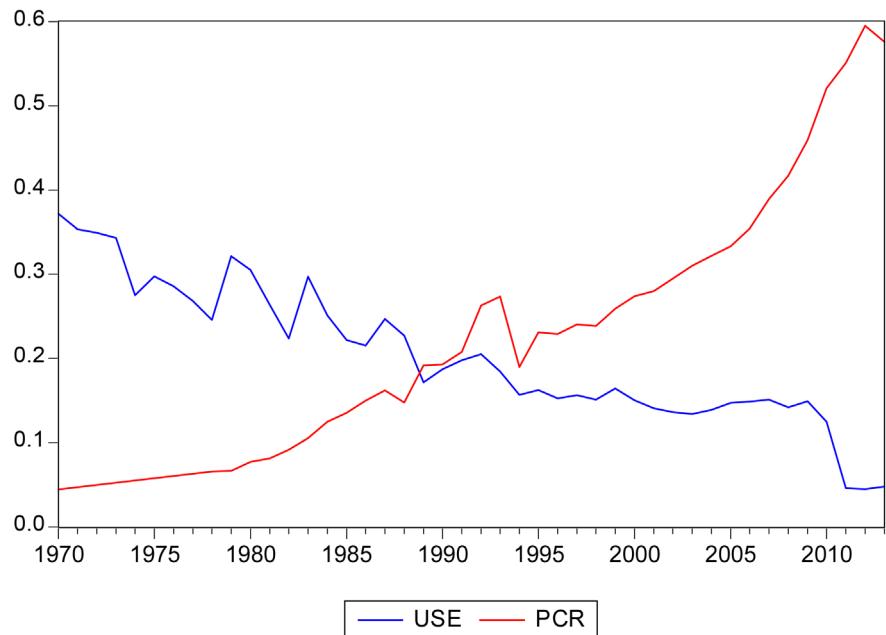
between 1970 and 2013. It has increased more than 4.75 times in 44 years, with an average annual growth rate of 3.60%. However, the primary completion rate rose from 4.46% to 57.6% during the same period. The increase in spending per student would be due to the growth of wealth of the country. Income growth would lead to individual earnings and, as a result, a general increase in the remuneration of educational staff, which accounts for more than 60% of unit expenditure.

The steady increase in budgeted public expenditure per pupil remains a concern in view of the population growth and education objectives, as well as Burkina Faso's financial capacities. Strong growth is seen in the level of investment expenditure per student, although a large part of the budget is devoted to salary expenses.

Moreover, the decline in unit costs seems to reflect the option of reducing operating expenses, especially salaries, in favor of capital expenditures in line with the work of [26], who found that there is no relationship between the academic and professional qualifications of teachers and the performance of the student. In fact, there is a large gap between the unit salary expense and the primary completion rate curves (Figure 2). This can be explained by the effects of the various strategies implemented by the government that are aimed at reducing the wage bill in the budget (civil service reforms with the introduction of contracts for teachers, setting up education volunteers, direct recruitment of teachers (assistant teachers), and the reduction of the duration of initial training from 2 years to 1 year).

However, the level of student achievement is influenced by the skills of the teachers. The presence of qualified teachers in the educational system leads to an increase in salary expenditure, regarding the system of remuneration of state agents and especially for teaching quality. Teacher remuneration is an important incentive that can influence both the quality of teaching and the motivation of teachers, as well as the dynamics of education indicators. The devaluation of the status of teachers compared to that of other professional groups and factors, such as mismanagement, reduced teaching time, and weak controls and follow-up, explain the apparent lack of effect of the steady increase in per-student expenditures on school results [27].

Carrying out reform in the primary education without having knowledge of



Source: Statistical yearbooks of primary education and financial regulation laws.

**Figure 2.** Evolution of primary completion rate (PCR) and unitary salary expenditure (USE) (%).

the type of causal relationship that exists between state expenditure and the Primary Completion Rate could result in ineffective and wasteful changes.

## 4. Methodology

### 4.1. Specification of the Econometric Model

For the econometric estimations, an education production function will be used. According to Glewwe and Kremer [28], the structural function of knowledge production is given by the following:

$$A = a(S, Q, C, H, I) \quad (1)$$

where  $A$  stands for knowledge acquired schooling,  $S$  is schooling,  $Q$  is a vector of school inputs and teacher characteristics,  $C$  is the vectors of student characteristics, including inherited skills,  $H$  is vectors of household characteristics, and  $I$  is the vector of school inputs under the control of parents (school frequency, acquisition of textbooks, etc.). Used both at the micro and macroeconomic levels after transformation, the education production function is more of an empirical approach to the educational production process than a genuine theoretical framework for study [29].

The empirical analysis of the relationship between education expenditures and outcomes is portrayed by the following equation:

$$Y = f(X, W, Z) + \mu \quad (2)$$

where  $Y$  is the education output (primary completion rate or gross enrollment ratio or score tests);  $X$  denotes the education expenditure (unit expenditure or

share of GDP allocated to education);  $W$  represents school characteristics (pupil-teacher ratio, teachers' level of education, teachers' experience, class size, and peer group);  $Z$  indicates the family characteristics (parents' level of education, number of household members, family income, and family location); and  $\mu$  is the error term.

Our research is conducted at the macroeconomic level. The data are annual education budget data. Data on family characteristics are unavailable. Since the data are essentially those related to the financial dimension of the analysis, the model (2) must be adapted to take this constraint into account. This gives the following:

$$Y_t = f(X_{it}, \beta) + \varepsilon_t \quad (3)$$

where  $Y_t$  stands for the completion rate of primary education at time  $t$ ;  $X_{it}$  denotes the budget variables (operating budget, salary, and investment expenditures of the Ministry of Education);  $\beta$  is the column vector of unknown coefficients of the estimated parameters, and  $\varepsilon_t$  indicates the error terms. Variables and data sources are presented in Section 4.2.

#### 4.2. Variable Specification and Data Source

Along with the endogenous variable and the primary completion rate, the variables used in this study for estimations are financial variables related to government expenditures that can influence educational outcomes. The primary completion rate per cohort is an indirect measure of the completion of primary education. Centered on children who have access to school, it measures the proportion of those who completed their schooling successfully. It is the product of the survival rate in the last year of primary education and the percentage of final-year students who obtain the corresponding degree. A pupil who completed his primary education can read and write. As a result, the completion of primary education forms the basis of sustainable literacy and the foundations of secondary and tertiary instruction. The primary completion rate (PCR) should progress in the same direction as the budget of the Ministry of Education.

The exogenous variables are the unit operating expenditures, unit expenditures for salaries, and unit investment expenditures. Operating expenditures are dedicated for the functioning of the Ministry of Education and its related services. The current amount is divided by the number of pupils and the GDP per capita of the same year. The expected sign of this variable is negative because operation activities are mainly administrative. Unit salary expenditure is the total amount of staff salaries, including those of the teachers, divided by the number of pupils in the year and the GDP per capita of the same year. The expected effect is positive because investment expenditures are the part of the education budget used for the construction of infrastructure and the acquisition of specific equipment or materials. The total amount is divided by the number of pupils and the GDP per capita of the same year. The expected effect is positive.

The data comprise the annual education budgetary data covering the period

1970 to 2013. The change from the budgeting process of the object budget to the program budget as of 2014 at the national level makes the budget expenditure data executed unavailable from 2014 to 2017. They are collected from national institutions in charge of education and public finances, including the state budget. The estimation techniques are presented in the next section.

## 5. Empirical Results

### 5.1. Unit Root Test

The augmented Dickey-Fuller (ADF) test, Philipps-Perron (PP) test, and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests were applied to test for the existence of unit roots. In addition,  $p$ , the optimal lag length, is determined by the Akaike or Schwarz and Hannan-Quinn information criterion. The estimations give an optimal lag of 1. The results of unit root tests are displayed in **Table 3**. Data in this table indicate that operating expenditures (opex), investment, and salary expenditures are stationary at the level. The primary completion rate is integrated at an order of 1.

### 5.2. Cointegration Test

Since the stationary test revealed the existence of variables integrated at the order of 1 and others that are stationary at the level, the presence of a long-term relationship between the series must be tested. The Johansen-Juselius test is performed. The results in **Table 4** show the absence of cointegration relationships. At the 5% level, the trace test shows that there are no cointegration equations that could be derived from this model. The absence of cointegration relationships is confirmed by the 95% maximum eigenvalue test.

Section 5.3 presents the different tests for assessing the quality of the model.

### 5.3. Model Quality Assessment Test

In addition to these two tests, we conducted quality assessment tests of the model. The results of the various quality tests of the models show that the coefficients are individually different from zero and are all significant at the 5% level. The

**Table 3.** Results of the unit root test.

Variables	Test ADF (trend + constant)		Test PP (trend + constant)		Test KPSS (trend + constant)	
	Level	First Difference	Level		Level	
PCR	-3.597*		-3.597*		0.739*	
Investment	-3.597*		-3.601*		0.739*	
Opex	-4.205*		-4.192*		0.739*	
Salary		-2.607***	-2.621*		0.739*	

\*, \*\* and \*\*\* denote significance level at 1%, 5%, and 10%, respectively. Source: Author based on collected data.

**Table 4.** Results of Johansen-Juselius test.

Rank	Trace		Maximum Eigenvalue	
	Trace Stat	CV at 5%	Maximum Eigenvalue	CV at 5%
<b>r = 0</b>	47.030	47.856	20.871	27.584
<b>r ≤ 1</b>	26.159	29.797	16.365	21.132
<b>r ≤ 2</b>	9.795	15.495	8.646	14.265
<b>r ≤ 3</b>	1.149	3.841	1.1492	3.841

Source: Author based on collected data.

coefficients of the variables explain the model because the probability of the Fischer statistic is equal to zero. The errors follow a normal law. The Breusch-Godfrey test of the Lagrange Multiplier on Errors and the Conditional Autoregression Test of Heteroscedasticity (ARCH) errors indicate that they are not correlated and are homoscedastic. The Ramsey test shows that the model is well specified, and the cumulative sum control chart (CUSUM) test reveals that the model is structurally unstable, as its representative curve is located outside the corridor at the 5% significance level in 2004. The square CUSUM test indicates a cyclical instability of the model at the 5% level in 1990-2008. This leads to introducing a dummy variable (*dum*) in the model to be estimated to portray the budget instability, where *dum* = 1 for years 1990 and 2008, and *dum* = 0 elsewhere. Considering this, the model to be estimated is as follows:

$$pcr_t = \beta_0 + \beta_1 opex_t + \beta_2 invest_t + \beta_3 salary_t + \beta_4 dum + \gamma_t$$

The estimation of this model gives the results presented and discussed in Section 6.

## 6. Results and Discussion

In view of the results of the various specification tests, an OLS procedure is adopted to conduct econometric analyses. Also, the unavailability of disaggregated data of budget expenditures executed in municipalities in Burkina Faso does not allow for estimation analysis in panel data. The results of the estimation are presented in **Table 5**. Data in **Table 5** show that unitary investment expenditure and operating expenditure have no significant effect on the completion rate of primary education. However, salary expenses have a significant negative effect at the 1% level. In fact, a 1% increase in unit costs of salary expenditures leads to a 1.98% decrease in the primary school completion rate. This result is contrary to the results from [4] [28] [29] [30] [31].

The negative effect of salary treatment on the completion rate of primary education could be explained by various factors. In Burkina Faso, there are many substitute teachers in urban areas who, while contributing to the increase of the wage bill in the education sector, have a low participation in the production of education services. In addition, it should be noted that the wage bill for education includes the salaries of administrative or clerical staff. Beyond these elements, the phenomenon of teacher absenteeism and the non-implementation of

**Table 5.** Results of model regression.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.589*	0.054	10.825	0.000
Operating Expenditure (opex)	0.208	0.727	0.286	0.776
Unit Investment (invest)	0.6514	0.453	1.438	0.159
Unit Salary (salary)	-1.983*	0.701	-2.828	0.007
DUM	-0.055***	0.028	-2.006	0.052
R-squared	0.831	Mean dependent variable		0.223
Adjusted R-squared	0.814	SD dependent variable		0.155
S.E. of regression	0.067	Akaike info criterion		-2.468
Sum squared resid	0.174	Schwarz criterion		-2.265
Log likelihood	59.298	Hannan-Quinn criterion		-2.393
F-statistic	47.974	Durbin-Watson stat		0.691
Prob (F-statistic)	0.000			

\*, \*\* and \*\*\* denote significance level at 1%, 5%, and 10%, respectively. Source: Author based on collected data.

the total number of hours assigned to teachers greatly contribute to reducing the productivity of education. Moreover, many teachers are assigned to tasks other than teaching and are always paid by the budget of the Ministry of Education. This poses the unfairness of the use of teachers and the lack of a reward system based on actual professional performance.

The instability of budget execution has a negative and significant effect on the completion rate of primary education. A 1% increase in budget instability decreases the primary school completion rate by 0.0552%.

In the light of all the above, what conclusions have been drawn?

## 7. Conclusions

This study aimed to identify and analyze the effects of budgetary expenditures on the completion rate of primary education in Burkina Faso. The OSL procedure revealed that constant increase in public budget expenditure of the Ministry of National Education and Literacy yields modest progress in the completion rate of primary education in Burkina Faso. The results indicate that investment expenditures and operating expenditures have no significant effect on the completion rate of primary education in Burkina Faso. However, these results suggest that wage expenditures and budget instability have a significant negative influence on the primary completion rate.

From a policy perspective, the results highlight the importance of the fact that the teacher remuneration structure must be based on productivity with a financial incentive policy. Since salary is a response to the merits and efforts provided, remuneration should be indexed on productivity and the obtained results. Given the fact that investment has no significant effect on the primary completion rate,

the investment process needs to be transformed into a genuine investment strategy that ensures the effectiveness of the investments made so that resources spent are used for activities for which they are intended. For school buildings and equipment, flexibility needs to be introduced in budget execution (procurement). The involvement or empowerment of grassroots communities will be an asset.

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