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External debt, fiscal consolidation, and government
expenditure on education

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Abstract

To face a debt crisis, countries often implement various forms of fiscal consolidation policies. This may have some implications for their education financing. This paper tries to better understand how debt and fiscal consolidation can potentially impact government expenditure on education. It shows that increased external debt is associated with a higher risk of fiscal consolidation which could, in turn, be associated with a decline in education spending. One percent increase in the external debt is associated with a 1.4 % decline in the spending per school-age child. Given the rising debt levels fueled by the COVID-19 response policies, a decline in education expenditure is to be expected in the post-pandemic world. Simulations show that in low- and middle-income countries, a 5 % increase in the external debt could lead to a \$12.8 billion decline in the volume of education expenditure, all things being equal. This decline is almost equivalent to the volume of official development assistance to the education sector in 2020. This paper sounds the alarm bell for the potential impact of the COVID-19-related debt on education financing.

JEL Code: O1, H5, H6, I2

Keywords: Human capital, Education Expenditure, Fiscal Consolidation, Debt

1. Introduction

The pandemic led to lockdowns in several countries which resulted in various challenges, including economic slowdowns and higher debt levels. The GDP growth has been negative in most developing countries in 2020, and GDP growth forecasts for 2021 and 2022 have been downgraded in many countries (World Bank, 2021). To help combat the pandemic, many countries received financial support from several institutions, including the multilateral and regional financial institutions as well as development agencies. Internal debt tools were also leveraged to face the short-term challenges caused by the pandemic. In 2020, global government debt reached 99% of the GDP, its highest level in half a century. Global external debt rose by 11 percentage points of GDP in 2020, to 114% of GDP in 2020 (Kose et al., 2021). Unprecedented fiscal stimulus combined with declining government revenue has triggered concerns for debt sustainability (World Bank, 2021, Kose et al., 2021). Many developing countries were either in or at risk of debt distress before the onset of the COVID pandemic and could be further challenged by the rising debt levels.

Public debt has several negative effects on economic activity as high public debt raises the risk of a fiscal crisis and keeps the borrowing costs high. Higher levels of debt may demand greater financing through deficit which leads to more debt, thus generating a vicious circle that could be explosive. Some empirical evidence suggests a negative relationship between debt and economic growth (Reinhart and Rogoff, 2010; Greenidge *et al.* 2012; Calderón *et al.* 2013). Reducing debt through economic growth is one of the best options to face a debt crisis. However, given the uncertainty of the post-pandemic economic environment, economic growth is not expected to accelerate substantially. Growth projections in many emerging and developing countries show modest growth prospects for the coming years (World Bank 2021 and IMF, 2021).

Fiscal consolidation is one of the tools commonly used to face fiscal unbalances. Governments have a set of tools such as inflation targeting, financial repression, debt default, or restructuring, at their disposal to face a debt crisis (Kose, et al, 2021). However, reducing debt through fiscal consolidation remains one of the most appropriate tools that governments have to curb fiscal imbalances (Amo-Yartey, *et al.* 2012; Salmon and Ruge, 2020; Beetsma, *et al.* 2021; Kose, et al, 2021). While there is no consensus on the most effective route to fiscal consolidation, empirical evidence of multiple countries seem to suggest that fiscal consolidation based on expenditure reductions tends to be more effective than tax-based consolidations (Amo-Yartey, et al 2012; Antelo and Peón, 2014; Beetsma, et al, 2021).

Expenditure-based fiscal consolidation may have some implications for human capital spending. Government expenditure plays a central role in education financing, especially in developing countries. The World Bank (2018) shows that public education expenditure contributes to 46.4% of total education expenditure in low-income countries, 66.5% in lower-middle income countries and 89.5% in upper-middle-income countries. Education is mostly financed by public resources in many developing countries and an eventual contraction of public expenditure to face a debt crisis could lead to fewer resources for human capital investments. Evidence from developed countries shows that fiscal consolidations can be harmful to government spending on human capital (Castro, 2005).

The purpose of this study is to investigate how fiscal consolidation due to high external debt could hinder education spending. It suggests a measure of the risk of fiscal consolidation and investigates the possible effects of fiscal consolidation on education expenditure. Results show that debt can lead to a higher risk of fiscal consolidation and a decline in government expenditure on education. In other terms, debt poses

a significant threat to domestic education financing. The rising debt levels caused by the COVID-19 pandemic pose a concern for education financing.

2. Empirical strategy

This study aims at understanding the relationship between external debt, fiscal consolidation, and government expenditure on education. To do so, a measure of the risk of fiscal consolidation is first proposed. Secondly, the impact of the suggested measure of fiscal consolidation on education spending is explored using a system-GMM regression.

Measuring the risk of fiscal consolidation

A proxy of the risk of fiscal consolidation is estimated using the external debt to reserve ratio as a regressor in a probit model. The debt to GDP ratio is a commonly used indicator to monitor debt sustainability. However, in the particular case of external debt, a high debt to GDP ratio may not be a perfect predictor of fiscal consolidation if the international reserves allow the government to face the debt service. Therefore, the external debt to reserve ratio becomes a more accurate indicator of debt sustainability.¹ A proxy of the risk of fiscal consolidation is proposed, using the external debt to reserve ratio in equation 1 as follows:

$$Pr(C_{it}) = \beta_0 + \beta_1 DebtRes_{it} + U_{it} + \gamma_i \quad (1)$$

With $DebtRes_{it}$ country's i debt to reserve ratio at time t , β_0 and β_1 parameters to be estimated, U_{it} residual terms, and γ_i individual country effects term. $Pr(C_{it})$ is the probability of a relative decline in total government expenditure of country i between time t and $t-1$ with respect to the government revenue. C_{it} tries to capture the government policy with regard to the fiscal deficit. Assuming EX_{it} the variation in percentage of total government expenditure and REV_{it} the variation in percentage of the government revenue between t and $t-1$, $SDEXREV$ being the standard deviation of $EX_{it} - REV_{it}$:

$$C_{it} = \begin{cases} 1 & \text{if } EX_{it} - REV_{it} \leq -SDEXREV \\ 0 & \text{otherwise} \end{cases} \quad (2)$$

In other terms, C_{it} is an indicator of whether the government expenditure is decreasing significantly faster than government revenue using one standard deviation effects size. The predicted probability is:

$$Fiscon_{it} = \widehat{Pr}(C_{it}) \quad (3)$$

$Fiscon_{it}$ is a proxy of the risk that the government implements a fiscal consolidation policy because of a high debt to reserve ratio. It is important to note here that C_{it} does not distinguish between expenditure-based and tax-based fiscal consolidation. A declining fiscal deficit can be driven by higher revenue or reduced spending. The purpose of this study is to investigate the impact of various types of fiscal consolidation policies on education financing which seems to be well captured by C_{it} . To control for specific country effects, a random-effects probit model is applied to estimate equation 1 (Greene, 2017; Bland and Cook, 2019).

¹ The debt to GDP ratio will also be tested in equation 1.

Fiscal consolidation and education expenditure

As a rising debt service could lead to fiscal consolidation, government expenditure on education may be impacted depending on whether the fiscal consolidation policy involves expenditure cuts. The literature shows that expenditure-based fiscal consolidation is one the most commonly applied fiscal consolidation policies. Education spending is a component of total government expenditure and any changes to government expenditure may have some implications for education expenditure. Particularly, increases in the debt levels could reduce education spending through eventual fiscal consolidation policies. To link fiscal consolidation and education spending, the following econometric model is estimated:

$$\begin{aligned} \log(ESpend_{it}) = & \theta_0 + \theta_1 \log(ESpend_{it-1}) + \theta_2 \log(Fiscon_{it-1}) \\ & + \theta_3 ODAgwh_{it} + \theta_4 GDPgwh_{it} + incgroup_{it} + v_{it} \end{aligned} \quad (4)$$

with θ a set of parameters to be estimated, $ESpend_{it}$ government education expenditure of country i at time t . $GDPgwh$ is the growth rate of the GDP per capita, $ODAgwh$ the growth rate of the Official Development Assistance per capita, $incgroup$ a set of country income group dummy variables, and v_{it} the residuals. Education spending at time $t-1$ is introduced as a regressor to control for the effects of past spending on current spending levels. In many countries, a large share of the education budget is dedicated to recurrent expenditure, including salaries. Because salaries may not be flexible in the short run, education expenditure at time t may be strongly correlated with the expenditure at time $t-1$.

It seems plausible to assume that after the start of a debt crisis, it takes time for an eventual fiscal consolidation to impact education spending. For this reason, the fiscal consolidation variable is delayed in equation 4. Education in developing countries is financed from internal and external resources (Fosu 2010; Al Samarrai et al. 2019). The GDP per capita growth rate is then included as a control variable for the availability of domestic resources while the growth rate of the official development assistance controls for the external support to the education sector.

Equation 4 is dynamic and could face issues related to endogeneity and autocorrelation. The GDP per capita growth and education spending variables may be affected by a reverse causality problem. To properly control for this potential endogeneity issue, a dynamic panel GMM estimation technique is implemented (Arellano and Bond, 1991; Arellano and Bover, 1995). The system GMM technique controls for endogeneity by using lags of the endogenous variables as instruments in the econometric equation. It also controls for eventual autocorrelation issues that could appear after introducing lags of the dependent variable as regressors. $ESpend_{it-1}$, $Fiscon_{it-1}$ and $GDPgwh_{it}$ are treated as endogenous variables in the system GMM regression.

3. Data

Table 1-Panel A shows the data used to estimate equation 1, and Panel B describes the data used to estimate equation 4. Data are collected from the World Economic Outlook and the World Development Indicators databases. The data cover the period 1990-2019. To address the data availability issues, all variables are averaged by a three-year interval.

Panel A data show that about 9.5% of the observations had a relative decline of total government expenditure over the last decades and the average debt service to reserve ratio varies between 0.5% and

397%. The average debt to GDP ratio is over the IMF's recommended benchmark of 40% in about 60% of the countries, showing that several countries may be affected by debt sustainability issues. The data are available for a total of 50 low- and middle-income countries from 1991 to 2019 to estimate equation 1.

The spending per school-age individual (in primary, secondary, and tertiary) is the dependent variable in equation 4 (Table 1-Panel B). Because countries included in the analysis have different demographic structures, the size of the school-age population may vary across countries. Government spending on education is usually designed to cover the school-age population, and education expenditure by school-age child appears to accurately capture government's effort toward education financing.

Panel B shows that the average spending per school-age child is about \$ 300. The spending per child hugely varies across income groups, from \$ 39.5 in low-income countries to \$ 636.7 in upper-middle income countries. This illustrates the large cross-country inequality in the volume of resources available to finance education. A total of 96 countries has available data to estimate equation 4. Almost half of these countries are lower-middle income countries.

Table 1: Descriptive statistics

	Obs	Mean	Std. Dev.	Min	Max
Panel A: Probit model (equation 1)					
Change in government expenditure compared to revenue (<i>C</i>)	577	0.095	0.294	0	1
External debt to reserve ratio (<i>DebtRes</i>)	577	6.095	18.612	0.492	397.016
Debt stock to GDP ratio (<i>DebtGDP</i>)	577	50.965	29.356	3.879	235.786
Panel B: GMM model (equation 4)					
Government education expenditure per school-age child (<i>Espend</i>)	902	300.991	377.873	8.529	2428.502
Probability of fiscal consolidation (<i>Fiscon</i>)	902	0.106	0.051	0.017	0.381
ODA per capita growth (<i>GDPgwh</i>)	902	0.215	1.078	-0.902	20.761
GDP per capita growth (<i>ODAgwh</i>)	902	0.026	0.047	-0.154	0.33

4. Results

Predicting the probability of fiscal consolidation

Table 2-Model 1 shows that the external debt to reserve ratio is a significant predictor of a relative decline of government expenditure compared to government revenue. In other terms, an increase in the external debt to reserve ratio is associated with a higher likelihood that the government conducts a fiscal consolidation policy. One percentage increase in the debt to reserve ratio is associated with 0.25 percentage points increase in the probability of a decline in the total government expenditure relative to government revenue. An increase in the government's external debt is thus associated with a higher likelihood that the government conducts a fiscal consolidation policy aiming at curbing the fiscal deficit.

The debt to GDP ratio seems to not be significantly related to the risk of fiscal consolidation (Table 2-Model 2).

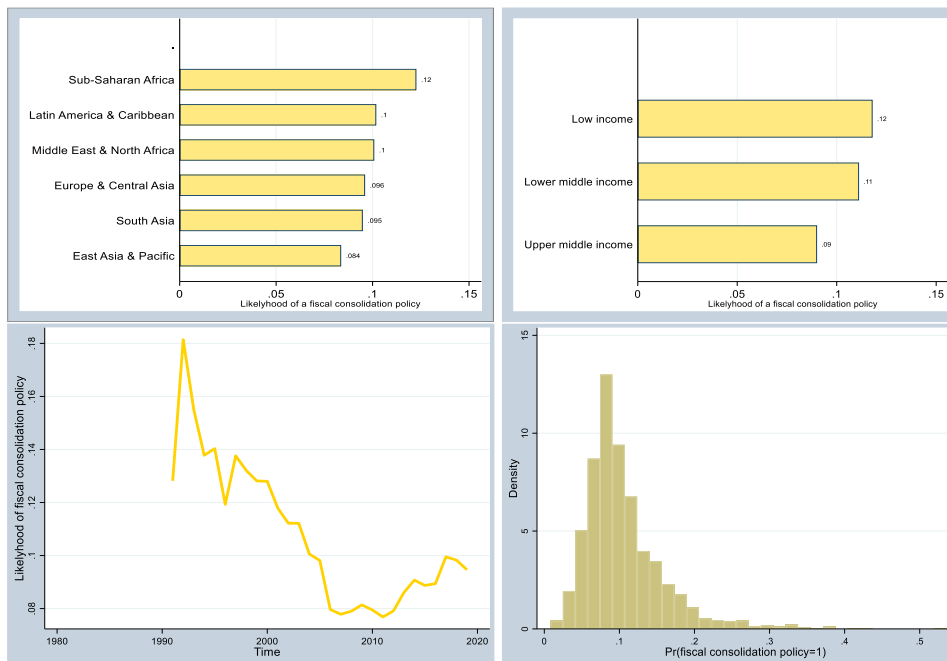
Table 2: Econometric results: debt and the likelihood of fiscal consolidation (equation 1)

	Dependent variable: C_{it}	
	Model 1	Model 2
Debt service to reserve ratio (logged)	0.252*** (0.086)	
Debt stock to GDP ratio (logged)		-0.077 (0.108)
Constant	-0.544* (0.287)	-1.38*** (0.418)
Number of observations	577	577
Countries	50	50
	Prob > chi2 = 0.0316	Prob > chi2 = 0.0602

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level

The results presented in Table 2-Model 1 are used to compute a proxy of the likelihood of a fiscal consolidation policy. The predicted probability varies by country, region, and income group (Figure 1). Countries with the highest development challenges seem to be exposed to a higher risk of fiscal consolidation (Sub-Saharan Africa and low-income countries). The risk of fiscal consolidation seems to have decreased between 1990 and 2011 but increased after 2011. This may be consistent with the low interest rates environment that occurred after the 2008 global economic crisis which encouraged many developing countries to finance their recovery policies by taking external loans.

Figure 1: Predicted probability of fiscal consolidation by region and income group



Fiscal consolidation and education expenditure

Equation 4 is estimated using a system GMM regression (Arellano and Bond, 1991; Arellano and Bover, 1995). The results show that the likelihood of fiscal consolidation has a negative effect on government expenditure on education (Model 3 in Table 3). This relationship is robust regardless of the control variables used (Table 3-Models 1 and 2). Increased risk of expenditure contraction due to higher external debt could lead to decreased expenditure on education. Results from Model 3 show that one percentage increase in the probability of a fiscal consolidation decreases education expenditure per school age child by 0.043 % in the following period. In other terms, one percentage point increase in the probability of fiscal consolidation decreases the average education expenditure per school child by approximately \$11.5.

Table 3: Econometric results: fiscal consolidation and education spending (equation 4)

	Dependent variable: log education expenditure per child		
	Model 1	Model 2	Model 3
Log education expenditure per school-age child (t-1)	0.973*** (0.012)	0.977*** (0.012)	0.980*** (0.008)
Log probability of fiscal consolidation (t-1)	-0.099*** (0.025)	-0.106*** (0.022)	-0.043** (0.018)
ODA per capita growth (t/t-1)		0.006 (0.01)	0.002 (0.009)
GDP per capita growth (t/t-1)			0.573*** (0.153)
Income group control	NO	YES	YES
Constant	-0.056 (0.067)	-0.082 (0.087)	0.038 (0.064)
Number of observations	902	902	902
Countries	96	96	96
	F(2, 95) = 4244 Prob > F = 0.000 Arellano-Bond test for AR(1) Pr > z = 0.000 Arellano-Bond test for AR(2) Pr > z = 0.333 Sargan test of overid. restrictions: chi2(127) = 97.46 Prob > chi2 = 0.976	F(7, 95) = 5155 Prob > F = 0.000 Arellano-Bond test for AR(1) Pr > z = 0.000 Arellano-Bond test for AR(2) Pr > z = 0.230 Sargan test of overid. restrictions: chi2(125) = 98.73 Prob > chi2 = 0.960	F(8, 95) = 5233.70 Prob > F = 0.000 Prob > chi2 = 0.357 Arellano-Bond test for AR(1) Pr > z = 0.000 Arellano-Bond test for AR(2) Pr > z = 0.207 Sargan test of overid. restrictions: chi2(180) = 186.62 Prob > chi2 = 0.352

Table 4 investigates a possible direct relationship between debt and education expenditure. A system GMM is applied to estimate equation 4 using the debt stock to GDP ratio and the debt service to reserve ratio as proxies for debt. The results show that a higher debt to reserve ratio is associated with lower

education spending. This is consistent with the results presented in Table 3. A higher debt level relative to reserves could mean that the government does not have sufficient capacity to face its debt burden. Government then attempts to control its fiscal imbalances through fiscal adjustments, leading to a decline of education expenditure. Education expenditure tends to overreact to an increase of the debt burden. In other terms, the decline of education spending is proportionally larger than the increase of the debt burden. Table 4 shows that one percent increase in the external debt volume without any changes to the reserve levels could lead to a 2.9% decrease in the spending per school-age child. In other terms, education expenditure is vulnerable to external debt. This means that education expenditure may be one of the top spending categories used by the government to adjust their fiscal deficits. Therefore, external debt poses a significant threat to education financing, especially in the current context of the rising debt levels caused by the pandemic. Protecting education finance should become a priority in the post COVID-19 era.²

Table 4: Econometric results: Debt and education spending

	Dependent variable: log education expenditure per child	
	Model 1	Model 2
Log education expenditure per school-age child (t-1)	0.994*** (0.025)	1.000*** (0.025)
Log debt to GDP ratio	-0.01 (0.023)	
External debt to reserve ratio (logged)		-0.029** (0.017)
ODA per capita growth (t/t-1)	-0.005 (0.036)	-0.018 (0.013)
GDP per capita growth (t/t-1)	0.605** (0.297)	0.625 * (0.331)
Constant	0.108 (0.202)	0.006 (0.131)
Number of observations	361	361
	F(4, 44) = 1066.63 Prob > F = 0.000	F(4, 44) = 875.95 Prob > F = 0.000
	Arellano-Bond test for AR(1) Pr > z = 0.001	Arellano-Bond test for AR(1) Pr > z = 0.004
	Arellano-Bond test for AR(2) 0.86 Pr > z = 0.391	Arellano-Bond test for AR(2) = Pr > z = 0.339
	Sargan test of overid. restrictions: chi2(172) = 171.71	Sargan test of overid. restrictions: chi2(172) = 193.86
	Prob > chi2 = 0.492	Prob > chi2 = 0.121

The growth of the official development assistance to the education sector seems to not be associated with a significant increase of education expenditure (Tables 3 and 4). A large proportion of education

² UNESCO (2021) stresses the need to protect investment in education in the world in the context of the COVID-19 pandemic. <https://en.unesco.org/news/protecting-education-funding-face-covid-19>

spending is provided to countries through project modalities and may not be counted as part of government education expenditure.³ In addition, education aid represents a small proportion of education financing. Because of the relatively small contribution of aid to the education budget, an increase of the amount of aid may not be enough to drive a substantial increase of overall government expenditure on education. Table 3 and 4 also show that GDP growth is associated with higher government expenditure on education. GDP growth drives higher government revenue which in turn contributes to increased education expenditure. This evidence is in support of the Wagner's law on the causal effect of GDP growth on government expenditure (Chandran et al., 2011; Dogan & Tang, 2006; Ebaidalla, 2013; Loizides & Vamvoukas, 2005; Ahuja and Pandit, 2020).

External debt and education expenditure in the context of the COVID-19 pandemic

Debt levels are expected to rise because of the COVID-19 pandemic. Using the estimations presented in Tables 2 and 3, the potential impact of debt on education expenditure is simulated. The external debt to reserve ratio increased by 2.2% on average between 2016 and 2020 and it is expected to further increase after the pandemic. Estimations using model 3 in table 3 shows that a hypothetical 5% increase in external debt without any change in reserves could lead to a \$14.50 average decrease in education spending per school-age child, all things being equal (Table 5). This decline varies from \$1.50 per child on average in low-income countries to \$7.70 in middle-income countries and \$44.30 in high-income countries.⁴

Table 5: Estimated decline in education expenditure per school-age child following an increase of the debt to reserve ratio (in \$US)

	Overall	Low income	Lower-middle-income	Upper middle-income
5 % increase in debt/reserve ratio	14.5	1.5	7.7	44.3
10 % increase in debt/reserve ratio	28.9	3.1	15.4	88.5
15 % increase in debt/reserve ratio	43.4	4.6	23	132.8

Debt could be associated with a huge decline in the total volume of domestic financing in developing countries. For instance, a hypothetic 5% increase in external debt could lead to a decline of the volume of government education expenditure by \$12.8 billion in low- and middle-income countries, all things being equal. The estimated decline is almost equivalent to the official development assistance to the education sector in 2019. This implies that rising external debt can lead to substantial decline of education expenditure. This is particularly concerning given the COVID-19 related debt and the risk of debt crisis in developing countries.

³ In 2019, only 3.5% of education ODA was provided through budget support modalities according to OECD Creditor Reporting System: <https://stats.oecd.org/Index.aspx?DataSetCode=crs1>

⁴ Simulations using the econometric results in table 4 give numbers that are very close to what is presented.

5. Conclusion

This paper investigates the relationship between debt, fiscal consolidation, and government expenditure on education. It shows that the external debt to reserve ratio is a good predictor of the probability of fiscal consolidation. To face the external debt burden, governments are likely to implement fiscal consolidation policies. These policies could lead to budget cuts which may affect government expenditure on education. This paper investigates the extent to which fiscal consolidation may affect education spending and tries to understand the potential impact of the COVID-19-related debt on education expenditure.

The results show that governments in developing countries have been facing an increasing risk of fiscal consolidation since 2011. Low-income countries and Sub-Saharan Africa seem to be especially exposed to the risk of fiscal consolidation. There is a negative relationship between education expenditure and the likelihood of fiscal consolidation. An increase in the external debt level is associated with lower levels of education spending. This finding illustrates the potential impact on education expenditure of the current high debt situation fueled by the COVID-19 pandemic.

While it is difficult to predict how the pandemic-related debt would evolve, simulating the effects of hypothetical increases of debt on education expenditure can help understand the extent of the debt problem. For instance, a 5% increase in external debt could lead to a \$12.8 billion decline in the volume of government education expenditure in low- and middle-income countries, all things being equal. The estimated decline is almost equivalent to the official development assistance to the education sector in 2019. The results of this study confirm that debt can compromise government expenditure on education. This can in turn negatively impact countries' potential to boost their economic growth through increased investment in human capital. Consequently, interventions in developing countries should consider implementing activities such as debt relief or debt swaps as ways to mitigate the impact of debt on education financing.

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