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Fiscal consolidation and health inequality: Evidence from infant mortality in Sub-Saharan Africa

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Abstract

In this paper, we examine the effect of fiscal consolidation episodes conducted over 1975-2015 on infant mortality in sub-Saharan African countries. Episodes of fiscal austerity are indeed likely to be associated with spending cuts which might negatively affect the quantity and/or quality of public services such as health centers and hospitals. Infant mortality is measured at the child level using the combination of Demographic and Health Surveys for 35 African countries. Fiscal consolidation is measured at the country level with a dummy variable that is equal to one if a fiscal consolidation occurred in the birth year of the child, or the year before. Fiscal consolidation is, on average, associated with higher infant mortality: the estimated contribution of fiscal austerity to infant mortality is around 7 per 1000 additional infant deaths as compared with a situation where birth would have occurred outside fiscal consolidation periods. We also investigate how fiscal consolidation influences health inequality and find that these episodes disproportionately affect child deaths of mothers belonging to the poorer segment of the population as well as those of middle-class mothers.

Résumé

Dans ce document, nous examinons l'effet des épisodes de consolidation budgétaire menés sur la période 1975-2015 sur la mortalité infantile dans les pays d'Afrique subsaharienne. Les épisodes d'austérité budgétaire sont en effet susceptibles d'être associés à des réductions de dépenses qui pourraient affecter négativement la quantité et/ou la qualité des services publics tels que les centres de santé et les hôpitaux. La mortalité infantile est mesurée au niveau de l'enfant en utilisant la combinaison d'enquêtes démographiques et sanitaires pour 35 pays africains. La consolidation fiscale est mesurée au niveau du pays avec une variable fictive qui est égale à un si la consolidation fiscale a eu lieu l'année de naissance de l'enfant, ou l'année précédente. La consolidation budgétaire est, en moyenne, associée à une mortalité infantile plus élevée : la contribution estimée de l'austérité budgétaire à la mortalité infantile est d'environ 7 pour 1000 décès infantiles supplémentaires par rapport à une situation où la naissance aurait eu lieu en dehors des périodes de consolidation budgétaire. Nous étudions également la manière dont l'assainissement budgétaire influence les inégalités en matière de santé et nous constatons que ces épisodes affectent de manière disproportionnée les décès d'enfants de mères appartenant au segment le plus pauvre de la population ainsi que ceux de mères de la classe moyenne.

Mots-clés

Mortalité infantile, inégalités de santé, consolidation fiscale.

Introduction

Over the past decades, public finance situation in sub-Saharan African countries has been scrutinized and often considered as critical to enable them engaging on a sustainable path of autonomous financing for development. In this vein, the international financial institutions, and the IMF in particular, have fostered the implementation of public finance reforms aiming at increasing domestic resources mobilization and better controlling public spending. Such reforms have mostly been conducted under the application of the "Washington Consensus" throughout the 1990s (Williamson, 1990), by making IMF financing conditional upon the achievement of important public finance stabilization programs. Among published studies, no consensus aroused regarding the positive contribution that IMF programs and fiscal consolidation episodes might have had on countries. Overall, most studies suggest that the average effect of such programs have been rather negative in terms of human costs (Cornia et al., 1987).

Yet, the importance of stabilizing public finance for low-income countries, and for sub-Saharan African states in particular, has been recently reassessed by the International Monetary Fund (2018). In light of the public debt expansion of many African states that followed the late 2000s debt relief initiatives, improvements in collecting taxes and public spending rationalization have figured among the top recommendations of various IMF regional economic outlooks and World bank reports (especially those with a strong focus on public debt evolution). Once again, sub-Saharan African governments have been urged to better monitor their public balance, and ultimately reduce deficits.

In the meantime, the international community, to which the IMF and the World Bank belongs to, has set up development targets to achieve by 2030, known as the sustainable development goals (SDGs). Within this new universal agenda, common to both developed and developing countries, a serious emphasis is attached to the reduction of inequality, in a multidimensional matter. One might therefore be concerned about a potential conflict between IFIs' recommendations of stabilizing public finance and the achievement of the SDGs, especially the one dedicated to lessen inequality. To what extent fiscal consolidation recommendations might affect people living in low-income countries and threaten inequality reduction is what this paper is trying to assess. Focusing on health, we adopt a long-run and mixed approach (both at the micro and macro-level) to examine the distributional impact of fiscal consolidation episodes conducted over 1975-2015 across various sub-Saharan African countries, on infant mortality.

Our research question builds on two strands of the economic literature. First, some studies have assessed the distributional consequences of fiscal consolidation but mostly focused on developed economies. Woo et al. (2017) and Ball et al. (2013) indeed find that income inequality is worsened by fiscal austerity measures. Agnello and Sousa (2014) present evidence that, in OECD countries, fiscal consolidation based on spending cuts are especially inequality enhancing. There exists however very few investigations regarding this relationship in low-income countries and in sub-Saharan Africa in particular. The closest papers to our research question with respect to the geographical area of study are those belonging to the other strand of the literature, investigating the effects of IMF programs

on receiving countries which encompassed much more than public finance consolidations. These studies found that, in developing countries, the broader effects of IMF stabilization programs tend to undermine economic growth and increase inequality (Garuda, 2000; Dreher, 2006; Oberdabernig, 2013). The effect of fiscal consolidation on income inequality has been widely investigated at the country-level, but on samples including few developing countries. Other studies have tried to focus on the effect of public finance developments on infant mortality measured at the individual-level but without investigating their distributional impact (Filmer and Pritchett, 1997; Welander, 2016) and without looking at fiscal consolidation in particular.

Fiscal policy and fiscal consolidation are expected to have substantial consequences on social outcomes such as health conditions and infant mortality. Episodes of fiscal austerity are indeed likely to be associated with spending cuts which might negatively affect the quantity and/or quality of public services such as free health centers and hospitals. But tax-based consolidation could also affect child mortality through the reduction of households' net disposable income and the resulting difficulty in paying maternity-related spending. Furthermore, both of these effects are expected to vary with respect to individuals' position into the income distribution and according to the instruments used to reduce public deficits (taxes vs. spending, or both).

Using public finance data at country-level from the World Economic Outlook Database (WEOD) and infant mortality data at child-level from the Demographic and Health Surveys (DHS) for a sample of 35 sub-Saharan African countries over 1975-2015, we investigate whether fiscal consolidation episodes affect within mother-child mortality and whether there is a distinctive effect according to the income group of the mother. We also look at the specific components of the fiscal consolidation (spending cuts vs. tax hikes) and estimate their effect on infant mortality with respect to the quartile to which each mother belongs to.

Our results suggest that fiscal consolidation is, on average, positively correlated with infant mortality as children being born or having spent the uterine phase in time of fiscal austerity have greater chances of dying before age one. The estimated contribution of fiscal austerity to infant mortality is around 7 per 1000 additional infant deaths as compared with a situation where birth would have occurred outside fiscal consolidation periods. In addition, we find that fiscal consolidation disproportionately affects child births of mother belonging to the poorer segments of the population as well as those of middle-class mothers. Quartile regressions indeed suggest that fiscal consolidation episodes lead to 9 per 1000 and 11 per 1000 additional infant deaths for poorest and middle-class mothers, respectively. Going further, we observe that such differential effects for mothers from the poorest segment of the population are mainly driven by spending cuts-based fiscal consolidation. For middle-class mothers, results indicate that additional deaths occur predominantly when austerity is conducted through tax hikes only, or jointly with public expenditure reduction.

The article is structured as follows. Section 2 describes the model and the data. The baseline results are presented in Section 3, along with a large set of robustness checks. Section 4 concludes.

1. Empirical strategy and data

We investigate the relationship between fiscal consolidation and infant mortality using the following baseline specification:

$$MORTALITY_{i,m,j,t} = \alpha + \beta X_{i,m,j,t} + \gamma Y_{j,t} + \mu_m + \tau_t + \epsilon_{i,m,j,t} \tag{1}$$

where MORTALITY$_{i,m,j,t}$ is a dummy variable representing whether or not the baby *i* of mother *m* born in country *j* in year *t* dies before reaching the age of one year. X$_{i,m,j,t}$ is a set of baby-level characteristics (birth order, sex), while Y$_{j,t}$ is a set of country-level variables including our variable of interest, fiscal consolidation, and the log of real income per capita that is entered as control variable. We include mother fixed effects, μ_m, as well as year dummies, τ_t.

In this framework, the fiscal consolidation variable is measured at the country level whereas the outcome, infant mortality, is measured at the child level. The statistical bias that results from attempts to measure the effect of aggregate policy variables on micro units has been underlined by Moulton (1990).[1] Consequently, in the macro-micro studies the standard errors are clustered at the level of aggregation of the variable of interest. In our case, given that CONSOLIDATION$_{j,t}$ is aggregated at the country-year level, we cluster the standard errors at the same level. Our setting also implies that in a given country and year, there are several different infant mortality observations per one fiscal consolidation period. The error term of the estimation might thus be large since it is difficult to fit all the outcome points at the same time, inducing a more conservative estimate of the effect of fiscal consolidation.

1.1. Child-Level Data

The dataset at the child level combines all the Demographic and Health Surveys (DHS) available in September 2019 for the African continent. These surveys represent a comprehensive and comparable source of data since the survey questions are the same across countries and over years. The dataset comprises more than 2 million children from 35 African countries (details in Table A1). Each survey asks questions to the household who gives information about all the children living in it, when they were born and eventually when they died. Surveys were conducted in various years over the period 1990-2019 but children surveyed in a given year were born over a larger time period. The time span of the study is thus not constrained by the year of the survey. Equation 1 is run controlling for the characteristics of the child using two variables, birth order (BORD$_{i,m,j,t}$) and a dummy equal to one for boys and zero for girls (SEX$_{i,m,j,t}$).

1.2. Country-Level Variables

At the country level, we control for the logarithm of real GDP per capita (LNGDPPC$_{j,t}$), using the Penn World Tables. The variable is measured in the year the child was born in order to

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[1]Random disturbances in the regression correlated within the groups that are used to merge aggregate with micro data can cause the standard errors from ordinary least squares to be biased downward (Moulton, 1990).

control for the economic situation of the country at that time. Finally, we enter a measure of fiscal consolidation, CONSOLIDATION$_{j,t}$, in our estimations. We define fiscal consolidation episodes following the definition of Alesina and Ardagna (2012) where a fiscal adjustment appears in either 1) a two year period in which the cyclically adjusted primary balance over GDP improves in each year and the cumulative improvement is at least two points of the balance-to-GDP ratio ; 2) a three or more year period in which the cyclically adjusted primary balance over GDP improves in each year and the cumulative improvement is at least three points of the balance-to-GDP ratio.

In order to identify the fiscal consolidation episodes, we first measure the cyclically adjusted primary balance over GDP as the predicted value of the following regression:

$$PRIMDEF_{j,t} = \beta\tau_t + \gamma PRIMDEF_{j,t-1} + \epsilon_{j,t} \tag{2}$$

where PRIMDEF$_{j,t}$ measures the primary deficit of country j in the year t and is predicted as a function of deterministic (τ_t) and stochastic (PRIMDEF$_{j,t-1}$) trends. Primary balance data are retrieved from the World Economic Outlook database (WEO) of the IMF, and thus excludes debt servicing-related expenditures. Once the cyclically adjusted primary balance (*i.e.* the trend in PRIMDEF) is computed, we identify the fiscal consolidation episodes by applying conditions 1) and 2). Episodes of fiscal consolidation are presented in Table A1. Figure 1 presents the number of children exposed to fiscal consolidation in their year of birth (totreated) or not (totcontrol) for each year.

Figure 1: **Number of children exposed or not to fiscal consolidation in their year of birth**
Sources: DHS, authors computation.
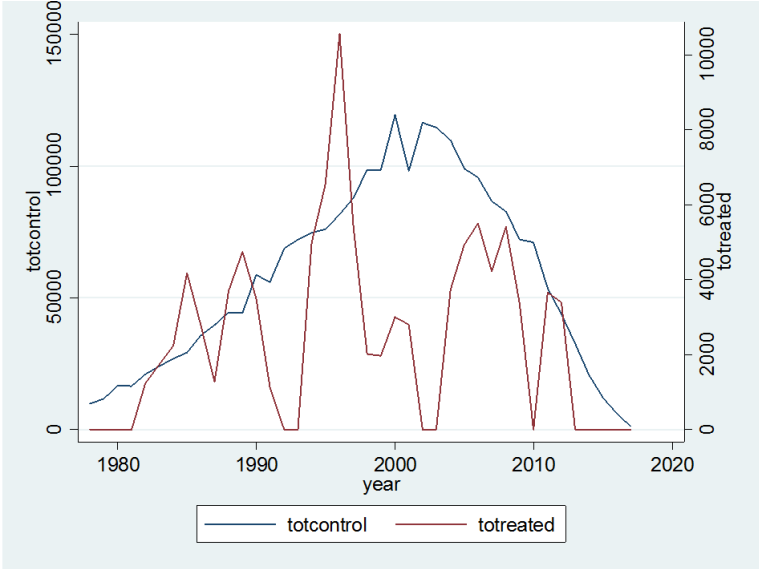
2. Fiscal consolidation's effect on infant mortality

2.1. Baseline Results

We first report results of equation 1 where we simply estimate the contribution of fiscal consolidation to the within mother probability of dying before age one. Results of column (1) in table 1 underline a positive correlation between fiscal consolidation and infant mortality. Entering no other controls than mother-fixed effects, baby-level characteristics and the log of per capita GDP, we observe that there is, on average, 7 per 1000 additional deaths under the age of one when baby are born in time of fiscal austerity, at given observed and unobserved mothers' characteristics. In columns (2) to (4), we then enter additional controls such as date of birth fixed effects, month of birth fixed effects, and country fixed effects which take into account the time invariant heterogeneity at the cohort, month and country level, respectively. Results remain unaffected by these various sets of fixed effects, with an estimated effect of fiscal consolidation converging around 6 to 7 per 1000 additional infant deaths. If the consolidation appears as a reaction to an economic crisis, the coefficient associated with fiscal consolidation could therefore capture both effects. We will address this issue in the following section by entering country-year fixed effects.

Table 1: **Fiscal consolidation contribution of infant mortality**

	(1)	(2)	(3)	(4)
Dependent:		MORTALITY$_{i,m,j,t}$		
CONSOLIDATION$_{j,t}$	0.007***	0.006**	0.007***	0.006**
	(0.002)	(0.002)	(0.002)	(0.003)
BORD$_{i,m,j,t}$			-0.017***	0.002***
			(0.001)	(0.000)
SEX$_{i,m,j,t}$			0.013***	0.013***
			(0.000)	(0.000)
LNGDPPC$_{j,t}$			-0.016***	-0.016***
			(0.003)	(0.002)
Constant	0.085***	0.085***	0.262***	0.198***
	(0.001)	(0.000)	(0.021)	(0.018)
Observations	2,426,046	2,426,046	2,426,046	2,426,046
Mother fixed effect	yes	yes	yes	no
Date of birth fixed effect	no	yes	yes	yes
Month fixed effects	no	no	yes	yes
Country fixed effect	no	no	no	yes

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

2.2. Distributional effect of fiscal consolidation

Equation (1) prevents an examination the distributional effect of fiscal consolidation. We thus extend the baseline estimation presented in Equation 1 in a way that allows distinguishing the effect of fiscal consolidation on infant mortality of children belonging to various quartiles. Based on information on assets such as durable goods and characteristics of the habitat, DHS data provide information on the wealth of individuals, hence enabling to calculate to which quartile they belong. We approximate the children's quartile at birth using mother's quartile at the time of the survey, hence assuming no strong social mobility of mothers through time. In order to examine the distributional effect of fiscal consolidation we estimate a model of the following form:

$$MORTALITY_{i,m,j,t} = \alpha + \beta X_{i,m,j,t} + \gamma CONSOLIDATION_{j,t} * Q_m + \mu_m + \tau_{j,t} + \epsilon_{i,m,j,t} \qquad (3)$$

where Q_m is a proxy for the quartile of the mother m of child i at the time of the survey. As compared with the previous model (cf. equation 1), this specification, by investigating the differential effect of a country-level variable ($CONSOLIDATION_{j,t}$) with respect to an individual-level (Q_m) allows being more accurate regarding control of omitted time varying factors at country-level by entering country-year fixed effects ($\tau_{j,t}$).

Results are reported in column (1) of Table 2 and suggest that middle-class mothers experience more infant deaths of their children when they give birth in time of fiscal austerity and as compared with the richest mothers of the population. This disproportionate effect of fiscal consolidation is supported by quartile regressions (columns (2) to (5)). Yet, we also notice that quartile regression results emphasize a positive and rather strong positive effect of fiscal consolidation on under one child mortality for mothers from the poorest segments of the population. The coefficient associated with the interaction term of fiscal consolidation with the first quartile is statistically significant and larger than the average effect (regardless of the income distribution). Results of column (2) hence suggest that the poorest mothers that gave birth during fiscal austerity have experienced, on average, 9 per 1000 additional infant deaths, as compared to when they had a baby outside fiscal consolidation episodes, and with respect the richest mothers of the country.

Table 2: **Distributional effect of fiscal consolidation**

Dependent: **MORTALITY**$_{i,m,j,t}$	(1)	(2)	(3)	(4)	(5)
			Quartiles Sub-samples		
	Baseline	Q1	Q2	Q3	Q4
CONSOLIDATION$_{j,t}$ x Q1$_m$	0.003				
	(0.003)				
CONSOLIDATION$_{j,t}$ x Q2$_m$	−0.001				
	(0.003)				
CONSOLIDATION$_{j,t}$ x Q3$_m$	0.006**				
	(0.003)				
CONSOLIDATION$_{j,t}$		0.009***	0.004	0.011***	0.004
		(0.003)	(0.003)	(0.003)	(0.003)
Observations	2,426,045	603,844	603,086	604,396	605,855
Mother fixed effect	yes	yes	yes	yes	yes
Date of birth fixed effect	yes	yes	yes	yes	yes
Month fixed effects	yes	yes	yes	yes	yes
Country-year fixed effects	yes	no	no	no	no
Controls	yes	yes	yes	yes	yes

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

2.3. Disaggregation of fiscal consolidation into revenue and expenditure consolidations

Lastly, we investigate the distributional effect of fiscal consolidation on infant mortality by distinguishing consolidation episodes based on their instruments (spending cuts, tax hikes, or both). To do so, we identify, among each consolidation episode, which primary balance component (revenue or spending) as been driving the fiscal consolidation. If only spending have been reducing over a fiscal consolidation period, the episode is characterized as a "spending-based consolidation" (while an adjustment resulting from tax hike is coined as "revenue-based consolidation"). Finally, some cases of fiscal consolidation episodes are identified as based on "both" dimensions.

Table 3 displays regression results. In line with our expectations, we observe that the overall positive effect of fiscal consolidation on infant mortality is mainly driven by spending cuts rather than tax hikes only. Yet, tax hikes seem to play when they are combined with a reduction in public spending as evidenced by the positive and statistically significant coefficient of BOTH$_{j,t}$. Focusing on this differential effect with respect to the rank in wealth distribution, we observe that the contribution of fiscal consolidation to infant mortality among the poorest mothers is essentially due to reduction in public expenditures. Poor households are indeed expected to be more sensitive to such adjustment since spending cuts probably lead to lessen the quality or provision of public services around birth dates or during pregnancy, which therefore increases the likelihood of losing the child before he/she reached year one.

However, results suggest that the effect of primary deficit reduction on child deaths of middle-class mothers, mainly stems from revenue-based consolidations (or consolidations based on both tax hikes and spending cuts). This differentiated effect between middle-class and poorest mothers can be explained by the predominance of informality in the poorest households of the population, leading them to avoid taxation more easily and being spared from tax adjustments. Conversely, mothers from middle-class households are more likely to

belong to households where income stems from official activities (if not fully at least partially). This can lead to a subsequent reduction in net income and limit the financing of health related private spending.

Table 3: '**Distributional and disaggregated effect of fiscal consolidation**

Dependent: **MORTALITY**$_{i,m,j,t}$	(1)	(2)	(3)	(4)	(5)
		Quartiles Sub-samples			
	Baseline	Q1	Q2	Q3	Q4
REVENUE$_{j,t}$	0.006	0.007	0.004	0.009*	0.003
	(0.004)	(0.006)	(0.005)	(0.005)	(0.006)
EXPENDITURE$_{j,t}$	0.007**	0.015***	0.004	0.008	0.002
	(0.003)	(0.005)	(0.004)	(0.006)	(0.004)
BOTH$_{j,t}$	0.008**	0.007*	0.004	0.013***	0.006
	(0.003)	(0.004)	(0.005)	(0.004)	(0.004)
Observations	2,426,046	603,844	603,086	604,396	605,855
Mother fixed effect	yes	yes	yes	yes	yes
Date of birth fixed effect	yes	yes	yes	yes	yes
Month fixed effects	yes	yes	yes	yes	yes
Controls	yes	yes	yes	yes	yes

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

3.   Conclusion and further work

The present study is a first step towards the identification of fiscal consolidation effects on infant mortality. Making use of both micro and macro data, we build a mixed-level empirical strategy aiming at capturing the effect of fiscal austerity on the probability of dying before age one within-mother. The very preliminary results exposed above suggest that fiscal consolidation is positively correlated with infant mortality and that such relationship might differ subject to where mothers rank in the wealth distribution, and to the fiscal instrument driving the consolidation. We indeed find that poorest and middle-class mothers are disproportionately affected by fiscal consolidation episodes since they report more infant death in times of austerity as compared with other mothers. We also observe that the poorest ones seems to be strongly impacted by spending-cuts consolidation while the effect for middle-class mothers mainly stems from revenue-based consolidation. These are very preliminary results that intend to be stabilized and challenged with several robustness checks.

The within mother dimension helps in alleviating several econometric issues that might arise from our empirical design. It indeed captures the contribution of all time unvarying factors at the mother-level that might explain why some children live while some other die before reaching their first anniversary. Yet, although controlling for some observables (both at the child- and country-level) and entering various sets of fixed effects (year-of-birth cohort, month of birth, country, and in some regression, country-year fixed effects) we cannot completely rule out the presence of endogeneity potentially biasing our estimates.

In order to improve our assessment of a causal effect running from fiscal consolidation to within-mother probability of dying under one, we are currently working on an instrumental variable strategy that will consider austerity episodes based on primary public balance's forecasts of the IMF as an instrument for our fiscal consolidation episodes. Using forecasts retrieved from the various World Economic Outlook Databases conducted over our period of study (and using IMF Article IV documents for the 80s) we will assume that the IMF forecasts regarding primary deficit can only affect child mortality through its realization on public balance, hence providing a source of exogenous variability in our variable of interest and alleviating the remaining bias in our empirical strategy.

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Appendix

Table A1: List of countries, fiscal consolidation episodes, and number of observations.

Country	Fiscal consolidation episode	N	Country	Fiscal consolidation episode	N
Benin	*none*		Malawi	*none*	
Burundi	**1998–99**		Mali	*none*	
Burkina Faso	*none*		Mozambique	**1985–86;1988–90**	
Cameroon	*none*		Namibia	**2005–08**	
Chad	**2008–09; 2011–12**		Niger	*none*	
Cote d'Ivoire	*none*		Nigeria	*none*	
Congo, Dem. Rep.	*none*		Rwanda	*none*	
Congo	**1994–97;2000–01;2004–07**		Sao Tome & Principe	*none*	
Comoros	*none*		Senegal	*none*	
Ethiopia	*none*		Sierra Leone	*none*	
Gabon	**1995–96;2000–01**		South Africa	*none*	
The Gambia	*none*		Swaziland	**1988–90; 2006–07**	
Ghana	**1982–85**		Togo	**1995–96**	
Guinea	*none*		Tanzania	**1996–97**	
Kenya	**1994–96**		Uganda	*none*	
Lesotho	**1984–85; 1989–91; 2004–05**		Zambia	*none*	
Liberia	*none*		Zimbabwe	*none*	
Madagascar	**1982–89; 2006–07**				

Notes: N refers to the number of child-level observations by country.

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