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A Comparative Empirical Analysis

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Moritz Piatti-Fünfkirchen [1] and Lodewijk Smets[2]

Abstract

This paper examines the relationship between public financial management (PFM), the financing of health interventions, and health outcomes. Specifically, the paper econometrically tests whether the effect of PFM on under-five (U5) mortality depends on the relevance of public sector health financing. Employing OLS on a sample of 215 observations indicates that a one-unit increase in PFM quality is associated with a reduction in the U5 mortality rate with about 14 deaths per 1,000 live births. For countries that channel at least 75 percent of health expenditures through the government system, this rate increases to 17 deaths per 1,000 child births. Results are robust to using an alternative dependent variable, adding year fixed effects, a sensitivity test where the health financing threshold is varied, a falsification test that verifies whether findings are driven by unobserved governance aspects, a sample restriction, and the inclusion of different controls. Furthermore, the paper provides a comparative analysis for Latin America and Caribbean (LAC), a region that remains mostly overlooked in the literature. The findings for LAC are broadly consistent with the global sample, though less pronounced and without a differential effect for countries across the financing threshold. Overall, the evidence indicates that the pursuit of universal health coverage and the progress toward related SDGs will be costlier if enabling systems are not in place.

JEL Codes: I10, I18, H51, O54

Keywords: health financing; health systems; Latin America and the Caribbean; public financial management; Sustainable Development Goals; under-five mortality

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1. Introduction and Motivation

Progress toward achieving universal health coverage and the Sustainable Development Goal (SDG) of 'ensuring healthy lives and promoting well-being for all at all ages' will require significant additional resources to the sector, estimated at approximately US$371 billion globally by 2030 (Stenberg et al., 2017). These recent estimates follow in the vein of similar efforts during the Millennium Development Goals (MDGs) era to cost the achievement of targets and identify financing gaps. For example, the Commission on Macroeconomics and Health developed estimates for the cost and financing needs to expand coverage of a limited set of priority services (World Health Organization, 2001). More recently, the High-Level Task Force on Innovative Financing for Health Systems estimated that US$54 per capita were needed by 2015 to achieve the health MDGs for low-income countries, which implied an increase of USS$39 relative to the contemporary level of spending of US$25 per capita (Taskforce on Innovative International Financing for Health Systems, 2009).

The effectiveness of spending on health will, however, depend on how funds are being used. The estimated financing gap assumes the existence of government capacity to absorb these funds. If government systems are strengthened simultaneously, it may well be possible that fewer funds are needed to achieve the ambitious universal health coverage and SDG goals. Conversely, the achievement of the various targets may be out of reach if public finance systems are not providing an enabling environment, and additional funds that are invested are not utilized effectively. Furthermore, advocacy for closing the financing gap will be easier if there is confidence that increased financing for health is used effectively and additional resources will deliver results.

Naturally, a government's ability to deliver health services depends, inter alia, on the quality of its public financial management (PFM). There is a small but growing body of literature that explicitly recognizes the role of PFM in health service delivery (Cashin et al., 2017; Chakraborty et al., 2010; Goryakin et al., 2017; Piatti-Fünfkirchen and Schneider, 2018; Welham et al., 2017; World Health Organization, 2018a, b). The way priorities are determined and funds allocated is likely to have an impact on the effectiveness of service provision and therefore health outcomes (Piatti-Fünfkirchen and Schneider, 2018). The rules and regulations that govern how the budget is executed will have consequences on service providers' ability to react to changing needs and therefore will be likely to affect health outcomes.

Procurement processes are a central part of budget execution, and the efficiency and transparency of procurement will likely affect value for money in the health sector. This is particularly important for the availability of drugs and medical supplies (Cashin et al., 2017;

Chakraborty et al., 2010). Similarly, the processes that underpin budget evaluation affect how stakeholders are held accountable and informs the formulation of the subsequent budget, which is critical to the health system. For example, whether value for money audits are done and guide the performance orientation in the provider payment system will contribute to a health system's effectiveness (Piatti-Fünfkirchen and Schneider, 2018; World Health Organization, 2018b). On the other hand, without an enabling PFM environment, carefully designed health policies may not lead to strong results, with an increased risk of inefficient use of resources that support neither inclusive growth nor service delivery objectives (Andrews et al., 2014; Schiavo-Campo, 2017).

The extent to which PFM matters in affecting service delivery will depend on the type of health system that is operational. A country relying mostly on private contributions through user fees or private insurance payments is unlikely to benefit significantly from PFM reforms. Similarly, donor funds that are not channeled through the government budget are unlikely to be significantly affected by PFM improvements. In many developing countries, however, the public sector plays an important role, and effective provision of health services is a function of the amount committed by government and the strength of its public finance system.

The effect of PFM on health systems to deliver better services or health outcomes remains, however, largely unexplored. A recent literature review on PFM in health suggests that 'the overall evidence in this field appears to be patchy,' with many hypotheses remaining largely underexplored, and insufficient evidence available to identify causal effects (Goryakin et al., 2017).

Cashin et al. (2017) and Chakraborty et al. (2010) conducted some exploratory conceptual work. They developed a framework on the interrelationship of PFM and health finance reforms. The authors conclude that health finance reform is likely more effective if objectives are closely aligned with PFM reforms. A qualitative study on Tanzania and Zambia identifies a number of bottlenecks and enabling factors on PFM and health service delivery from the service providers' perspective (Piatti-Fünfkirchen and Schneider, 2018). Marwa et al. (2013), explored the effect of good governance on the effectiveness of health spending and found that government health spending was positively correlated with reducing child and infant mortality and the size of the coefficient depends on good governance. Their measure of governance, however, has limitations and contains a multitude of factors unrelated to PFM (Gisselquist, 2014). Finally, to the best of our knowledge, Welham et al. (2017) provide the only attempt to econometrically quantify improvements in PFM on health outcomes and use average scores from PEFA assessments as a proxy for PFM quality. Controlling for GDP per capita, female literacy, and HIV prevalence, the authors find that a one-point improvement in the PEFA score is associated with a 20 percent fall

in U5 mortality. Welham et al. (2017) note, however, a number of methodological limitations, such as endogeneity bias, and stress that their results should be treated with caution.

This paper examines the relationship between PFM, the financing of health interventions, and health outcomes. It adds value in several important ways. First, compared to Welham et al. (2017), our study includes more years and countries by relying on an expanded dataset. For instance, while Welham et al. (2017) use 78 observations, this study makes use of 215 observations in the analysis, allowing for more precise and more accurate findings. Relatedly, the paper provides a comparative analysis for the LAC region, which remains mostly overlooked by the limited literature currently available. Third, given that the relationship between health outcomes and strength of PFM is likely to vary depending on the relevance of public sector health financing, our paper explores this hitherto unexamined interaction. Finally, in contrast with previous studies, we subject the main findings to a comprehensive set of robustness tests, including different model specifications, a sensitivity test, and a falsification test.

Results from estimating an OLS model on 215 observations indicate that in countries that do not heavily rely on public financing of health interventions, a one-unit increase in PFM quality is associated with a reduction in U5 mortality by about 13 deaths per 1,000 child births. On the other hand, in countries where most of the health interventions are publicly financed—that is, where at least 75 percent of all health expenditures are challenged through the public system—the U5 mortality rate drops by 17 deaths per 1,000 child births. Interestingly, while the data indicate that PFM also seems to matter in the LAC region, we do not find that the type of heath financing has an influence on U5 mortality. We relate this result to the fact that insurance funds and semi-autonomous institutions in LAC are more developed compared to other regions.

The remainder of this paper is structured as follows. In the next section we discuss the data and methods used to examine the relationship between public financial management, health financing, and under-five mortality. In Section 3 we present the econometric results, including robustness tests, for both the global sample and the LAC sample. Section 4 provides a summary and some concluding remarks.

2. Data and Methods

2.1 Dependent Variable and Variables of Interest

To investigate whether PFM quality matters for health outcomes, this paper considers U5 mortality as a proxy for overall health. While there is no standard, broadly accepted measure to approximate general health, U5 mortality is closely related to a host of health-specific factors such as availability and quality of maternal and child care, outreach services, and sensitization of

spacing as well as other non-health system factors such as the quality of drinking water (Gebretsadik and Gabreyohannes, 2016). This study follows a host of others in choosing this variable as a proxy for health outcomes. Furthermore, the World Bank's Human Capital Index uses U5 mortality as a proxy for survival (Kraay 2018). Sensitivity analysis with maternal mortality is conducted to check for consistency of findings with other health outcome indicators.

The quality of PFM is proxied by PEFA ratings, which were kindly made available by the PEFA secretariat (PEFA Secretariat, 2018b). PEFA assessments, routinely conducted across countries, evaluate a set of PFM functions including budget reliability, transparency, management of assets and liabilities, policy-based fiscal strategy, budgeting, predictability and control in budget execution, accounting and reporting, external scrutiny, and audit. A rigorous quality control mechanism is built into the process, as the PEFA Secretariat reviews and vets all assessments. PEFA scores are expressed on an alphabetical scale of "A" to "D", with "A" being the best achievable rating. For the purposes of this study, the alphabetical ratings were mapped to numerical values following the guidance of the PEFA Secretariat for research and other work in the field (De Renzio, 2009; Hashim and Piatti-Fünfkirchen, 2016).

To test the hypothesis that PFM matters more in countries where a larger share of health expenditures is channeled through the government budget, we constructed a dummy coded one when at least 75 of health expenditures were channeled through the public system. To explore the consistency of our findings, we varied the cut-off level—at 60, 70, and 80 percent –and re-estimated our main model using the alternative cut-off levels.

2.2 Descriptive Statistics

In our regression sample, the average U5 mortality rate corresponds to 58.5 deaths per 1,000 live births (see Table 1). The country with the lowest U5 mortality rate is Montenegro, with only 5.3 deaths per 1,000 live births. The country with the highest child mortality rate in our sample is Sierra Leone (188 deaths per 1,000 live births). In 12.6 percent of our sample (19 countries), countries reach the 75 percent threshold of total health expenditures channeled through government. PFM quality, as measured by the overall PEFA score, is on average rated at 2.374, which is between a "C" and a "B" score. South Africa has the highest PFM quality (average PEFA score of 3.6, equivalent to a B^{+}) while Guinea Bissau comes out at the bottom (1.28, or equivalent to a D). Table 1 also shows that PFM quality does not vary significantly for countries across both sides of the 75 percent threshold.

Table 1: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
under-5 mortality	58.5	40.212	5.3	188
At least 75% of health expenditures channeled through government	0.126	0.332	0	1
PFM quality	2.374	0.462	1.280	3.6
PFM quality for countries that meet the 75% financing threshold	2.335	0.387	1.685	3.144
PFM quality for countries below the 75% financing threshold	2.380	0.473	1.280	3.600
logarithm of per capita GDP	7.474	1.067	5.365	9.744
CPIA rating	3.461	0.475	2.117	4.625
health expenditures (as a % of GDP)	6.283	2.551	0.368	16.980
logarithm of population	15.464	2.0495	9.1946	20.931

2.3 Econometric Model

To investigate the relationship between the quality of a country's PFM, its health system, and health outcomes, we estimate variants of the following equation:

$$y_{i,t} = \beta_0 + \beta_1 x_{i,t} + \beta_2 (x_{i,t}.d_{i,t}) + \beta_3 Z_{i,t} + \varepsilon_{i,t} \quad (1)$$

with $y_{i,t}$ the U5 mortality rate (per 1,000 live births), $x_{i,t}$ the quality of a country's PFM system as measured by the average PEFA score, and $d_{i,t}$ a dummy coded one if at least 75 percent of health expenditures are channeled through the public health system, and zero otherwise. $Z_{i,t}$ is a vector of control variables. Richer countries tend to be associated with better health outcomes and improved PFM systems. That is why we include the logarithm of per capita GDP as a control variable. Furthermore, as many factors influence a country's welfare, GDP per capita also serves as a general control. We add a time trend to adjust for any secular fluctuations in child mortality. To correct for the possibility that health outcomes and PFM developments are driven by the overall quality of a country's institutional framework, we include the World Bank's assessment of a country's policies and institutions (CPIA) as an additional covariate. We also add total health expenditures (as a percentage of GDP), and insert the logarithm of population as a final control variable. $\varepsilon_{i,t}$ is a well-behaved error term.

We estimate the coefficients of this model by employing OLS on a sample of 215 observations, covering 116 low- and middle-income countries in the period 2005-2014.[3] Standard errors are adjusted for country clustering of observations.

3. Empirical Findings

3.1 Baseline Results

Table 2 presents the findings of estimating the baseline model, both with and without the interaction term for health financing. Equation (1) indicates that a one-unit increase in PFM quality is associated with a reduction in the U5 mortality rate by about 14 deaths per 1,000 live births, a finding statistically significant at the 5 percent level. Equation (2) shows that the reduction in U5 mortality is significantly larger in countries where more funds are channeled through the public health system. A one-unit increase in PFM quality in countries above the 75 percent threshold is associated with a reduction in the U5 mortality rate by about 17 deaths per 1,000 child births, a result statistically significant at the 5 percent level. On the other hand, a one-unit increase in PFM quality in countries below the 75 percent threshold only reduces U5 mortality by 12.7 deaths per 1,000 live births.

Furthermore, Table 2 provides empirical evidence that higher income levels are associated with U5 mortality and that the U5 mortality rate has decreased over time. It is important to note that the regression model is able to explain more than 60 percent of the variation in the data. There is also tentative evidence that larger countries face higher U5 mortality rates.

Table 2: Regression Results

	(1)	(2)
VARIABLES	under-5 mortality	under-5 mortality
PFM quality	-13.922**	.
	(6.685)	
PFM quality in countries below the 75% financing threshold	.	-12.709*
		(6.858)
PFM quality in countries that meet the 75% financing threshold	.	-16.910**
		(6.656)
logarithm of per capita GDP	-23.006***	-23.158***
	(3.041)	(3.017)

[3] For 72 countries in our sample, at least two observations are available, which in principle allows for a panel analysis. However, to make optimal use of the variability in the data, and since we are also testing our econometric models on a (heavily reduced) sub-sample of LAC countries, we decided to run the regressions on a pooled cross-section.

year	-1.640***	-1.567***
	(0.530)	(0.523)
CPIA rating	-8.744	-9.293
	(6.067)	(6.027)
health expenditures (% of GDP)	-0.181	-0.335
	(0.957)	(0.945)
logarithm of population	2.215**	1.344
	(1.005)	(1.127)
Observations	215	215
R-squared	0.628	0.639

Cluster-Robust standard errors in parentheses. Constant not reported.

*** p<0.01, ** p<0.05, * p<0.1

3.2 Robustness Tests

To verify the robustness of our findings, we run six additional tests. First, we estimate the model with an alternative dependent variable, that is, maternal mortality instead of U5 mortality. Second, we estimate a model with year fixed effects instead of a year trend. Third, we vary the cut-off level of the public health dummy and examine the association with child mortality. Ceteris paribus, we should observe a further decrease in U5 mortality as more financing is channeled through the public health system. Additionally, by varying the cut-off level we test whether our results are robust to the choice of the threshold. Fourth, we provide a falsification test to examine if the relation between health spending, PFM, and health outcomes is driven by unobserved governance aspects. Fifth, we restrict the sample so that only the most recent observation for each country is included in the analysis. Finally, we estimate the baseline model but replace per capita GDP and health expenditures over GDP with per capita health expenditures. The results from these tests are reported in Table 3.[4]

Table 3: Robustness Tests

MODEL	(1) Alternative dep. var	(2) year fixed effects	(3) 60 percent threshold	(4) 70 percent threshold	(5) 80 percent threshold	(6) falsification test
PFM quality, below the threshold	-106.546**	-13.385*	.	.	.	-12.063
(75 % threshold)	(49.569)	(7.019)				(9.050)
PFM quality, above the threshold	-134.183***	-17.450**	.	.	.	-12.727

[4] For space considerations we only report the regression output of the first four tests in Table 3. Regression results for the final two tests are available upon request. We do, however, discuss the findings of all robustness tests in the text.

(75 % threshold)	(48.185)	(6.666)				(10.156)
PFM quality, below the threshold	.	.	-13.936**	.	.	.
(60 % threshold)			(6.725)			
PFM quality, above the threshold	.	.	-13.824**	.	.	.
(60 % threshold)			(6.695)			
PFM quality, below the threshold	.	.	.	-13.754**	.	.
(70 % threshold)				(6.752)		
PFM quality, above the threshold	.	.	.	-15.828**	.	.
(70 % threshold)				(6.534)		
PFM quality, below the threshold	.	.	.	.	-12.079*	.
(80 % threshold)					(6.846)	
PFM quality, above the threshold	.	.	.	.	-17.191**	.
(80 % threshold)					(6.756)	
logarithm of per capita GDP	-171.511***	-22.845***	-23.030***	-22.820***	-23.209***	1.522
	(24.537)	(3.040)	(3.055)	(3.022)	(3.024)	(2.949)
CPIA rating	-33.063	-8.846	-8.758	-8.464	-9.869	-18.257**
	(45.750)	(6.271)	(6.085)	(6.030)	(6.002)	(7.110)
health expenditures (% of GDP)	8.699	-0.291	-0.180	-0.197	-0.429	-0.990
	(12.564)	(1.042)	(0.958)	(0.952)	(0.935)	(1.154)
logarithm of population	9.568	1.416	2.231**	1.848*	1.219	0.794
	(10.881)	(1.137)	(0.986)	(0.985)	(1.150)	(2.062)
year	-1.427	.	-1.639***	-1.587***	-1.589***	-3.641***
	(3.555)		(0.533)	(0.520)	(0.525)	(0.871)
year-fixed effects	*no*	*yes*	*no*	*no*	*no*	*no*
Observations	207	215	215	215	215	214
R-squared	0.548	0.652	0.637	0.639	0.644	0.177

Cluster-robust standard errors in parentheses. Constant not reported.

*** p<0.01, ** p<0.05, * p<0.1

Equation (1) of Table 3 indicates that similar results appear when replacing U5 mortality with maternal mortality—measured as the number of maternal deaths per 100,000 live births—as our dependent variable. That is, an increase in PFM quality has a larger impact in countries where a greater share of resources is channeled through government systems. Equation (2) shows that results do not substantially differ when replacing the year trend with year fixed effects.

In equations (3)-(5), we estimate model (1) but vary the 75 percent threshold level to a 60, 70, and 80 percent threshold, respectively. Ceteris paribus, the effect should be amplified the higher the threshold, which is what equations (3)-(5) indeed show: increasing the threshold from 60 percent to 80 percent decreases U5 mortality from 13.8 deaths to 17.1 deaths with a one-unit

increase in PFM quality. In other words, an improvement in PFM quality leads to a larger impact in countries that rely more heavily on public financing of health interventions. Equations (3)-(5) also indicate that our results are robust to the choice of the threshold. Interestingly, at the 60 percent threshold level, we do not observe a differential impact of PFM quality across health systems.

Next, we implement a falsification test to examine if the relation between health spending, PFM, and health outcomes is driven by unobserved governance aspects. That is, it could be that the statistically significant association between PFM quality, health financing, and health outcomes is capturing a broader relationship between good public sector governance and health outcomes. To test whether this is the case, we substitute our dependent variable—U5 mortality—with the time it takes to start a business, another outcome related to public sector governance. In this regression, significant coefficient estimates for the interaction term would suggest that the association between PFM quality, health financing, and health outcomes is driven by unobserved governance aspects. However, equation (6) indicates that this is not the case as the coefficient estimates for PFM quality do not come in significantly at conventional levels. Interestingly, when dropping the CPIA rating as a control variable, the coefficient estimates for PFM quality—for both public health and non-public health systems—come in significantly negative in a regression with time to start a business as the dependent variable, suggesting that indeed governance matters.[5] Consequently, leaving out overall institutional quality as a control variable would lead to a spurious correlation.

As a fifth robustness test, we restrict the sample so that only the most recent observation for each country is included in the analysis. Estimating equation (1) on this reduced sample of 116 observations again indicates a significant association between PFM and U5 mortality: a one-unit increase in PFM quality is associated with a reduction in the U5 mortality rate by about 16 deaths per 1,000 live births, a finding statistically significant at the 5 percent level. It is important to note that the differential impact of health financing only becomes significant at the 80 percent threshold (β_1=-14.9**; β_2=-17.1** at the 80 percent threshold vs. β_1=-15.5**; β_2=-16.5** at the 75 percent threshold).

Finally, we estimate the baseline model but replace per capita GDP and health expenditures over GDP with per capita health expenditures. In this model, results come out even stronger, where a one-unit increase in PFM quality is associated with a reduction in the U5 mortality rate by about 23 deaths per 1,000 live births, a result statistically significant at the 1

[5] Results are not reported here but are available upon request.

percent level. In countries where more funds are channeled through the public system (75 percent threshold), a one-unit increase in PFM quality is associated with a reduction in the U5 mortality rate by about 27.1 deaths per 1,000 child births, a finding significant at the 1 percent level.

3.3 Findings for Latin America and the Caribbean

The sample for Latin America and the Caribbean contains 44 observations, corresponding to 24 countries.[6] The average U5 mortality rate in our LAC sample is 26.3 deaths per 1,000 live births, with Haiti coming out at the bottom (83 deaths per 1,000 live births) and Costa Rica coming out on top (10.2 deaths per 1,000 live births). The only country that meets the 75 percent threshold level is St. Vincent and the Grenadines. To avoid empirical results to be driven by a sole country, we reduced the threshold at 70 percent, which also covers Panama, Guyana, Dominica, Colombia, and Costa Rica. The average overall PEFA score is 2.491, with Brazil (3.442, equivalent to a B^+ score) rated as having the highest PFM quality while Haiti (1.461, equivalent to a D^+ score) is ranked at the bottom. On average, PFM quality in LAC is similar across both sides of the financing threshold.

Equation (1) indicates that a one-unit increase in PFM quality is associated with a reduction in the U5 mortality rate of 12.5 deaths per 1,000 live births, a finding statistically significant at the 5 percent level. This is a somewhat lower reduction when compared to the global sample, which may have to do with the fact that, on average, U5 mortality is much lower in LAC (26.3 deaths per 1,000 live births compared to 58.8 deaths per 1,000 live births). Interestingly, equation (2) shows that the coefficient estimates for the interaction term are not significantly different from each other. These results suggest that, contrary to the global sample, in LAC the share of financing channeled through the government system does not matter for health outcomes. Generally, robustness tests confirm these findings (see Table A.1 in the Appendix).

How to explain this difference between the global sample and the LAC sample? There is a lot of heterogeneity in terms of how funds are channeled through the government system, and the effect of financial management on the adequate use of funds is likely to depend on this. Countries that make greater use of transfers to semi-autonomous institutions such as social security funds are less reliant on strong PFM systems, as it is easier to manage transfers than to administer budget formulation, releases, and execution for many individual spending agencies or facilities. Therefore, there may still be a significant amount of funds channeled through the budget, but the strength of PFM is less likely to matter than if the government alone were to implement

[6] The countries included in the LAC sample are: Belize, Bolivia, Brazil, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Nicaragua, Panama, Paraguay, Peru, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Trinidad and Tobago, and Uruguay.

services. As insurance funds in the LAC region are more exhaustively developed and used than in other regions such as Africa or South Asia, this may partially help to explain this observation.

Table 4: Regression Results -- LAC Sample

VARIABLES	(1) under-5 mortality	(2) under-5 mortality
PFM quality	-12.472**	.
	(4.990)	
PFM quality in countries below the 70% threshold	.	-12.639**
		(5.076)
PFM quality in countries above the 70% threshold	.	-11.552**
		(4.733)
logarithm of per capita GDP	-10.621***	-10.688***
	(3.566)	(3.644)
year	-1.056*	-1.039
	(0.616)	(0.618)
CPIA rating	-2.464	-2.963
	(3.729)	(3.817)
health expenditures (% of GDP)	-1.683*	-1.776*
	(0.937)	(0.927)
logarithm of population	2.413***	2.473***
	(0.592)	(0.612)
Observations	44	44
R-squared	0.713	0.717

Cluster-Robust standard errors in parentheses. Constant not reported

*** p<0.01, ** p<0.05, * p<0.1

4. Summary and Concluding Remarks

This study investigates whether the quality of spending matters for improved health outcomes and finds that indeed it does. Employing OLS on a sample of 215 observations indicates that a one-unit increase in PFM quality is associated with a reduction in the U5 mortality rate of about 14 deaths per 1,000 live births, a finding statistically significant at the 5 percent level. For countries that channel at least 75 percent of total health expenditure through the government system, this rate of reduction increases to 17 deaths per 1,000 child births. These results are robust to using an alternative dependent variable, adding year fixed effects, a sensitivity test where we vary the health financing threshold, a falsification test to verify if results are driven by unobserved governance aspects, a sample restriction, and the inclusion of different controls.

Findings for the Latin America and Caribbean region are broadly consistent with the global sample, though less pronounced, and there is no differential effect for countries across the financing threshold. We relate the latter result to the fact that insurance funds and semi-autonomous institutions in LAC are more developed than other regions.

While the directions of these findings may be intuitive, it has profound implications. It evidences that the pursuit of universal health coverage and the progress toward related SDGs will be costlier if enabling systems are not in place. Given the many competing demands on fiscal resources, evidencing value for money for investing in human capital matters for ministries of finance and the development community alike and will strengthen health ministries' ability to advocate for a greater share in the budget. As a corollary, if investing in public financial management systems offers increasing returns to health spending, the marginal benefit of such expenditures may well outweigh the marginal cost and thus be an endeavor worth pursuing. This paper suggests that on average good PFM matters significantly and that it matters significantly more in health systems that are more reliant on government financing.

The paper does not, however, provide explicit guidance as to what PFM reforms countries should pursue. Different types of PFM reforms are likely to have different effects on health outcomes. For example, the extent to which competitive and transparent procurement affects access to drugs and medical supplies is an interesting area for future research. Similarly, whether progress in budgeting and budget execution leads to efficiency gains and more equitable resource allocations is a hypothesis worth exploring.

Our study also assumes that the effect of improved PFM on health outcomes is linear. This may not be the case. Furthermore, the extent to which some PEFA dimensions are relevant will depend on country context. Whether and how donor funds are captured in the budget for example will matter more in countries that have significant inflows from donor funds. Poor donor integration may not mean all that much if their absolute contribution is negligible. Other PFM reforms may actually be inversely related to health outcomes. Rigorous ex-ante commitment control, for example, may inhibit the flexibility necessary for service providers to react to changing needs and improvements in this dimension may actually not be corresponding to improved health outcomes at all. Program budget reforms may be considered good practice but diminish facility autonomy by elevating the budget holder role from the facility to the program manager. Treasury single account reforms may take away access to financial services from facilities and therefore diminish their autonomy and financial accountability. This paper encourages further research along these lines. For countries pursuing PFM reforms for improved health service delivery, purposeful qualitative work may provide the most relevant and contextualized policy guidance.

Appendix: Robustness Tests LAC sample

Table A.1: Robustness Tests -- LAC Sample

MODEL	(1) Alternative dep. var	(2) year fixed effects	(3) 60 percent threshold	(4) 75 percent threshold	(5) falsification test
PFM quality, below the threshold	-55.039*	-7.865	.	.	-10.726
(70 % threshold)	(29.378)	(4.680)			(21.140)
PFM quality, above the threshold	-49.103*	-6.423	.	.	-8.593
(70 % threshold)	(27.731)	(4.374)			(19.900)
PFM quality, below the threshold	.	.	-12.819**	.	.
(60 % threshold)			(5.112)		
PFM quality, above the threshold	.	.	-12.099**	.	.
(60 % threshold)			(5.054)		
PFM quality, below the threshold	.	.	.	-12.438**	.
(75 % threshold)				(5.098)	
PFM quality, above the threshold	.	.	.	-13.238***	.
(75 % threshold)				(4.629)	
logarithm of per capita GDP	-84.262***	-11.879***	-10.232***	-10.676***	-5.157
	(25.152)	(3.489)	(3.471)	(3.589)	(14.397)
CPIA rating	5.759	-2.413	-3.442	-2.392	-35.572**
	(28.551)	(5.366)	(4.398)	(3.773)	(13.950)
health expenditures (% of GDP)	2.499	-1.946**	-1.563*	-1.713*	5.072
	(4.990)	(0.848)	(0.880)	(0.980)	(4.133)
logarithm of population	11.726**	2.132***	2.530***	2.380***	6.912*
	(4.795)	(0.569)	(0.577)	(0.610)	(4.014)
year	-8.413**	.	-1.184**	-1.064	-5.872**
	(3.950)		(0.561)	(0.627)	(2.392)
year-fixed effects	*no*	*yes*	*no*	*no*	*no*
Observations	40	44	44	44	44
R-squared	0.753	0.787	0.716	0.714	0.380

Cluster-robust standard errors in parentheses. Constant not reported.

*** p<0.01, ** p<0.05, * p<0.1

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