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# Healing or Harming? Unveiling the Dual Impact of IMF Reforms on Child Health Outcomes in Developing Nations

Michael Chletsos<sup>1</sup>  | Nikolaos Mylonidis<sup>2</sup>  | Andreas Sintos<sup>3</sup> <sup>1</sup>Department of Economics, University of Piraeus, Piraeus, Greece | <sup>2</sup>Department of Economics, University of Ioannina, Ioannina, Greece | <sup>3</sup>Department of Economics and Management, Université du Luxembourg—Campus Kirchberg, Luxembourg, Luxembourg**Correspondence:** Andreas Sintos ([andreas.sintos@uni.lu](mailto:andreas.sintos@uni.lu))**Received:** 10 February 2024 | **Revised:** 20 January 2025 | **Accepted:** 7 July 2025**Keywords:** child mortality rates | IMF conditionality | IMF programs

## ABSTRACT

We provide new insights regarding the impact of IMF programme participation and imposed policy reforms on child mortality rates using a sample of developing countries from 2000 to 2013. To account for the selection bias related to both IMF participation and conditionality, we employ a recently developed compound instrumental variables methodology. Using annual data, we show that IMF programme participation and state-owned enterprise (SOE) privatisation conditions improve recipient countries' child mortality rates, whereas all other conditions exert an adverse effect on child mortality rates. These novel findings highlight the heterogeneous effect of IMF conditionalities and document that mandated policy reforms aimed at alleviating mismanagement and inefficiencies in SOEs can actually lead to lower child mortality rates. More generally, our results suggest that the IMF's focus on specific structural reforms, rather than on widening the scope of conditionality, is likely to yield better public health outcomes.

**JEL Classification:** F33, F34, I12

## 1 | Introduction

The imperative of child survival emerges as a paramount objective within the Sustainable Development Goals (SDGs), ratified by the United Nations in 2015. This initiative represents a global appeal to eradicate poverty, safeguard environmental integrity and guarantee universal peace and prosperity by the year 2030. Accordingly, neonatal and child mortality rates are critical to achieving the goal of ending preventable deaths of children and ensuring the provision of good health and well-being at all ages. Not surprisingly, these mortality rates are often viewed as a major public health criterion and provide evidence for the socioeconomic development of a country.

Data from World Development Indicators on child mortality indicate a continuous decline in the number of newborn and under-5 child deaths over the last 30 years. For instance, the world average of under-5 mortality rate fell from 93 deaths per

1000 live births in 1990 to 38 in 2021. The spatial distribution of child mortality is not uniform across countries, with sub-Saharan and South Asian countries having the highest rates of under-5 mortality in the world. There are several factors which are closely related to child mortality, including, inter alia, socioeconomic and demographic characteristics, the structure and efficiency of the health system, access to safe water, electricity and vaccination, hygiene and macroeconomic factors (Guilkey and Riphahn 1998; Wang 2003; Gobebo 2021; Yemane 2022; Murad et al. 2023; Yerdessov et al. 2023).

Most developing countries face severe economic and social problems, and international organisations (IOs) play an important role in helping to address them. The International Monetary Fund (IMF) stands out as one of the most powerful IOs in the post-World War II era (Stone 2002). Initially founded with a membership comprising 44 states in 1946, it has experienced significant expansion, with its membership currently

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encompassing 190 states. Until 1973, the IMF was the guarantor of exchange rates among advanced economies. More recently, in the 1980s the role of the IMF has evolved into that of a crisis manager for both developing and developed countries. Extensive scholarly research underscores the multifaceted effects of IMF loan programmes on recipient nations. These effects span various dimensions, notably influencing economic growth rates (Atoyán and Conway 2006; Bas and Stone 2014; Dreher 2006; Gehring and Lang 2020), altering patterns of poverty and income inequality (Forster et al. 2019; Lang 2021; Oberdabernig 2013), affecting labour rights (Blanton et al. 2015; Reinsberg, Stubbs, et al. 2019), modulating public expenditure (A. Kentikelenis and Stubbs 2023; Rickard and Caraway 2019; T. Stubbs et al. 2020) and shaping tax revenue structures (Blanton et al. 2018; Crivelli and Gupta 2015; Reinsberg, Kentikelenis, et al. 2019), among others.

The policies and measures imposed by the IMF on countries experiencing economic crises or seeking loans are often subject to criticism for their impacts on society and the economy. Some of the primary sources of criticism include the toughness of austerity programmes, high loan interest rates and the structural reforms imposed by the IMF, which tend to deteriorate further, in the long run, the weak economies of developing countries (Li et al. 2015). These reforms may include cuts to social programmes, reductions in wages and pensions and privatisation of state-owned enterprises. Many researchers (Makedonas et al. 2015; Forster et al. 2019; Thomson et al. 2017; Li et al. 2017) argue that these reforms often worsen poverty and inequalities in recipient countries, as their primary objective is to foster economic stability, rather than improving the health status or well-being of their citizens. Hence, any influence stemming from IMF interventions on health status, poverty and unemployment in developing countries should be seen through the lens of indirectness.

In this paper, we empirically examine the effect of both IMF participation and concomitant conditionalities on recipient countries' child mortality rates. We focus on the mortality of children for the following reasons: First, child mortality rates are widely recognised as a bellwether of population health (McGuire 2006). Second, and more importantly, child mortality reflects economic and social development in a rather *sensitive* way, as it provides a broader view of the effectiveness of recipient countries' health care systems, nutrition, immunisation programmes and sanitation facilities.<sup>1</sup>

Previous studies focus on the pre-2000 period and handle IMF programmes as homogeneous, thus being unable to distinguish the different impact of IMF participation and IMF conditionality on outcome variables.<sup>2</sup> In our analysis, we place the spotlight on state-owned enterprise (SOE) privatisation conditions (while controlling for all other conditions), which allegedly aim at altering the underlying structure of the economies (A. E. Kentikelenis et al. 2016) by strengthening competition and improving firms' efficiency and productivity. Therefore, SOE privatisation is expected to contribute to economic development and yield better health outcomes by improving water quality and sanitary conditions and facilitating the access of a growing number of citizens to these goods. Daoud and Reinsberg (2019)

also examine the effect of privatisation reforms on under-5 mortality. Yet, they ignore the potential impact of other IMF conditions on mortality rates; as such, their analysis suffers from omitted variable bias, and their estimates may likely capture the effects of other (highly collinear) conditions (Forster et al. 2020).

A. E. Kentikelenis (2017) argues that IMF's structural adjustment policies exert a multidimensional impact on borrowing countries' health systems. First, the implementation of these programmes may cause changes in the structure of the financing of health care by substituting public health expenditures with private health expenditures. Second, these programmes are related to austerity measures which influence the public sector health care workforce via redundancies, hiring halts and wage reductions. Third, the imposed revenue-raising reforms and cost-cutting measures may affect health coverage. Fourth, IMF-mandated deregulation policies can also affect the public-private mix in health service provision by stimulating the private sector's role. Fifth, IMF programmes often lead to the decentralisation of the health system by transferring fiscal and operational responsibilities to the subnational level. Lastly, these programmes include priority spending floors to protect vulnerable groups (such as children) and set minimum expenditures mostly on health and education.

To address the challenges previously delineated, this study conducts a comprehensive evaluation of the effects of IMF loan programmes—conditional upon the requisite policy reforms—on child mortality rates during the post-2000 era, utilising panel data from 116 developing countries. In pursuit of this objective, we utilise an advanced econometric methodology, as introduced by T. Stubbs et al. (2020), which effectively mitigates the endogeneity bias associated with IMF participation and the stipulated conditionality. Our main findings suggest that IMF programme participation and SOE privatisation conditions improve recipient countries' child mortality rates, whereas all other remaining conditions exert a detrimental effect. This, in turn, highlights the heterogeneous effect of IMF conditionalities and documents that mandated policy reforms aimed at alleviating mismanagement and inefficiencies in SOE can actually lead to better health outcomes. To our knowledge, this is a novel finding given that the previous evidence (see A. E. Kentikelenis et al. (2016) and the references therein) suggests that the increasing number of IMF conditions is linked to a weakening of health protection policies, insufficient public health resources and impeded efforts to reduce child and maternal mortality. Therefore, our results indicate that IMF's focus on specific structural reforms, rather than on widening the scope of conditionality, is likely to yield beneficial effects on child health.

The remainder of this paper is organised in the following manner: Section 2 provides a comprehensive review of the pertinent literature. Section 3 delineates the various mechanisms by which IMF intervention influences child mortality rates. In Section 4, the data utilised for analysis and the empirical methods applied are elucidated. Section 5 presents the findings derived from the empirical investigation. The paper is drawn to a conclusion in Section 6.

## 2 | Literature Review

Generally, the existing empirical evidence points to the negative effects of IMF loan programmes on recipient countries' infant/child mortality rates and child health. J. M. Shandra et al. (2004), for example, investigate the infant mortality effects of IMF loan programmes in 59 developing countries over the 1980–1997 period using a two-point lagged dependent variable panel regression. They find that IMF programme participation significantly deteriorates infant mortality rates. This finding is confirmed for a larger set of developing countries (Makedonas et al. 2015) as well as for individual countries, including Argentina, Uruguay (Oliver 2006) and Cameroon (Pongou et al. 2006).

The negative effects of IMF programmes on mortality rates and child health continue to hold when selection bias is accounted for. Stuckler et al. (2008) use a control function approach and show that IMF programme participation in Eastern European and former Soviet Union countries is associated with higher mortality rates from tuberculosis. C. L. Shandra et al. (2012) also report detrimental effects of IMF structural adjustment loans on infant mortality in 32 sub-Saharan countries when using a two-way selection model. More recently, Daoud et al. (2017) use a multilevel logistic regression and show that IMF loans exert a damaging effect on child malnourishment in 67 developing countries.<sup>3</sup> Daoud and Reinsberg (2019) decompose IMF policies into fiscal, public-sector employment, privatisation of state-owned enterprises and price liberalisation and examine their impact on public health expenditure, child vaccination and child mortality in 128 developing countries during 1980–2014. Using an instrumental variables approach, they conclude that IMF policy reforms on public-sector employment negatively affect child health. Forster et al. (2020) focus on the effect of IMF-imposed labour market reforms on health system access and neonatal mortality rates for a sample of 137 developing countries between 1980 and 2014. They also apply an instrumental variables approach and show that structural adjustment reforms exert a harmful effect on health system access and neonatal mortality.

Very few studies reach opposing conclusions concerning the association between IMF loan programmes and borrowing countries' infant mortality rates. Hajro and Joyce (2009) show beneficial effects of IMF programmes on infant mortality in 82 low- and middle-income countries for the period 1985–2000. In particular, the authors find that nonconcessional IMF loans reduce infant mortality in developing countries (when interacted with economic growth), whereas they find no association between the two for concessional loans.<sup>4</sup> Beneficial effects of IMF programmes on infant mortality are also reported by Bird et al. (2020) for a sample of 48 low- and middle-income countries during 1990–2015. Specifically, the authors find that after the completion of a concessional or nonconcessional programme, there is evidence of a decline in infant mortality rates.

The articulation of contrasting perspectives on the ramifications stemming from IMF interventions on public health is substantially underpinned by the theoretical framework employed to dissect these policy measures. The recipient nations of IMF support are characterised by their confrontation with debt

crises, substantial economic quandaries, unemployment and destitution. The focal point of inquiry pertains to the extent to which the IMF's recommended reforms are capable of either facilitating or impeding these nations in augmenting their infrastructural capacities and engendering prerequisites for advancements in both economic and societal dimensions.

## 3 | Pathways Through Which IMF Intervention Affects Child Health Outcomes

### 3.1 | SOE Privatisation

SOEs comprise a significant share of economic and public sector activity, typically specialising in network industries such as water, energy and other key public services critical for improving social and health conditions. SOEs are prone to financial weaknesses for many reasons, including, inter alia, capacity constraints and weak governance and oversight (Baum et al. 2020). As such, IMF support programmes often incorporate the conditionality of SOE privatisation as a means to reduce fiscal burdens, improve service delivery and enhance economic performance.

A number of studies indicate that privatisation of SOEs promotes efficiency, prompts political and economic competition and reduces public management corruption (Ruger 2005; Alishahi-Tabriz et al. 2013; Clemens and Kremer 2016). The IMF operates under the assumption that privatisation incentivises investments which lead to higher health care quality (Daoud and Reinsberg 2019). The mechanisms through which privatisation can potentially improve child mortality in recipient countries are the following: First, privatised firms operate more efficiently in relation to SOEs (Omran 2004). This can result in better public service delivery, including the expansion of water supply and sewerage network, fewer water shortages and cleaner water, all of which are crucial for public health and child mortality in particular. Galiani et al. (2005) find that child deaths fell by 8% in Argentinean municipalities which privatised their water services in the 1990s and that this effect was at least three times higher in the poorest areas. Similar improved health outcomes after water privatisation are reported for urban municipalities in Colombia (Barrera-Osorio and Olivera 2007) and in Brazil (Saiani and de Azevedo 2018), as well as in 39 African countries (Kosec 2014). In a similar vein, electricity sector privatisation can also improve health outcomes in the developing world through network expansion and service improvement in terms of fewer supply shortages. Besides electricity being essential for operating water pumping systems and improving access to clean water (Luna et al. 2019; Nguea 2024), it is also crucial for the provision of clean and safe household environments, the functioning of life-saving equipment and the preservation of medicines.<sup>5</sup> Gonzalez-Eiras and Rossi (2012) confirm that electricity privatisation in Argentina improved service coverage, reduced the frequency of supply interruptions and decreased child mortality rates caused by food poisoning in the 1990s.

Second, the IMF supports privatisation as a means of broader economic reforms that foster economic growth in recipient

countries. Hajro and Joyce (2009) show that growth induced by IMF programmes in a panel of 82 countries significantly reduces infant mortality. This finding likely reflects the fact that higher household incomes can enable better access to health care services, higher living conditions and better nutrition, thereby indirectly affecting health outcomes.

Third, privatisation of health care in particular may induce competition effects and improve performance across the entire health system as providers strive to attract and retain patients (Goodair and Reeves 2024). Bangladesh, for instance, successfully reduced infant mortality by two thirds between 1990 and 2011 by fostering competition among health care providers and encouraging partnerships with the private sector (WHO 2015). At the same time, the provision of private health care services in IMF recipient countries can potentially lead to efficiency gains, albeit the outcomes certainly depend on implementation and context. Garcia-Escribano et al. (2022) document significant health inefficiencies, especially in developing countries, that can translate into years of lost life (up to 10 years in sub-Saharan countries) and up to 2% of GDP on wasted resources. In this sense and given that private companies often have stronger incentives to manage resources more efficiently to maximise profits, privatisation of health care can lead to better allocation of resources and reduced wastage.

However, the privatisation of state-owned health services might not always result in desired outcomes. It has been documented that privatisation often reduces access to health care for low-income households (Ismi 2004; Pongou et al. 2006) due to the increase in the price of services (Barlowe and Clark 2003). In addition, cost-cutting measures to increase health services efficiency might compromise patient care and negatively affect the quality of health care provision. As such, the success of privatisation depends on effective regulation and oversight to ensure that the benefits are equitably distributed and that health service quality is maintained.

To address these issues, the IMF has recently advocated the introduction of conditional cash transfers (CCTs) through loan programmes to middle- and lower-income member states. CCTs are expected to affect health outcomes, and especially child mortality, through the income and conditionality effect, that is, by transferring income to the beneficiary families' contingent on behavioural requirements, such as attending regular health checkups. Ranganathan and Lagarde (2012) argue that there is rigorous evidence showing that CCTs exert beneficial effects on health outcomes by decreasing barriers to access for the poorest populations and incentivising them to use health services. It should be pointed out, however, that CCTs cannot improve health outcomes in low- and middle-income countries in isolation. Instead, these demand-side mechanisms should be implemented in combination with supply-side factors (e.g., adequate health infrastructure) to maximise their positive impact.

### 3.2 | Other IMF Conditions

The effects of IMF-imposed structural conditions on child health outcomes are not confined only to SOE privatisation. First, IMF

programmes frequently require recipient countries to adjust their government spending, which, in turn, alters the quality and quantity of health services provided to children. The relevant literature on the association between IMF programmes and recipient countries' government expenditures is inconclusive (Bird et al. 2020; Gupta et al. 2018; Nooruddin and Simmons 2006). On the one hand, a strand of literature highlights that IMF programmes can boost government consumption, including health and social expenditures (Clements et al. 2013; Huber et al. 2008; Mumssen et al. 2013), which results in better health outcomes (Bird et al. 2020; Hajro and Joyce 2009).<sup>6</sup> On the other hand, a number of studies highlight that although governments tend to subsidise the costs of immunisations, food and health services (Daoud 2007, 2015; Halleröd et al. 2013), these subsidies are often the first to be dismantled under IMF programmes given their fiscal discipline provisions (C. L. Shandra et al. 2011).

IMF-supported programmes also exert a catalytic effect on foreign investment and aid (Clements et al. 2013). Woo (2013) argues that this effect is stronger in the case of IMF programmes with stricter conditions than in those with less stringent conditions. The inflow of these resources allows, in turn, host countries to channel resources back into the health care sector and combat health deprivations (T. H. Stubbs et al. 2016; Bird et al. 2020; Hajro and Joyce 2009). Mishra and Newhouse (2007) use data from 118 countries between 1973 and 2004 and document discernible effects of health aid on infant mortality (a doubling of per capita health aid is associated with a 2% reduction in infant mortality rate).

In addition, IMF programmes can affect health outcomes indirectly via second-order consequences of policy reforms (Daoud et al. 2022). Specifically, Daoud and Reinsberg (2019) argue that IMF policy conditionality often forces governments to set a cap on public sector wages (Rickard and Caraway 2014). As such, lower wages in the health sector may have adverse effects on the quality and quantity of health care staff available to treat child and maternal health conditions (A. E. Kentikelenis et al. 2015). IMF policy reforms also frequently aim at liberating borrowing countries' trade and investment regimes by lowering tariffs, quotas, duties and taxes (Dreher 2009). Although these policies may eventually be beneficial for countries, they often result in lower short-term revenues which reduce government budgets for targeted social spending (Daoud et al. 2022). This, in turn, may have negative implications for child and health outcomes (Thomson et al. 2017; C. L. Shandra et al. 2012). In a similar vein, policy reforms enacted by the IMF frequently encompass devaluations of the domestic currency, which substantially increase the cost of imported medicines and other medical supplies, thereby adversely affecting child mortality (C. L. Shandra et al. 2011). Lastly, IMF conditionality relates to the borrowing country's political influence and its relationship with the IMF. It is well documented that allies of big powers tend to experience favourable treatment by the IMF in terms of the volume of resources and the number of conditions they receive (Barro and Lee 2005; Vreeland 2007; Woo 2013). The IMF also takes different negotiation positions if the recipient country complies with its requirements (Oliver 2006; Pongou et al. 2006). As such, the relationship and the political ties with the IMF may result in less stringent and more favourable terms for maintaining social spending, including health services for children.

## 4 | Data and Empirical Specification

### 4.1 | Data

This study employs data encompassing 116 developing countries spanning from the year 2000–2013. The determination of countries included and the delineation of the time period are contingent upon the availability of pertinent data. The sample encompasses both years characterised by IMF programme participation and those devoid of such involvement, encapsulating countries with no historical engagement in IMF programmes.<sup>7</sup> As is customary in numerous empirical investigations, our panel exhibits an unbalanced structure, characterised by the presence of missing data points across certain years and countries within the specified sample period.

For the construction of our dataset, we compile data from World Development Indicators (WDI), IMF lending arrangements and the databases of Cruz et al. (2018), A. E. Kentikelenis et al. (2016), T. Stubbs et al. (2020) and Teorell et al. (2016). As dependent variables, we use three different child mortality rates, namely, (i) infant, (ii) neonate and (iii) under-5 mortality rates, which are all measured per 1000 live births. Mortality rates are some of the most important measures of global health (UNICEF 2016; WHO (World Health Organization) 2019).

In accordance with Dreher's (2006) seminal work, our first main explanatory variable (IMF programme) assumes the form of a binary or dummy variable. Specifically, it adopts a value of one to signify the presence of an IMF programme persisting for a minimum duration of 5 months within a given year  $t$ , while assuming a value of zero in instances where no such programme is operational. The data utilised in this context are sourced from T. Stubbs et al. (2020) and the IMF Lending Arrangements database. In assessing our second main variable of interest, namely, IMF conditionality, which pertains to the total number of policy reforms imposed on each recipient country in a given year, we rely on data extracted from A. E. Kentikelenis et al. (2016), originating directly from internal documents of the IMF. More specifically, we disaggregate IMF conditions into SOE privatisation and other conditions. The latter encompasses the number of total conditions minus the number of SOE privatisation conditions.<sup>8</sup>

In line with Forster et al. (2020), the set of control variables includes education, female population, ethnic fractionalisation, government orientation and the democracy index. The data for education (years of schooling), the percentage of the female population and the index of ethnolinguistic fractionalisation are sourced from Teorell et al. (2016). The variables capturing the political context of health (Navarro and Shi 2001), namely, government orientation and the level of democracy, are both obtained from Cruz et al. (2018).

### 4.2 | Empirical Methodology

In the analytical framework under consideration, countries engage in a dual selection process involving IMF participation and conditionality. This situation introduces a notable

inferential challenge, characterised by non-random selection into IMF programmes and associated policy conditions. First, countries are not randomly assigned into a treatment group of IMF programmes in a given year. Consequently, it becomes essential to adjust for latent or unobserved factors, such as the political will to enact reforms, which exert an influence on both the decision to participate in IMF programmes and the dependent variables under examination (Vreeland 2003). This denotes that IMF programme participation is endogenous, contingent upon both observable and latent determinants. As such, the decision to participate in IMF programmes is influenced by both observed and unobserved factors, rendering the variable of IMF participation endogenous. Although the inclusion of control variables allows for the mitigation of bias arising from observable determinants, the negligence of unobservable factors precipitates a bias attributable to omitted variables. Second, the conditions attached to IMF loans in a given year are also non-randomly assigned. Consequently, another source of endogeneity may emanate from the systematic differences between countries subjected to a greater number of IMF-imposed conditions as opposed to those encumbered with fewer. Absent appropriate corrections, such endogeneity would lead to an underestimation of the genuine impact of IMF conditionality on the dependent variables.

To mitigate the aforementioned inferential challenges, we adopt the methodological framework delineated by T. Stubbs et al. (2020), wherein we undertake the estimation of a system of four equations, inclusive of instrumental variables, employing the maximum likelihood estimation technique while concurrently accommodating the presence of correlated errors across the equations (Roodman 2011). In a more granular sense, we employ an instrumental variables strategy for IMF participation, utilising the interaction between the within-country average of IMF programme participation over the designated temporal span and the IMF's fiscal constraints, which are proxied by the logarithmic transformation of the IMF liquidity ratio (Lang 2021; Nelson and Wallace 2017; T. Stubbs et al. 2020). The IMF liquidity ratio is calculated as liquid resources divided by liquid liabilities.

In relation to the conditions imposed by the IMF pertaining to the privatization of SOEs, in accordance with T. Stubbs et al. (2020), meticulous attention is directed towards incorporating all residual conditions, delineated as the total conditions minus those pertinent to SOE privatisation, within the estimated models. This practice ensures that the influence of these remaining conditions on the outcomes under scrutiny is appropriately accounted for, thereby mitigating the risk of erroneously attributing their effects solely to the policy condition of interest. To address endogeneity concerns, we employ an instrumental variables approach wherein SOE privatisation conditions are instrumented using the interaction of the within-country average of this condition and the IMF's year-on-year budget constraint (T. Stubbs et al. 2020). We use a similar strategy in instrumenting all remaining conditions.

We contemplate that this instrumentation strategy is valid. First, these instruments fulfil the relevance criterion because in years with resource scarcity, that is, when the liquidity ratio is lower, the IMF is likely to provide fewer loans (Vreeland 2003)

carrying a greater number of conditions to recipient countries (Dreher and Vaubel 2004; Lang 2021; T. Stubbs et al. 2020). Second, the instruments are likely to fulfil the exclusion restriction because the Fund's budget constraint—determined independent of a given country—affects child mortality rates only through the IMF measure of interest (participation and conditionality, respectively), conditional on a country's mean exposure to IMF programmes, the controls, and country and year fixed effects (Forster et al. 2020).

Drawing upon the preceding discussion, our delineated identification framework is expounded as follows:

$$\widehat{\text{IMF}}_{it-1} = i_0 + i_1(\overline{\text{IMF}}_i \times \text{Budget}_t)_{t-2} + i_2 X_{it-2} + \gamma Z_{it-2} + \kappa_i + \delta_i \quad (1)$$

$$\hat{P}_{it-1} = p_0 + p_1(\overline{P}_i \times \text{Budget}_t)_{t-2} + p_2 X_{it-2} + \mu_i + \delta_i, \quad (2)$$

$$\hat{O}_{it-1} = o_0 + o_1(\overline{O}_i \times \text{Budget}_t)_{t-2} + o_2 X_{it-2} + \mu_i + \delta_i, \quad (3)$$

$$\text{Mor}_{it} = \beta_0 + \beta_1 \widehat{\text{IMF}}_{it-1} + \beta_2 \hat{P}_{it-1} + \beta_3 \hat{O}_{it-1} + \beta_4 X_{it-1} + \mu_i + \delta_i + \varepsilon_{it}, \quad (4)$$

where  $i$  symbolises a country and  $t$  a year. Equation (4) is the outcome equation where  $\text{Mor}$  measures child mortality rates.  $\widehat{\text{IMF}}$  is the fitted value for IMF participation derived from Equation (1);  $\hat{P}$  is the fitted value for the number of SOE privatisation conditions obtained from Equation (2);  $\hat{O}$  is the fitted value for the number of other conditions based on Equation (3);  $X$  denotes the vector of control variables described in Section 4.1;  $\mu$  and  $\delta$  represent country and year fixed effects, respectively, and  $\varepsilon$  is the error term. All explanatory variables are lagged by 1 year to allow for a delayed effect. Finally, we calculate robust standard errors (clustered at the country level) to deal with heteroskedasticity and serial correlation.

Equation (1) represents a probit model wherein the dependent variable is the lagged IMF programme participation. It is modelled as a function of the second lag of the compound instrument,  $\overline{\text{IMF}} \times \text{Budget}$ , alongside two sets of covariates: the vector of control variables,  $X$  (lagged two periods), and the vector of explanatory variables pertinent to the determination of selection into IMF programmes,  $Z$  (lagged two periods). More specifically, within Vector  $Z$ , several variables are encompassed to encapsulate macroeconomic conditions. These variables encompass GDP per capita, GDP growth, total reserves and government balance (Gündüz 2016). Additionally, Vector  $Z$  incorporates a count variable representing countries under IMF programmes, as the participation in such programmes is influenced by the availability of resources from the Fund, which, in turn, is contingent upon the prevailing number of participating countries (Vreeland 2003). Moreover, Vector  $Z$  includes a variable pertaining to past IMF participation, recognising that prior exposure serves as a robust predictor of both present and future programme participation, as evidenced by Bird et al. (2004). Lastly, Vector  $Z$  encompasses a variable designed to control for regime durability, measured by the duration of the existing political order since its last transformation. Finally,  $\kappa$  denotes regional fixed effects, whereas  $\delta$  represents year fixed effects within the specified model framework.<sup>9</sup>

Equations (2) and (3) employ instrumental variables to account for the lagged number of privatisation and other conditions. Specifically, the second lag of the compound instruments, denoted as  $\overline{P} \times \text{Budget}$  and  $\overline{O} \times \text{Budget}$ , respectively, serve as instruments. These equations encompass the vector of control variables,  $X$ , lagged by two periods, along with country fixed effects represented by  $\mu$ , and year fixed effects denoted by  $\delta$ .

## 5 | Empirical Results

Table 1 reports our baseline results using annual data. Each column corresponds to a different mortality rate (infant, neonatal and under-5).<sup>10</sup> In all specifications (Columns 1–3), IMF programme participation and SOE privatisation conditions exert a negative and highly significant effect on child mortality rates. Specifically, in Column 1, countries participating in an IMF programme experience on average lower infant mortality by approximately 5 deaths per 1000 live births (compared to similar countries not under such a programme). The magnitude of this effect is equivalent to a decline in the infant mortality rate by 20% of its standard deviation. Declines of this size are quite common over our full sample period. In particular, in 81 countries (out of 87 countries that received an IMF programme at least once in this period), infant mortality rates dropped 5 or more points between 2000 and 2013.

Furthermore, a one standard deviation increase (0.904) in SOE privatisation conditions leads to a decrease in the infant mortality rate of approximately 1.655 ( $= 0.904 \times 1.8302$ ) fewer deaths per 1000 live births, which corresponds to about 6% of the standard deviation of the outcome variable. Figure 1 visualises the marginal plot of the predicted values of the infant mortality rate along with the 95% confidence intervals. In the absence of an IMF programme, our model predicts a value of 33.8426 for the infant mortality rate. For countries with IMF programmes, the corresponding estimated value is 28.3327 (IMF programme with zero privatisation conditions), which is 5.5099 points lower compared to the predicted value of no IMF programme. Evidently, this divergence increases further with the number of privatisation conditions.

Similar findings are reported for the neonatal mortality rate (Column 2), where an additional year of the IMF programme is associated with a reduction of approximately 1.7543 neonatal deaths per 1000 live births. An increase in privatisation conditions by one standard deviation reduces the neonatal mortality rate by approximately 0.3610 ( $= 0.904 \times 0.3993$ ) deaths per 1000 live births, which corresponds to about 3% of its standard deviation. Based on Figure 2, we note that our model predicts a value of 18.7253 for the neonatal mortality rate in the absence of an IMF programme. This estimated value falls to 16.9710 in the case of the IMF programme with zero privatisation conditions and decreases further as the number of privatisation conditions increases.

In Column 3, IMF participation and conditionality exert the strongest effects on child mortality rates. Specifically, one year of participation in IMF programmes results in a statistically significant reduction of 11.0717 deaths per 1000 live births in

**TABLE 1** | IMF intervention and child mortality rates (annual data).

	(1)	(2)	(3)
	<b>Mortality rates</b>		
	<b>Infant</b>	<b>Neonatal</b>	<b>Under-5</b>
L. IMF programme	−5.5099*** [1.0271]	−1.7543*** [0.3258]	−11.0717*** [1.8701]
L. SOE privatisation	−1.8302*** [0.5301]	−0.3993** [0.1569]	−3.8243*** [1.1775]
L. Other conditions	0.2897*** [0.0715]	0.0792*** [0.0253]	0.5242*** [0.1549]
L. Education	6.8611 [7.5225]	2.3547 [3.8881]	18.4291 [13.9980]
L. Female population	5.5496** [2.6929]	0.7332 [1.3198]	13.2824** [5.3524]
L. Ethnic fractionalisation	135.1170*** [20.7132]	35.3026*** [11.3322]	243.9090*** [39.6219]
L. Government orientation	−0.2413 [0.3798]	−0.1475 [0.1422]	−0.2356 [0.8029]
L. Democracy	−0.5168 [0.4163]	−0.1810 [0.1284]	−0.6109 [0.7557]
Country FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	1093	1093	1093
Within- $R^2$ for outcome equation	0.9755	0.9832	0.9676
Pseudo- $R^2$ for participation equation	0.3767	0.3767	0.3767
F-statistic for participation instrument	169.40	134.13	180.11
Within- $R^2$ for SOE privatisation equation	0.5398	0.5398	0.5398
F-statistic for SOE privatisation	70.10	63.12	80.24
Within- $R^2$ for other conditions equation	0.4853	0.4853	0.4853
F-statistic for other conditions	44.34	45.29	45.46
Joint $F$ -statistic	239.52	188.53	267.88

Note: Standard errors robust at the country level are reported in brackets.  $F$ -tests are Kleibergen–Paap Wald statistics. \*\*\*, \*\* and \* denote statistical significance at 1%, 5% and 10%, respectively.

the under-5 mortality rate. In addition, a one standard deviation increase in SOE privatisation conditions reduces the under-5 mortality rate by approximately 3.4572 ( $= 0.904 \times 3.8243$ ) deaths per 1000 live births or, alternatively, by 8% of its standard deviation. Figure 3 illustrates the predicted value of the under-5 mortality rate (47.4920) in the absence of an IMF programme. For countries under IMF programmes, this predicted value steadily declines with the number of SOE privatisation conditions.

It is worth mentioning that all other remaining conditions retain their highly significant and positive effect across all alternative specifications. Specifically, without an IMF programme, our model predicts infant, neonatal and under-5 mortality rates at 29.2972, 17.4993 and 39.1821, respectively (Figures 4–6). These rates are lower when up to 19, 22 and 21 other conditions are present, respectively, but increase as the number of other conditions exceeds these thresholds. Taken

together, these findings suggest that SOE privatisation conditions operate in a different manner from other conditions which focus on core policy issues such as external debt, monetary and fiscal policy, trade and exchange rates.

These baseline findings are in accordance with previous studies which suggest that SOE privatisation, and especially the privatisation of water supply and sanitation, improves the access to and quality of services (Barrera-Osorio and Olivera 2007; Clarke et al. 2009; Kosec 2012), reduces poverty (Verme 2011) and ultimately exerts a beneficial effect on mortality rates (Galiani et al. 2005; Kosec 2014; Saiani and de Azevedo 2018).

The results of the first stage, as documented in Supporting Information S1: Table A7 in the supplementary Appendix, reveal that the compound instrument employed for assessing IMF participation demonstrates a positive and statistically significant ( $p < 0.01$ ) coefficient. This implies that, given the IMF's

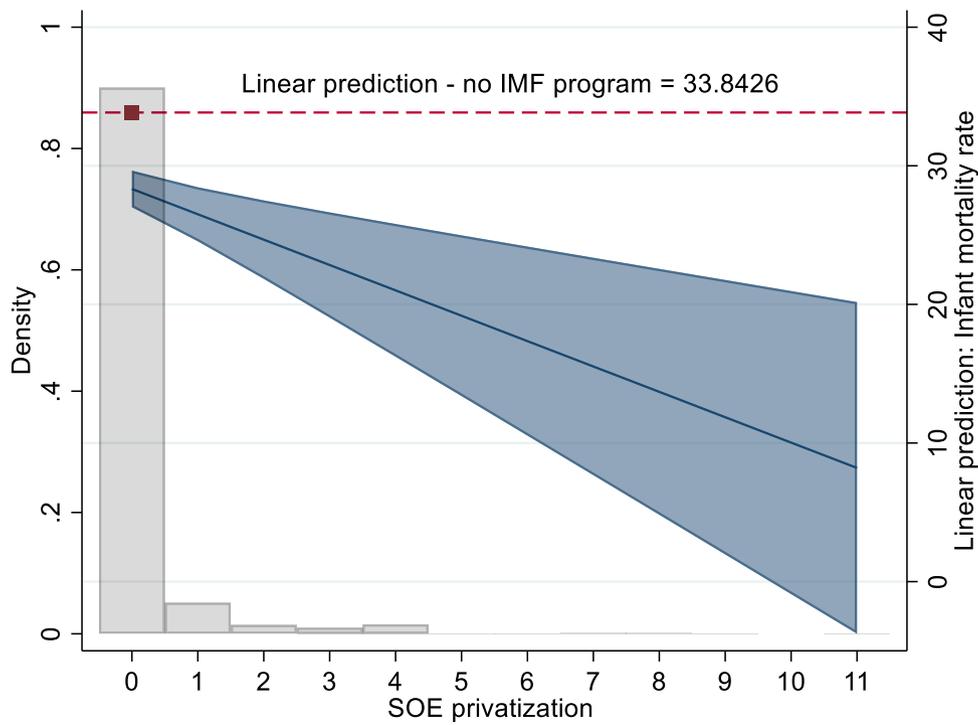


FIGURE 1 | Marginal effect of SOE privatisation conditions on the infant mortality rate.

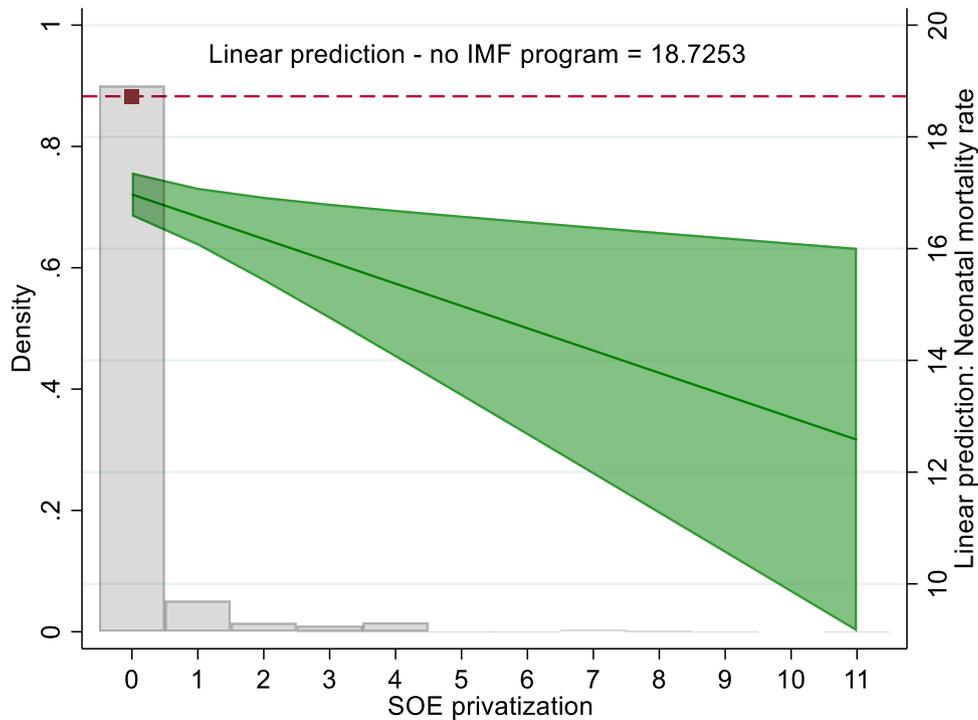


FIGURE 2 | Marginal effect of SOE privatisation conditions on the neonatal mortality rate.

budget constraint, a higher mean exposure to IMF programmes makes future participation more likely (Forster et al. 2020). We also observe that the compound instruments for SOE privatisation and other conditions are both highly significant ( $p < 0.01$ ). Diagnostic test results (Kleibergen–Paap  $F$ -statistics), reported at the bottom panel of Table 1, further confirm the instrumentation strategy of IMF programme participation and conditionality and the validity of the compound instruments.

Lastly, the  $F$ -statistic shows that both instruments are jointly relevant in all alternative specifications.<sup>11</sup>

In the supplementary Appendix, we offer several additional robustness checks, with further elaboration provided therein. We first verify our results using five nonoverlapping 3-year averages (Supporting Information S1: Table A8). The findings remain robust across these specifications. We also conduct

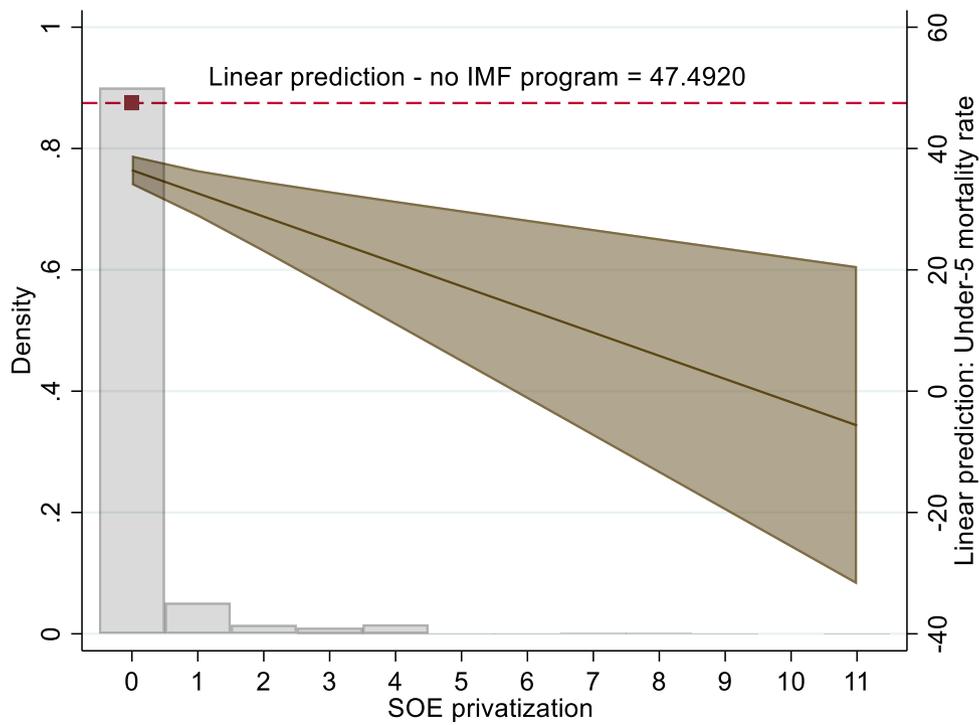


FIGURE 3 | Marginal effect of SOE privatisation conditions on the under-5 mortality rate.

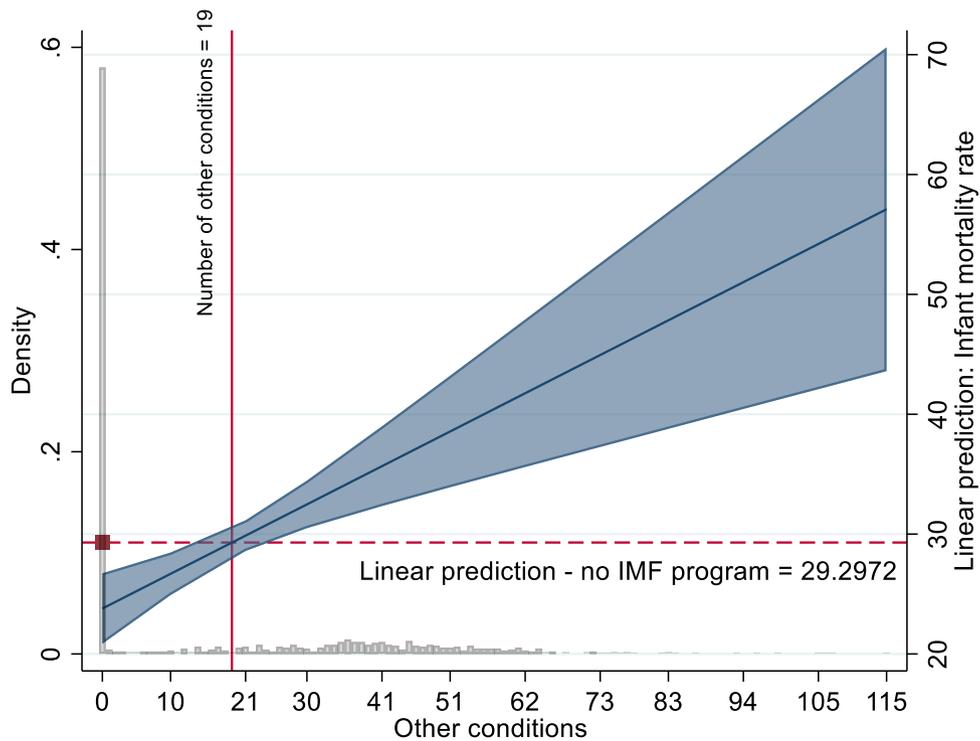


FIGURE 4 | Marginal effect of other conditions on the infant mortality rate.

analyses limited to binding conditions (Supporting Information S1: Table A10) and estimate models with additional explanatory variables (Supporting Information S1: Tables A11 and A12), with results remaining consistent.

Furthermore, to address the limited variation and skewed distribution inherent in the SOE privatisation conditions

variable, we adopt two alternative transformations. First, we apply a logarithmic transformation to capture the relative changes more effectively (Supporting Information S1: Table A13). Second, we redefine the variable as a binary indicator, assigning a value of 0 in the absence of privatisation conditions and 1 when at least one privatisation condition is attached to an IMF programme (Supporting Information S1: Table A14). It

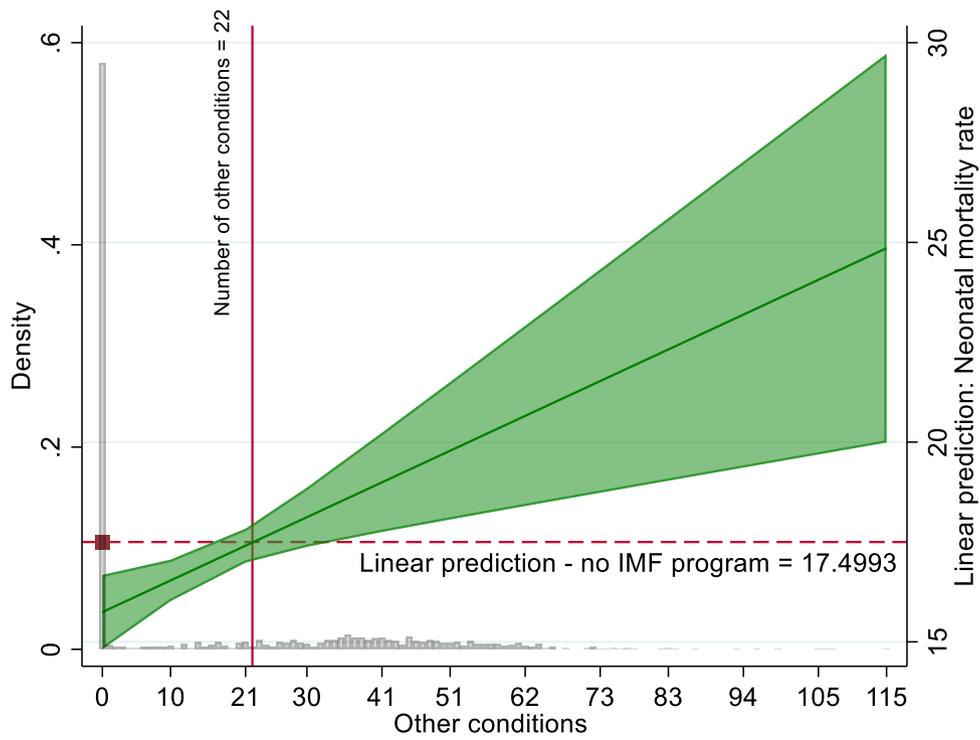


FIGURE 5 | Marginal effect of other conditions on the neonatal mortality rate.

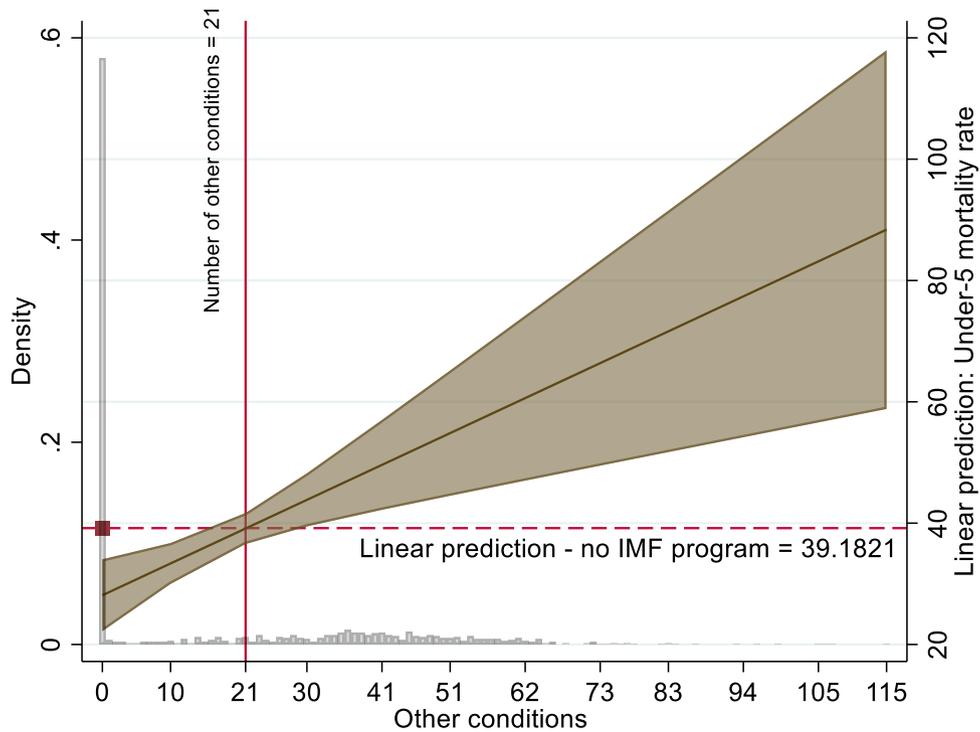


FIGURE 6 | Marginal effect of other conditions on the under-5 mortality rate.

is important to note that the binary specification introduces a potential limitation: instances with multiple privatisation conditions (e.g., five conditions) are treated equivalently to those with only a single condition. This adjustment inherently influences the precision of the model's specification and may attenuate the variable's explanatory power. Despite this limitation, the results align broadly with our initial findings. The

logarithmic transformation yields comparable results across all mortality measures, whereas the binary specification shows reduced significance for neonatal mortality but remains significant for infant and under-5 mortality rates.

As a final exercise, we disaggregate IMF conditions and consider how alternative structural adjustments (including but not

confined to SOE privatisation) affect child health outcomes, namely, via conditions related to external debt, external sector, financial sector, fiscal policy, labour, tax revenues and social policy. Because of the limited scope of our research, we refrain from formulating explicit hypotheses on their impact. The results of the disaggregated analysis are presented in the supplementary Appendix (Supporting Information S1: Table A15).

Upon examining Supporting Information S1: Table A15, we find that fiscal policy conditions, which stipulate reductions in government expenditures, worsen infant and under-5 mortality rates. This suggests that reduced public spending on health care undermines access to quality and affordable health care services and leads to higher child mortality rates. In contrast, external sector reforms (referring inter alia to trade and capital liberalisation) seem to significantly lower child mortality rates. This finding implies that economic openness improves child living standards, as increased trade and investment can boost economic growth, leading to higher incomes and better health care infrastructure and services. Yet, these findings should be interpreted with caution because the instruments for both conditions are relatively weak in our model specifications.

Interestingly, the most statistically robust evidence in Supporting Information S1: Table A15 is provided for social policy conditions, which include restrictive or neutral changes in any social policy (including health), as well as social sector restructuring. Specifically, we document that these robustly instrumented conditions significantly reduce all three mortality rates under investigation. This finding indicates that social expenses can be both fiscally sustainable and cost-effective, thereby increasing the efficiency and targeting of health care spending as a means to lower child mortality rates.

## 6 | Concluding Remarks

In this paper, we provide new insights regarding the impact of IMF intervention (IMF programme participation and conditionality) on child mortality rates in developing countries over the 2000–2013 period. Using annual data, we show that IMF programme participation and SOE privatisation conditions improve recipient countries' child mortality rates, whereas all remaining conditions worsen them.

These findings may stem from a positive effect of IMF-designed structural reforms on state governance. The latter involves both the management of public resources and the creation of an economic and regulatory environment that is conducive to private sector activities. In this sense, good governance improves the effectiveness of the public health system, thus leading to better health outcomes. Doucouliagos et al. (2021), for instance, show that health aid reduces child mortality, conditional on the quality of state governance.

Our findings carry significant policy implications, indicating that targeted privatisation initiatives for SOEs and an improved health system resulting from the implemented structural reforms can indeed exert favourable effects on child mortality. To achieve this, the IMF's architecture on establishing core policy

strategies should be designed with the involvement of the recipient country's authorities and civil society to implement structural reforms. We believe that these policy reforms should be part of a long-term process that accounts for country-specific characteristics and avoids one-size-fits-all policies in diverse country settings.

## Conflicts of Interest

The authors declare no conflicts of interest.

## Endnotes

<sup>1</sup> In contrast, adult mortality is strongly affected by biomedical factors that proceed with age, and thus it is less preventable than child mortality.

<sup>2</sup> The IMF claims that conditionalities attached to its loans perform an important signalling role and enhance the credibility of policy reforms (Bird 2002).

<sup>3</sup> This study indicates that IMF loan arrangements decrease the protective effect of parental education on child health, especially in rural areas.

<sup>4</sup> Nonconcessional loans are mainly designed to provide short- or medium-term balance-of-payments financing to countries experiencing financial crises, whereas concessional loans provide long-term development financing. Furthermore, concessional programmes are loan arrangements which carry zero interest payments (through the end of 2013) and are available for low-income countries only. In contrast, nonconcessional loan programmes are subject to the IMF's market-related interest rate, called the rate of charge (based on the SDR interest rate). For an in-depth exploration of the lending programmes of the IMF, refer to, among others, the publications by the IMF (2018, 2020) and the work by Chletsos and Sintos (2023).

<sup>5</sup> See Irwin et al. (2020) for a systematic review on the health effects of access to electricity in low- and middle-income countries.

<sup>6</sup> It should be noted that increased spending does not automatically translate into better health outcomes. Grigoli and Kapsoli (2018) suggest that increased public expenditure in the health sector may not guarantee better health outcomes when the efficiency of this spending is low. To this end, they highlight that higher efficiency can have beneficial effects on health outcomes in African countries even with unchanged spending levels.

<sup>7</sup> See Supporting Information S1: Table A1 in the supplementary Appendix for the list of all countries, including those without IMF programme participation. In addition, Supporting Information S1: Table A2 provides explicit definitions for all variables used in the empirical analysis, whereas Supporting Information S1: Table A3 reports basic summary statistics. Supporting Information S1: Table A5 presents the corresponding correlation matrix.

<sup>8</sup> The classification of IMF conditions is described in detail in A. E. Kentikelenis et al. (2016). Conditions pertaining to the privatisation of SOEs encompass all processes involved in the transfer of nonfinancial state-owned entities to private ownership. This includes activities such as the liquidation and initiation of bankruptcy proceedings for these enterprises.

<sup>9</sup> Regions: (1) East Asia and the Pacific, (2) Europe and Central Asia, (3) Latin America and the Caribbean, (4) the Middle East and North Africa, (5) South Asia and (6) sub-Saharan Africa.

<sup>10</sup> Augmented Dickey–Fuller tests show that all child mortality rates are stationary at levels (results available upon request).

<sup>11</sup> Staiger and Stock (1997) suggest that the *F*-statistic for the (joint) significance of the instruments in the first stage should exceed 10 to

ensure that the maximum bias in instrumental variables (IV) estimators is less than 10%.

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### Supporting Information

Additional supporting information can be found online in the Supporting Information section.