Journal of International Development
J. Int. Dev. **30**, 367–398 (2018)
Published online 9 October 2017 in Wiley Online Library
(wileyonlinelibrary.com) DOI: 10.1002/jid.3326

DOES SOCIAL SPENDING IMPROVE WELFARE IN LOW-INCOME AND MIDDLE-INCOME COUNTRIES?

FISEHA HAILE[1] and MIGUEL NIÑO-ZARAZÚA[2]*
[1]*The World Bank, Washington D.C., USA*
[2]*United Nations University–World Institute for Development Economics Research (UNU-WIDER), Helsinki, Finland*

Abstract: Over the past two decades, there has been unprecedented attention to the promotion of human development via government spending in the social sectors as a *conditio sine qua non* for economic growth and improved aggregate welfare. Yet the existing evidence on the subject remains limited and contested. This paper contributes to the literature by examining the causal effect of government spending on the social sectors (health, education and social protection) on three measures of aggregate welfare: the Human Development Index, the Inequality-adjusted Human Development Index and child mortality rates, using longitudinal data from 55 low-income and middle-income countries from 1990 to 2009. We find strong evidence to support the proposition that government social spending has played a significant role in improving aggregate welfare in the developing world. Our results are fairly robust to, *inter alia*, the method of estimation, the set of control variables and the use of alternative samples and instruments. © 2017 UNU-WIDER. *Journal of International Development* published by John Wiley & Sons, Ltd.

Keywords: social spending; aggregate welfare; human development; child mortality; developing countries

1 INTRODUCTION

Economic growth has been at the heart of development objectives over the past half century. The development of endogenous growth theory (Lucas, 1988; Romer, 1994) has brought to the fore the importance of social sector policy, which largely focuses on enhancing human development. The advancement of human development is found to have

*Correspondence to: Miguel Niño-Zarazúa, United Nations University–World Institute for Development Economics Research (UNU-WIDER), Katajanokanlaituri 6 B, Helsinki FI-00160, Finland.
E-mail: miguel@wider.unu.edu

profound effects on the long-run patterns of economic growth (Barro, 1991; Benhabib & Spiegel, 1994) as well as strong links with poverty reduction (Ravallion & Chen, 1997; Squire, 1993).

Continuing investments in the social sectors have been recognized by the international community. In 2000, the Millennium Development Goals were established, which comprise, *inter alia*, explicit targets to tackle extreme poverty and promote human development. To this end, much of the increase in development assistance has been directed towards the social sectors.[1]

There has been a fair amount of research in the economics literature that looks at the effect of social spending. The endogenous growth theory has proposed several models linking social spending with growth (Aschauer, 1989; Barro 1990, Barro, 1991; Levine & Renelt, 1992; Easterly & Rebelo, 1993; Devarajan *et al.*, 1996; Mittnik & Neumann, 2003). However, the empirical work on the more specific question of whether there is a sizable causal relationship between government social spending and aggregate welfare remains limited and contested.

One strand of the literature finds that social spending is a weak predictor of improved welfare (e.g. Flug, Spilimbergo, & Wachtenheim, 1998; Filmer & Pritchett, 1999; Kim & Moody, 1992; Dreher, Nunnenkamp, & Thiele, 2008), whereas other studies contend that social spending does positively impact welfare outcomes of societies (e.g. Bidani & Ravallion, 1997; Gupta, Verhoeven, & Tiongson, 2002, 2003; Baldacci, Clements, Gupta, & Cui, 2008). More recent studies (e.g. Rajkumar & Swaroop, 2008; Rodrik, Subramanian, & Trebbi, 2004) argue that this holds true only in countries with good governance.

Previous analyses on the effects of social spending have been hampered by, *inter alia*, the dearth of reliable data and measurement problems, particularly with regard to endogeneity associated with simultaneous causality between social spending and welfare outcomes and the omission of crucial mediating factors that underpin the relationship between social spending and aggregate welfare. Furthermore, many studies suffer from considerable sensitivity to the set of control variables and the choice of estimators.

This paper contributes to the literature in at least two important respects.

First, it provides new evidence on the long-standing debate surrounding the effectiveness of social spending, particularly in the context of low-income and middle-income countries, where this concern is particularly salient. More specifically, the paper examines the causal relationship between government expenditure on the social sectors (health, education and social protection) and three major indicators of aggregate welfare: the Human Development Index (HDI), child mortality rates and the Inequality-adjusted Human Development Index (IHDI). We include the IHDI in the analysis to account for existing distributional inequalities in the domains of health, education and income, and which integrate the conventional HDI.

Second, it adopts a wide array of econometric methods and empirical specifications to address endogeneity problems that may arise from simultaneous causality between social spending and welfare outcomes, and the omission of crucial mediating factors that underpin such relationship. Furthermore, it performs extensive rigorous robustness checks to test the validity of the findings.

[1]Aid to the social sectors, namely education, health and water and sanitation, excluding social protection spending, increased from an average of US$2billion a year in the 1960s to US$50billion in the 2000s at constant 2010 US$. For a detailed discussion, see Addison, Niño-Zarazúa, and Tarp (2015).

Overall, we find strong evidence of a positive causal relationship between the allocation of public resources to the social sectors and the observed changes in aggregate welfare in low-income and middle-income countries over the past decades. The preferred System GMM (SGMM) specification indicates that a 1 per cent increase in government social spending as share of gross domestic product (GDP) leads to a 0.004 points increase in the IHDI, which is modest, albeit not negligible. The dynamic nature of our preferred model allows to estimate the long-term effect of a 1 per cent increase in social spending, which is found to be in the order of a 0.057 points increase in the IHDI. Similarly, we find that increasing health spending by 1 per cent would reduce child mortality rates by approximately 0.06 per cent, whereas in the long-term, a 1 per cent increase in health spending would lower child mortality rates by about 0.86 per cent. We also find that when the IHDI is replaced with the conventional HDI, social spending has a larger impact. This indicates that prevailing inequalities in the components of the HDI reduce the effectiveness of social policy in improving aggregate welfare.

Our results are fairly robust to, *inter alia*, the method of estimation, the use of alternative instruments to control for the endogeneity of social spending, the set of control variables included in the regressions and the use of alternative samples. Our findings stand in contrast to earlier studies (e.g. Filmer & Pritchett, 1999; Filmer, Hammer, & Pritchett, 2000) that argue that per capita income accounts for most of the cross-country variation in aggregate welfare, whereby social spending is a poor predictor.

The remainder of this paper is organized as follows. Section 2 provides a brief overview of the empirical literature on the link between social spending and welfare outcomes. Section 3 discusses the data, while Section 4 presents the model specification. Sections 5 and 6 present the econometric methodology and the empirical results, respectively, while Section 7 performs extensive robustness checks on the main findings to validate the results. Finally, Section 8 concludes with reflections on policy.

2 A BIRD'S-EYE VIEW OF THE LITERATURE

The dearth of reliable and internationally comparable data on aggregate (economy wide) welfare has led most previous studies to focus on health or education indicators. One strand of the literature finds evidence that health spending improves health outcomes. For instance, Anand and Ravallion (1993), Hojman (1996) and Bidani and Ravallion (1997) show that government health spending has a significant impact on health status. In the same vein, Gupta *et al.* (2002) find that health expenditure reduces child mortality while Gupta *et al.* (2003) point out that the effects of health spending on health status among the poor seem stronger in low-income countries than in high-income countries, suggesting diminishing marginal returns to social health investment.

However, these results are not incontrovertible. A second strand of the literature finds a weak causal relationship between health spending and health outcomes. For example, Kim and Moody (1992) and Filmer and Pritchett (1999) find that health spending has a small and statistically insignificant effect on infant and child mortality, whereas a country's per capita income and socio-economic resources accounts for most of the cross-national variation in mortality rates. Filmer *et al.* (2000) argue that inadequate institutional capacity and market failures are behind the tenuous link between health spending and improvements in health status.

DOI: 10.1002/jid

In the education sector, evidence of a positive effect of education spending is found in, *inter alia*, Psacharopoulos (1994), Psacharopoulos and Patrinos (2004), Gupta *et al.* (2002) and Baldacci, Guin-Siu Maria, and De Mello (2003). More recently, Baldacci *et al.* (2008) find that both education and health spending have positive and significant impact on education and health. In contrast, Hanushek (1995), Mingat and Tan (1998), Flug *et al.* (1998), Wolf (2004) and Dreher *et al.* (2008), among others, conclude that education spending has no discernible effects on education attainment.

Recent evidence indicates that the ineffectiveness of social spending can be ascribed to poor governance and institutional inefficiencies. Rajkumar and Swaroop (2008) have shown that an increase in public spending on health and education translates into the expected improvement in health and education outcomes only in countries with good governance.

Despite the considerable effort geared towards assessing the impact of social spending on health and education indicators, such analysis assumes away the distributional aspects of social spending. Put another way, an improvement in such indicators does not necessarily imply that the poor are on the receiving end of the benefits.

The World Bank (2004) contended in the World Development Report that the 'weak' association between social spending and social outcomes is due to the small fraction of social spending going to the poor. This line of argument is similar to that of Dollar and Kraay (2002) who found that 'pro-poor' policies, such as public expenditure on education and health, did not have significant effects on the income of the poor.

Some recent studies have investigated the impact of social spending on poverty specifically.

Mosley, Hudson, and Verschoor (2004) find that higher levels of pro-poor expenditure are associated with lower levels of poverty. Gomanee, Girma, and Morrissey (2005) also show that higher pro-poor public spending improves aggregate welfare although Gomanee, Morrissey, Mosley, and Verschoor (2005) also find that the causal relationship is weak among middle-income countries.

The mixed results on the effectiveness of social spending can be attributed to several factors. First, most previous studies have been hampered by limited data and measurement problems. Statistics on social spending and the relevant welfare indicators are relatively scarce and truncated *vis-à-vis* other macroeconomic indicators.

Second, several studies have been hindered by endogeneity concerns and country-specific effects, which often lead to biased estimates. Furthermore, several studies suffer from considerable sensitivity to the set of controls and the choice of estimators.

Finally, many studies fail to control for the underlying factors that the literature highlights as strong predictors for social spending effectiveness. In particular, the role of governance and bureaucratic institutions as mediating factors between social spending, aggregate welfare and ultimately growth have been highlighted by Abed and Gupta (2002), Gupta *et al.* (2002), Mauro (1998), Rajkumar and Swaroop (2008), Rodrik *et al.* (2004) and Hausmann *et al.* (2005). Kaufmann, Kraay, and Mastruzzi (2004) also show that good governance is critical for reducing child mortality.

Other studies underline the significance of democratic institutions in guaranteeing political freedoms and voice. Boone (1996) shows that liberal political regimes and democracies perform better in terms of welfare dimensions than repressive regimes. Kosack (2003) shows that aid improves the quality of life in democracies but it has no effect in autocracies. Chiripanhura and Niño-Zarazúa (2015) also point out the link between political business cycles and aid-induced expansionary fiscal stimuli that political regimes in sub-Saharan Africa often resort to maximize the probability of re-election.

The present study builds on the existing literature to empirically test the proposition that social spending strongly predict positive changes in aggregate welfare.

3 DATA

3.1 Social Spending

Social policy and the institutions and public resources that facilitate the allocation of social services have long been recognized for their intrinsic and instrumental values for human capital formation (Becker, 1962; Schultz, 1961, 1971; Weisbrod, 1962). Education and health policies and the provision of social protection benefits can have profound effects on social and economic progress of nations (Bloom, Canning, & Sevilla, 2004; Barro, 1991; King & Rebelo, 1990; Lucas, 1988; Romer, 1994).

Social policy decisions and priorities can be captured with a degree of approximation by the volume and composition of government social spending.[2] In this study, we take a broader definition of social spending to include government expenditure on education, health and social protection.[3] There are at least three important reasons for adopting a broader definition.

First, there are theoretical and empirical grounds to justify government intervention in the provision of public goods, particularly in contexts of positive externalities and market failures (Anand & Ravallion, 1993; Poterba, 1996; Roberts, 1984; Stiglitz, 1989). Second, there are important complementary and reinforcing effects between healthcare and education policy and the provision of social protection benefits (Baker *et al*., 2011; Cutler & Lleras-Muney, 2008, 2010; Ross & Wu, 1995). Third, and as discussed in Section 3.2, two out of our three aggregate welfare indicators (HDI and IHDI) are integrated by dimensions that reflect achievements in the domains of health, education and income. Social spending in its composite form as defined in this study provides a good parameter for measuring the effect of social policy on human development, proxied by our indicators of aggregate welfare.

For the empirical analysis, we use data on social spending from the IMF's Government Finance Statistics (GFS: 2011 edition). Although the GFS database provides information dating as far back as 1972, we were only able to use data for the period 1990–2009. Data before 1990 are based on the accounting system described in the 1986 GFS manual (GFSM 1986),[4] while the data from 1990 onwards are based on a revised accounting method outlined in GFSM 2001. The revision resulted in major changes in, *inter alia*,

[2]Foreign aid has also contributed to the allocation of economic resources in the social sectors, especially among low-income countries. For an overview, see Addison *et al*. (2015).

[3]Education expenditure includes allocations to pre-school, primary, secundary, tertiary, vocational and higher education, subsidiary services to education, education R&D and other activities no definable by education levels. Health expenditure includes hospital and outpatient services, public health services, health R&D, and expenses on medical products, appliances and equipment. Social protection expenditure includes old age pensions, disability and sickness pensions, family and children allowances, unemployment and housing benefits, and R&D in social protection. For further details on this typology, see IMF (2011).

[4]The GFSM 1986 Manual is available on the following link: https://www.imf.org/external/pubs/ft/gfs/manual/1986/eng/

the definitions and classification of expenditures, as well as the timing at which economic events were recorded. For instance, transactions and other economic flows are recorded on an accrual basis in GFSM 2001, that is, flows are computed at the time when a transaction occurred, regardless of the timing of cash flows. In contrast, in GFSM 1986, transactions are recorded when cash was exchanged.[5]

The data from the GFS database are given in local currency units (LCU). Previous studies have used either data in LCU or convert them into monetary units using exchange rates. However, this is likely to be misleading because exchange rates do not necessarily reflect the relative purchasing power across countries. Therefore, we transformed the data in LCU into purchasing power parity (PPP) dollars using data on the consumer price index from the IMF's (2012) World Economic Outlook and the PPP exchange rate and official exchange rate from the World Bank's (2012) World Development Indicators and Global Development Finance.[6]

For some of the countries in our sample (see Table A3 in the Appendix), the social spending data are partly in cash and partly in accrual, which raises a question of comparability. Confining the analysis to include only cash or accrual data would result in a sample size that is too small to perform any meaningful analysis. It is difficult to convert cash data into accrual (or *vice versa*) without making constraining assumptions. Seiferling (2013) suggests merging both data and including an indicator (dummy) variable in parametric analysis to account for any systematic differences. This approach implicitly assumes that cash data can substitute accrual data and *vice versa*. However, given the methodological changes introduced by GFSM 2001, mixing cash and accrual data does not seem a plausible option.

Given that most social spending data are in cash, a possible way to circumvent this problem is to extend the cash data using the annual growth rates for the accrual data. This is, in effect, tantamount to predicting the values of the cash data for periods for which we have only accrual data. The underlying assumption is that the year-to-year growth rates of the cash and accrual data are not systematically different from each other, although the actual values might differ. This is, in our view, a far less restrictive assumption than the one suggested by Seiferling (2013).

Another limitation of the GFS database is that the government spending data for some of the sample countries have gaps (see Table A3 in Appendix). Hence, we imputed the missing observations using total health expenditure data at constant 2005 PPP from World Development Indicators (2013).[7] In Section 7, we test the robustness of our results by excluding the countries with data that are partly in cash and partly in accrual and countries with data that have gaps. The results remain robust across the subsample of countries.

Finally, note that we use data on central government spending as a proxy measure for general government (GG) spending (central plus subnational). Data on social spending for the GG are scanty for most countries, whereas there is a more comprehensive coverage for central government accounts. Although a potential solution would be to assemble data for the GG based on data for lower government levels (central as well as state and/or local governments), the latter are missing for most countries and periods.

[5]See IMF (2001: Appendix I) for a more detailed discussion on the changes introduced by GFSM 2001.
[6]For a detailed description on the method used to transform social spending data into dollars PPP, see Gebregziabher and Niño-Zarazúa (2014).
[7]The correlation between social spending and health spending for periods for which both are available is fairly high, with correlation coefficients of 0.75 or more for 9 of the 10 countries with data gaps.

3.2 Aggregate Welfare

We use the IHDI and child mortality rates as the two major indicators of aggregate welfare and also the more conventional HDI in supplementary specifications as a robustness check for our results.[8] The HDI, an index between 0 and 1, is built from three separate components: (1) longevity, measured by life expectancy at birth; (2) educational attainment, proxied by a weighted average of adult literacy and school enrolment rates; and (3) standard of living, measured by gross national income per capita (adjusted for purchasing power). HDI is a widely used measure of aggregate welfare and is calculated using a consistent methodology.[9]

However, the HDI fails to take into account distributional inequalities in the domains of health, education and income. There are good reasons to believe that high inequalities in those dimensions can limit development achievements (Hicks, 1997). To address this constraint, the United Nations Development Programme introduced a new measure, the IHDI, which incorporates distributional aspects into the conventional HDI. The IHDI follows the Atkinson (1970) family of inequality measures that take the general form:

$$A_x = 1 - \frac{\sqrt[n]{X_1 \ldots X_n}}{\overline{X}} \tag{1}$$

where $\{X_1 \ldots X_n\}$ captures the underlying distributions of the longevity, educational attainment and standard of living components of the HDI. The IHDI indices can be obtained by multiplying the HDI indices, I_x by $1 - A_x$ as follows:

$$I_x^* = (1 - A_x) \cdot I_x \tag{2}$$

where A_x is the Atkinson inequality measure described in ((1)).

The aggregated IHDI is simply the geometric mean of its individual components, that is,

$$IHDI = \sqrt[3]{I^*_{longevity} \cdot I^*_{education} \cdot I^*_{standard\ of\ living}} \tag{3}$$

Inequality-adjusted Human Development Index equals HDI if there is perfect equality in the distribution of its welfare dimensions. We use annual data on the IHDI for the period 1990–2009 from Huang and Quibria (2013). It is worth noting that HDI values from historical editions of the Human Development Reports (HDR) are not necessarily comparable over time. Regular revisions of the HDI, and thus the year-to-year changes in the indices from the annual HDRs, may simply capture the effect of data improvements and may not strictly represent real changes in the levels of human development. Huang and Quibria (2013) computed the IHDI using consistent annual data on the HDI from the United Nations Development Programme's HDR office. The third welfare indicator is

[8]Reddy and Pogge (2010) argue that non-income indicators of human development, such as the HDI and child mortality rates, can be equally informative as income-based poverty rates. In our sample, the correlation at country level between the IHDI and the '\$1.25 a day' poverty line is −0.82, whereas the correlation between child mortality and the '\$1.25 a day' poverty line is 0.84. This unveils a substantial information overlap between welfare measures and absolute poverty measures that have implications for the public spending-poverty nexus in our analysis.

[9]For a discussion on the calculation of the HDI and IHDI, see technical note 1 in UNDP (2011).

DOI: 10.1002/jid

the under-five child mortality rate, which measures the number of children who die by the age of 5 years per thousand live births per year. Child mortality rates are estimated by the UN Inter-agency Group for Child Mortality Estimation, constituted by UNICEF, WHO, World Bank and UN DESA Population Division, and were extracted from the World Development Indicators (2012).

4 MODEL SPECIFICATION

We use a panel dataset comprising 55 countries from 1990 to 2009. Given that most of the data are available on an annual basis and that the number of countries is relatively small, we initially focused on an annual panel spanning the period 1990–2009, which provided more degrees of freedom. However, the downside of using annual observations is that empirical estimates may be driven by short-term 'noise'. It is common in the literature to use time-averaged data to smooth potential business cycle effects and reduce measurement errors. For this reason, we use both annual data and 3-year averages in the models presented in the succeeding text over the period 1990–2009.[10] The definitions and data sources for all variables are listed in Table A1 in the Appendix. The list of countries in the sample and a summary statistics are presented in Tables A2 and A3 in the Appendix.

We estimate two models: the first model estimates the effect of social spending on the IHDI. The model takes the following form:[11]

$$W_{i,t} = \theta_0 W_{i,t-1} + \beta_1 Y_{i,t} + \beta_2 S_{i,t} + \beta_3 I_{i,t} + \beta_4 D_{i,t} + \gamma X + \eta_i + v_t + \varepsilon_{i,t} \qquad (4)$$

where the subscripts i and t denote country and year respectively; $W_{i,t}$ stands for IHDI; $W_{i,t-1}$ for one-period lagged IHDI, θ_0 measures the persistence of $W_{i,t}$; $Y_{i,t}$ for real GDP per capita[12]; $S_{i,t}$ for government spending on social sectors (health, education and social protection), in per cent of GDP; β_2 is the key parameter of interest and measures the direct effect of social spending on IHDI once we have controlled for the relevant explanatory variables; $I_{i,t}$ captures institutional quality; $D_{i,t}$ is an indicator of the level of democratization; X is the vector of control variables that may affect $W_{i,t}$ and $S_{i,t}$; η_i denotes unobserved country-specific and time-invariant effects; v_t is a vector of time dummies capturing universal time trends; and finally, $\varepsilon_{i,t}$ represents the disturbance term.

As indicators for institutional quality, we follow Rajkumar and Swaroop (2008) and use the indices of bureaucratic quality and corruption from the International Country Risk Guide (ICRG). The bureaucratic quality index ranges from 1 to 4 and measures the soundness of institutions and the quality of the civil service. The corruption index, ranging from 0 to 6, measures corruption within the political system, with a score of 0 pointing to very high corruption. The democracy index comes from the Polity IV project. The measures of economic policy used in the regressions are standard in the literature: inflation rate, proxy for a country's monetary policy stance; trade openness; and the share of domestic credit to private sector in GDP, an indicator for the potential role of financial

[10]Although it is more common in the literature to use 5-year averages, this would have significantly reduced our sample and the degrees of freedom. Therefore, we focus on 3-year averages.
[11]This specification draws mainly on Gomanee *et al*. (2005) and Kosack (2003).
[12]In the models that employ the annual panel, we use GDP per capita in the preceding period ($Y_{i,t-1}$) to address potential endogeneity problems.

DOI: 10.1002/jid

sector development in improving welfare. Many of the countries in our sample are vulnerable to the vagaries of the international economy and particularly to primary commodity price fluctuations. The terms of trade index controls for this effect.

The relationship between $W_{i,t}$ and $S_{i,t}$ is estimated using two functional forms: (i) linear-log specification, where $W_{i,t}$ is linear and $S_{i,t}$ is logarithmic, and (ii) log-log specification, where both variables are in log form. The linear-log specification may be preferable because it provides the absolute change in the IHDI associated with a per cent change in social spending. The log-log specification has the added convenience of smoothing the data and allowing coefficients to be interpreted as elasticities. We adopt both the former functional form in Section 5 and also estimate the latter one in a set of alternative specifications as part of the robustness checks.

The second model estimates the effect of health spending on child mortality as follows:

$$C_{i,t} = \alpha_0 C_{i,t-1} + \delta_1 Y_{i,t} + \delta_1 H_{i,t} + \delta_3 I_{i,t} + \delta_4 D_{i,t} + \Phi M + \eta_i + v_t + \varepsilon_{i,t} \tag{5}$$

where $C_{i,t}$ is the child mortality rate in country i in year t; $C_{i,t-1}$ is one-period lagged $C_{i,t}$, with α_0 capturing the persistence in $C_{i,t}$; $H_{i,t}$ stands for government health spending in per cent of GDP; M is a vector of robust explanatory variables associated with child health; and the remaining variables are as defined previously in Equation (4).[13] Income is one of the crucial determinants of health status (Pritchett & Summers, 1996). Moreover, a number of studies show that higher levels of female education are associated with better health status of children as well as the population in general. Hence, following Baldacci *et al.* (2008), we include the share of female students in primary and secondary schools as an indicator for gender equality to control for institutional factors that may influence children's well-being through mothers' education. There is also evidence of a strong correlation between health status and access to safe drinking water and improved sanitation facilities (Rajkumar & Swaroop, 2008); the degree of urbanization (Schultz, 1993) and fertility rates (Baldacci *et al.*, 2008; Mishra & Newhouse, 2009). Because data on the aforementioned variables differs considerably across countries and over time (see Tables A2 and A3 in the Appendix), our sample size differs across specifications, depending on the control variables included and the instrumental variables used. In the next section, we discuss the econometric methods used in the empirical analysis.

5 ECONOMETRIC METHODS

As a first approximation, we estimate Equations (1) and (2) using ordinary least squares. However, this presumes, *inter alia*, that social spending is exogenously determined, which is an unreasonable assumption given that both social spending and the measures of aggregate welfare, $W_{i,t}$ and $C_{i,t}$, are likely to be affected by the same unobserved factors and the possibility of reverse causality. For instance, poor health and low human development achievements in low-income countries are likely to be correlated with insufficient government spending on the social sectors, as much as the limited fiscal space to finance social spending are likely to be associated with limited stocks of human capital. In order to address the endogeneity problem, we first instrument for social spending in a

[13] $C_{i,t}$ and $H_{i,t}$ are log-transformed, as is common in the literature. However, all regression results are fairly robust to specifying these variables in levels instead of logs.

two-stage least squares (2SLS) and fixed-effects (FE) framework.[14] The presence of country fixed-effects, η_i, in Equations (1) and (2) suggests that FE estimators would be the preferred approach, which allows to mitigate heterogeneity-induced bias. However, the inclusion of lagged dependent variables would render FE estimates inconsistent because they would be correlated with the transformed errors, even if they were uncorrelated with the disturbance term. 2SLS estimations are also likely to suffer from dynamic panel bias because η_i is correlated with the lagged dependent variables (Baum *et al.*, 2007). For this reason, we first exclude the lagged dependent variables and estimate the models using 2SLS and FE, the robustness of which is tested using dynamic panel data estimators. Although the 2SLS estimator does not allow for η_i, we capture some of the influence of omitted spatially correlated fixed-effects using regional dummy variables for sub-Saharan Africa, Asia, Latin America and Caribbean, and East and Central Europe.

Despite that finding reliable instruments is a daunting challenge, we experiment with a common instrumental variable in the literature, the lag values of government spending. We note, however, that the economic motivation behind the use of lagged values as instruments is somewhat questionable in our case, as this would be equivalent to claim that contemporaneous social spending affects aggregate welfare but previous spending efforts do not. For that reason, we resort to 'external' instruments in the 2SLS and FE specifications to control for the endogeneity of social spending, the robustness of which is tested using 'internal' instruments—lags of the instrumented variables—in a dynamic panel data framework.

Following Easterly and Rebelo (1993), Gisselquist, Leiderer, and Niño-Zarazúa (2016) and Tanzi (1992), we use the logarithm of population and the share of agriculture in GDP as external instruments. Easterly and Rebelo (1993) and Gisselquist *et al.* (2016) find that the scale of the economy (measured by its population) is an important determinant of fiscal policy in general and the level of public spending in particular. They provide evidence in favour of strong scale effects: countries with higher population have lower public spending. High population countries tend to spend less, yet there is no reason to suspect that a country can have higher or lower level of welfare simply because it has more or less people. In our sample, the log of population is highly correlated with the share of social spending in GDP (a correlation coefficient, r, of -0.52).

Another factor that is found to influence the level of social spending is a country's economic structure, which is reflected in the share of agriculture in GDP. Tanzi (1992) argues that agrarian societies find it more difficult to raise taxes and thus allocate social spending to optimal levels. Earlier studies have found that it is difficult to impose taxes on the agricultural sector, although the sector is often subject to implicit taxes (Ahmad & Stern, 1991). The reason is that agricultural activity is small scale and spatially spread, particularly in low-income and middle-income countries. Our data shows that social spending and agriculture (both in per cent of GDP) are negatively correlated ($r = -0.51$).

Furthermore, we use the ICRG index of ethnic tensions as an additional instrument, which has been used in earlier studies (Dreher *et al.*, 2008). Cross country studies have found that ethnic divisions often lead to a suboptimal allocation of public resources because of a common pool problem, that is, by inducing one section of society to neglect the tax burden and falling on others (Von Hagen, 2005; Alesina, Baqir, & Easterly,

[14]Statistical tests (available on request) indicate that the random-effects model should be rejected in favour of the FE specification (Hausman test, p-value = 0.00). Hence, we report only FE estimates.

1999). We find a considerable correlation in our sample between social spending and the ethnic tensions index ($r = 0.39$). We test the validity of our instruments in Section 7.

As a robustness check, we organize the data into 3-year periods and estimate the models using dynamic panel data estimators.[15]

As pointed out earlier, the presence of lagged dependent variables and country fixed-effects poses a challenge that demands the use of more sophisticated econometric methods. The Arellano and Bond (1991) first-differenced GMM (Dif-GMM) estimators circumvent the endogeneity problem by removing η_i using first-differencing or orthogonal deviations and then deploying suitably lagged values of the independent and dependent variables as instruments. However, the Dif-GMM estimator suffers from large finite-sample biases and poor precision when the time series are persistent. In such cases, the lagged levels of the series are weakly correlated with the lagged first differences, thereby making the instruments for the first-differenced equations 'weak' (Blundell & Bond, 1998).

The SGMM estimator developed by Blundell and Bond (1998) works around the weak instrument problem associated with Dif-GMM. SGMM solves a system of level and difference equations. Lagged differences of the endogenous variables are used as instruments in the level equations, while lagged levels of the endogenous variables are used as instruments in the first differenced equations. SGMM significantly improves the accuracy of estimates by exploiting additional moment conditions that are informative even for persistent data (Blundell & Bond, 1998). Thus, we opt for the SGMM estimator given that it addresses some of the finite-sample biases and imprecision inherent in the Dif-GMM.

It is worth pointing out that the additional moment conditions of the SGMM estimator do not come without a cost, and some restrictions on the initial conditions are required. In particular, the instruments for the level equations are valid as long as they are orthogonal to the country fixed-effects. In addition, it has recently come to light that the SGMM may equally suffer from the weak instrument problem in some cases (Bun & Windmeijer, 2010). To mitigate this problem and thereby check the sensitivity of the results, we complement the internally generated set of instruments with the identified external instruments.

Another potential problem of the SGMM (and Dif-GMM) estimator is that the number of internal instruments grows quadratically as the number of time periods increases. Instrument proliferation can over-fit endogenous variables, biasing coefficient estimates and weakening the Hansen test of the instruments' joint validity (Roodman, 2009b). Therefore, we reduce the instrument count by 'collapsing' instruments and take 3-year averages that considerably reduce the sample size.[16] All these caveats should be borne in mind when interpreting the SGMM results and the alternative specifications presented in the following section.

6 RESULTS

Section 6.1 presents the results on the impact of social spending on the IHDI, while Section 6.2 discusses the results on the effect of health spending on child mortality.

[15]In the annual panel, the number of time series observations, T, is relatively 'large' compared with the number of countries, N. However, the GMM estimators are particularly designed for the panel data setting with fixed T and large N, and as T increases, they may lose even consistency.

[16]Roodman (2009a) shows that in some common cases collapsing instruments is superior to restricting the lag ranges.

DOI: 10.1002/jid

All regressions include time dummies and the t-statistics (given in parentheses) are robust to arbitrary heteroskedasticity and autocorrelation. The SGMM models are based on a two-step estimator, which allows for Windmeijer's (2005) finite sample correction.

6.1 Social Spending and IHDI

The 2SLS, FE and SGMM regression results are reported in Table 1. In order to deal with the potential endogeneity of social spending, we first estimate Equation (1) using 2SLS and employing the log of population and the ethnic tensions index as instruments. The Hansen test of over-identifying restrictions indicates that the validity of the instruments cannot be rejected. The Kleibergen–Paap F test of weak identification, which like the standard F-statistic, tests for the strength of the partial correlation between the included endogenous variable and the excluded instruments but makes finite-sample corrections, comfortably exceeds conventional critical values. Further, the Stock–Wright LM S statistic, which is robust in the presence of weak instruments, confirms the existence of significant correlation between the excluded instruments and the dependent variable. These results confirms the validity of our specifications.

The estimated coefficient on social spending is positive and significant. It indicates that a 1 per cent increase in social spending increases the IHDI by 0.014 points. Note, however, that the 2SLS regressions do not allow for country fixed-effects, which may have a significant bearing on the empirical results. Column 3 of Table 1 reports the FE estimates. The Hansen test cannot be rejected at conventional levels of significance, suggesting that there are no signs that the instruments are endogenous. Moreover, the Stock–Wright S statistic indicates that the endogenous regressors are relevant. However, the Kleibergen–Paap F statistic is slightly below the rule of thumb threshold of 10 proposed by Staiger and Stock (1997). The FE estimate implies that increasing social spending by 1 per cent would increase IHDI by 0.012 points, which is consistent with the 2SLS result.

We now turn to the SGMM results, which are reported in columns 4 and 5.[17] Identification is based on a set of 'internal' as well as 'external' instruments. The validity of the instruments and moment conditions was tested using the Hansen test of over-identifying restrictions and the Arellano–Bond test for autocorrelation. The test results show that the null of no second-order autocorrelation is rejected, which precludes the use of second lags of the endogenous variables as instruments. Hence, we restricted the instrument set to lags three and longer of the variables. Table 1 shows that all specifications pass the Hansen test, suggesting that the instrument set is valid. The test for the null of no third-order autocorrelation cannot be rejected either.[18] Further, we performed a difference in Hansen test for the exogeneity of the subset of additional instruments in the SGMM and found that the specifications cannot be rejected.

The SGMM estimates reveal a substantial degree of inertia in the IHDI. The lag of the IHDI is highly significant and has considerable explanatory power, rendering some of the

[17]To preserve degrees of freedom, we excluded age dependency ratio from the SGMM models. The results when this variable is included do not change and can be provided upon request from the authors.
[18]The null of no autocorrelation of higher orders is not rejected as well.

Table 1. IHDI equation (OLS, 2SLS, FE and SGMM regressions)

Regression method	(1) OLS	(2) 2SLS[a]	(3) FE[b]	(4) SGMM[c]	(5) SGMM[d]	(6) SGMM
Lagged IHDI				0.93 (37.56)***	0.94 (18.86)***	
Social spending (% GDP) (*ln*)	0.009 (10.07)***	0.014 (6.02)***	0.012 (2.54)**	0.004 (2.48)**	0.005 (1.80)*	0.044 (5.66)***
GDP per capita (*ln*)	0.029 (24.44)***	0.026 (13.65)***	0.017 (6.10)***	0.002 (2.98)***	0.002 (1.97)**	0.021 (5.27)***
Openness (*ln*)	0.004 (3.07)***	0.001 (0.43)	0.003 (1.99)**	0.005 (2.04)**	0.005 (1.99)**	0.045 (2:37)**
Terms of trade (*ln*)	−0.011 (4.94)***	−0.012 (3.76)***	−0.005 (2.73)***	−0.005 (1:83)*	−0.005 (1.91)*	−0.036 (2.55)*
Inflation	−0.002 (2.22)**	−0.002 (1.47)	0.0002 (0.61)	−0.001 (1.27)	−0.0004 (0.27)	0.004 (0.83)
Quality of bureaucracy	0.001 (1.50)	0.003 (1.70)*	0.002 (2.78)***	0.001 (0.77)	0.001 (0.27)	0.011 (1.57)
Democracy	0.001 (4.12)***	0.001 (2.66)***	−0.0002 (1.34)	0.000 (0.40)	0.000 (0.12)	0.002 (2.61)***
Age dependency (*ln*)	−0.035 (6.92)***	−0.033 (4.29)***	−0.016 (1.91)*			
Number of countries	51	51	38	42	42	42
Observations	504	504	417	175	175	199
R-squared	0.92	0.91	0.90			
Number of instruments		2	2	33	30	34
Kleibergen–Paap F statistic		42.17	9.82			
Stock–Wright LM statistic		18.80	6.13			
(*p*-value)		0.00	0.05			
Hansen test[×]		0.77	0.69	0.73	0.60	0.22
Difference-in-Hansen test[×]				0.89	0.87	0.10
Autocorrelation (2nd order)[×]				0.03	0.03	0.09
Autocorrelation (3rd order)[×]				0.82	0.66	0.24

2SLS, two-stage least squares; FE, fixed-effects; GDP, gross domestic product; IHDI, Inequality-adjusted Human Development Index; OLS, ordinary least squares; SGMM, System GMM.
[×]Denotes *p*-value.
[a]Instruments for social spending using log population and index of ethnic tensions.
[b]Uses ethnic tensions index and budget deficit (% GDP) as instruments.
[c]Uses both internal (third and longer lags of IHDI, social spending, GDP per capita and openness) and external [log population, agriculture (% GDP) and ethnic tensions] instruments.
[d]Uses only the aforementioned internal instruments.
*10% significance level.
**5% significance level.
***1% significance level.

covariates included in the regression insignificant. The coefficient on social spending is positive and significant. The estimates imply that a 1 per cent increase in social spending increases the IHDI by 0.004 points. Given the inclusion of the lagged dependent variable, it is possible to calculate the long-run effects.[19] The estimates in the preferred SGMM specification (column 4 of Table 1), coefficients of 0.004 for social spending and 0.93 for lagged IHDI suggest that the long-run effect of a 1 per cent increase in social spending is to increase the IHDI by about 0.057 points. Re-estimating the equation using only internal instruments (column 5) shows that the coefficient on social spending remains unaffected, although its statistical significance declines.

Our results support the proposition that social spending is a strong predictor of improvements in aggregate welfare in low-income and middle-income countries. Although not strictly comparable, our findings also echo those reported by Gomanee *et al*. (2005), who find positive, albeit weak, impacts of social spending on the HDI and infant mortality in middle-income countries.

The impact size is modest, albeit not negligible. To illustrate, the average government social spending in low-income and middle-income countries was in the order of 9.3 per cent of GDP over the period of analysis. Organisation for Economic Co-operation and Development (OECD) countries spend on average about 20 per cent on social services. If in 2010 developing countries in, say, Latin America and sub-Saharan Africa, had decided to double the allocation of public resources to the social sectors, up to levels of industrialized nations, the IHDI would have increased from 0.527 to 0.56, and from 0.261 to 0.28 in these two regions, respectively. These levels would be comparably low relative to the ones observed in OECD countries (0.789). Such gaps in human development achievements draw attention to the historical development deficits that remain in low-income and middle-income countries and which may take decades to converge.

6.2 Health Spending and Child Mortality

We now turn to the results for child mortality, which are reported in Table 2. The 2SLS results, which are based on regressions that instrument for health spending using the log of population and the share of agriculture in GDP, are shown in column 2. The models pass the specification tests and the explanatory variables account for a considerable portion of the variation in child mortality rates. The estimates indicate that a 1 per cent increase in health spending reduces child mortality rate by around 0.18 per cent. The coefficient on per capita income is consistent with the robust finding in the literature that income explains a good portion of the variation in child mortality rates across countries and over time (Filmer & Pritchett, 1999). The coefficient on lagged fertility suggests that a decline in fertility rates has a positive impact on child survival rates.

[19]By long term effects, we refer to the steady-state solution obtained from our model. There are several approaches to estimate long term effects using panel data. Chudik and Hashem (2015) provide an overview of the most common approaches. We adopt a method that considers the estimation of long-term effects in heterogeneous dynamic panels, and which can be approximated by using the coefficients of social spending β_2 and the lagged dependent variable θ_0 that are obtained from the panel of 3-year averages over the period 1990–2009. This is done by a procedure described in Chudik, Raissi, Pesaran, and Mohaddes (2016) that get the expression: $\ell = \frac{\beta_2}{1-\theta_0}$.

Table 2. Child mortality [ln(CM)] equation (OLS, 2SLS, FE and SGMM regressions)

Regression method	(1) OLS	(2) 2SLS[a]	(3) FE[b]	(4) SGMM[c]	(5) SGMM[d]	(6) SGMM
Lagged *ln*(CM)				0.93 (14.61)***	0.94 (10.97)***	
Health spending (% GDP) (*ln*)	−0.135 (9.69)***	−0.177 (5.36)***	−0.087 (2.56)**	−0.061 (3.17)***	−0.061 (2.42)**	−0.252 (2:22)**
GDP per capita (*ln*)	−0.238 (5.52)***	−0.214 (3.08)***	−0.19 (2.87)***	−0.029 (2.67)***	−0.065 (1.94)*	−0.052 (0.81)
Female education (*ln*)	0.001 (0.12)	0.004 (0.32)	−0.011 (1.78)	−0.004 (0.85)	−0.009 (1.49)	0.006 (0.22)
Access to sanitation	−0.012 (9.35)***	−0.012 (6.19)***	−0.002 (0.57)	−0.0002 (0.12)	−0.001 (0.41)	−0.013 (1.77)*
Access to safe water	0.004 (2.97)***	0.004 (1.90)*	−0.004 (1.29)	0.001 (0.44)	0.002 (0.66)	0.007 (0.82)
Degree of urbanization	−0.0005 (0.40)	−0.001 (0.64)	−0.009 (1.88)*	−0.0002 (0.26)	0.000 (0.01)	−0.006 (1.68)*
Fertility rate (*t*-1)	0.208 (8.59)***	0.227 (5.68)***	−0.027 (0.74)	0.017 (0.93)	−0.003 (0.11)	0.189 (3.64)***
Quality of bureaucracy	−0.027 (1.44)	−0.027 (0.99)	−0.025 (1.27)	0.001 (0.06)	0.013 (0.45)	−0.079 (0.96)
Democracy	−0.009 (2.52)**	−0.005 (0.89)	0.007 (2.60)***	0.002 (0.89)	−0.0001 (0.02)	−0.017 (1.36)
Number of countries	55	55	44	44	44	44
Observations	537	533	425	193	195	192
R-squared	0.86	0.88	0.91			
Number of instrument		2	2	33	31	33
Kleibergen–Paap F statistic		75.83	20.1			
Stock–Wright LM statistic		19.18	7.73			
(*p*-value)		0.00	0.02			
Hansen test[×]		0.88	0.97	0.33	0.34	0.22
Difference-in-Hansen test[×]				0.20	0.32	0.22
Autocorrelation (2nd order)[×]				0.89	0.99	0.24
Autocorrelation (3rd order)[×]				0.12	0.15	0.21

2SLS, two-stage least squares; FE, fixed-effects; GDP, gross domestic product; OLS, ordinary least squares; SGMM, System GMM.
[×]Denotes *p*-value.
[a]Uses log of population and agriculture (% GDP) as instruments.
[b]Uses the second lag of health spending and the military spending of neighbouring countries (as % of central government spending) as instruments.
[c]Uses internal (second and longer lags of child mortality, health spending and GDP per capita) and external [log of population and agriculture (% GDP)] as instruments.
[d]Uses only the aforementioned internal instruments.
*10% significance level.
**5% significance level.
***1% significance level.

It should be noted, however, that unaccounted-for country-specific effects may be biasing the 2SLS results. We thus turn to the FE results in column 3.

It is important to note that the instruments employed in the 2SLS regressions turned out to be weak in the FE specifications. Thus, we resorted to an additional set of instruments, namely the use of military spending as percentage of total central government spending of neighbouring countries, following Filmer and Pritchett (1999) and Bokhari, Gai, and Gottret (2007), and the second lag of health spending. Government health spending is an inverse function of domestic military budget, while the latter is a function of the military budget of neighbouring countries. Consequently, in the reduced form equation, we could expect that health spending is a function of neighbouring countries' military spending, while it is highly unlikely that the latter will be correlated with domestic child mortality rates.

The specification tests indicate that the FE models are by and large well specified. Consistent with the 2SLS results, health spending and per capita income are statistically significant and have the expected sign. The coefficients indicate that a 1 per cent increase in health spending results in a decline in child mortality rate of about 0.09 per cent. Female education shows a negative coefficient, suggesting that mother's schooling reduces the incidence of child mortality, which is consistent with our priors and previous studies (e.g. Filmer & Pritchett, 1999 and Rajkumar & Swaroop, 2008). The negative coefficient of the degree of urbanization is in line with Schultz (1993), who finds that child mortality rates are higher in rural, low-income and agricultural settings.

Columns 4 and 5 of Table 2 report the SGMM results. In all specifications, the null hypotheses that the instruments are valid and that there is no serial correlation of order two and higher cannot be rejected at conventional critical values. The SGMM estimate for health spending is qualitatively similar to those from the 2SLS and FE regressions. The coefficient on the lagged dependent variable indicates that child mortality rate is a highly persistent series, rendering most of the other covariates insignificant. The result implies that increasing health spending by 1 per cent would reduce child mortality rate by approximately 0.06 per cent. Given the inclusion of the lagged dependent variable, it is also possible to calculate the long-run effect. The estimate in the preferred GMM specification (column 4 of Table 2) and coefficients of 0.06 for health spending and 0.93 for lagged health spending suggest that the long-term effect of a 1 per cent increase in health spending is a reduction in the child mortality rate of about 0.86 per cent. Column 5 shows that this result is fairly robust to using only internal instruments.

7 HOW ROBUST ARE OUR RESULTS?

In this section, we run several robustness checks to test the validity of our findings. Section 7.1 rerun Equations (4) and (5) using alternative samples. In Section 7.2, social spending is measured in per capita terms instead of in percentage of GDP, while aggregate welfare is measured using the conventional HDI instead of IHDI. Section 7.3 employs alternative specifications whereas Section 7.4 expands the set of controls. Section 7.5 disaggregates social spending by its components (education, health and social protection spending) and assess their separate effect on aggregate welfare, whereas finally,

DOI: 10.1002/jid

Section 7.6 tests whether the efficacy of social spending is conditional upon democratic governance.[20]

7.1 Alternative Samples

Five countries in our dataset (Argentina, Chile, Latvia, Lithuania and Uruguay) are upper middle income and transition economies with high IHDI and very low child mortality rates, and their inclusion could downward bias the results. Thus, we rerun our main regressions using a restricted sample that excludes these countries. Moreover, we test the sensitivity of our results by only including middle-income countries, which constitute about two-thirds of the sample. Columns 1 and 2 of Tables 3 and 4 present the results, which show no considerable difference in the effect of social (or health) spending when the sample is restricted to this subset of countries.

As discussed in Section 3, for some countries, social spending data are reported partly in cash or partly in accrual values. In order to extend the cash-based data, we used the growth rates of the accrual data. To ensure that these imputations are not systematically correlated with the results, we re-estimate the baseline models only with the countries for which we have complete cash data and also exclude countries with data gaps. Columns 3 and 4 of Tables 3 and 4 present the results, which validate the robustness of our findings.

7.2 Redefining Social Spending and Aggregate Welfare

In the analysis presented earlier, social spending has been defined relative to a country's GDP, which provides a reasonable approximation to a country's spending capacity relative to its available resources. Per capita social spending is an alternative measure, which may be deemed more appropriate for assessing the efficacy of social spending with respect to development objectives. Therefore, we rerun Equations (4) and (5) using social spending per capita and present the results in Column 5 of Tables 3 and 4. Overall, the results are broadly consistent with those found in the original specifications.

So far, our focus has been on the causal relationship between social spending and the IHDI. In Columns 4 through 6 of Table 6, we present the results after running the 2SLS, FE and SGMM models with the conventional HDI. We find qualitatively similar results (Columns 4 through 6 of Table 6), although social spending exhibit a larger effect. This suggests that distributional inequalities in the dimensions of education, health and income seem to constrain the effectiveness of social spending. However, the concerns of inequality is not a trivial one and requires further analysis, which is beyond the scope of this paper.

7.3 Alternative Specifications

An alternative approach to assessing the effectiveness of social spending is to look at the rates of change in IHDI and child mortality instead of looking at the variation in these

[20]Due to space limitations, we largely focus on the preferred SGMM estimators; although consistent with the SGMM estimations, the 2SLS and FE results are fairly robust to the tests discussed in the succeeding text.

DOI: 10.1002/jid

Table 3. IHDI equation: alternative samples and specifications

Method	SGMM regressions						
Dependent variable	IHDI						
Regression	(1)[a]	(2)[b]	(3)[c]	(4)[d]	(5)[e]	*ln*(IHDI) (6)	*Δln*(IHDI) (7)
Social spending (% GDP) (*ln*)	0.004 (2.35)**	0.003 (3.34)***	0.003 (2.17)**	0.003 (2.09)**		0.021 (2.28)**	0.019 (2.35)**
Social spending per capita (*ln*)					0.003 (2.70)***		
Lagged IHDI	0.95 (31.32)***	0.96 (24.98)***	0.96 (33.53)***	0.94 (32.92)***	0.87 (19.35)***		
Lagged *ln*(IHDI)						0.91 (36.24)***	
Initial IHDI (*ln*)							−0.088 (3.52)***
Number of countries	38	33	36	33	42	42	39
Observations	160	141	148	141	175	175	166
Number of instruments	33	33	33	33	33	33	33
Hansen test[×]	0.75	0.32	0.49	0.35	0.77	0.31	0.31
Difference-in-Hansen test[×]	0.87	0.78	0.46	0.48	0.84	0.37	0.33
Autocorrelation (2nd order)[×]	0.02	0.03	0.01	0.02	0.03	0.03	0.02
Autocorrelation (3rd order)[×]	0.78	0.62	0.85	0.23	0.82	0.98	0.96

GDP, gross domestic product; IHDI, Inequality-adjusted Human Development Index; SGMM, System GMM.
[×]Denotes *p*-value.
[a]Excludes high-income countries.
[b]Includes only middle-income countries.
[c]Includes only countries with complete cash-based data.
[d]Includes only countries with no data gaps.
[e]Uses social spending per capita of social spending in per cent of GDP.
*10% significance level.
**5% significance level.
***1% significance level.

Table 4. CM equation: alternative samples and specifications

Method	SGMM regressions					
Dependent variable	*ln*(CM)					
Regression	(1)[a]	(2)[b]	(3)[c]	(4)[d]	(5)[e]	Δ *ln*(CM) (6)
Health spending (% GDP) (*ln*)	−0.056 (3.43)***	−0.078 (4.06)***	−0.057 (3.20)***	−0.063 (3.24)***		−0.059 (2.88)***
Health spending per capita (*ln*)					−0.051 (3.37)***	
Lagged child mortality (*ln*)	0.90 (15.62)***	0.91 (16.57)***	0.94 (12.46)***	0.96 (12.69)***	0.86 (13.51)***	
Initial *ln*(CM)						−0.11 (2.31)**
Number of countries	39	33	36	35	44	44
Observations	172	145	155	154	193	193
Number of instruments	33	33	33	33	33	33
Hansen test	0.44	0.89	0.23	0.15	0.31	0.25
Difference-in-Hansen test[×]	0.16	0.93	0.10	0.09	0.20	0.20
Autocorrelation (2nd order)[×]	0.94	0.20	0.74	0.53	0.99	0.97
Autocorrelation (3rd order)[×]	0.12	0.27	0.24	0.29	0.09	0.14

CM, child mortality; GDP, gross domestic product; SGMM, System GMM.
[×]Denotes *p*-value.
[a]Excludes high-income countries.
[b]Only middle-income countries.
[c]Only countries with complete cash data.
[d]Only countries with no data gaps.
[e]Uses spending per capita.
*10% significance level.
**5% significance level.
***1% significance level.

welfare dimensions. The rates of change in aggregate welfare better capture the long(er)-term effects of social spending and may also better reflect the convergence of countries towards higher levels of development. We re-estimate the main SGMM models using the growth rates of IHDI and child mortality in Table 3 (column 7) and Table 4 (column 6). Consistent with our main results, we find that social spending has a significantly positive impact on IHDI growth. The coefficient on the initial level of IHDI is negative and significant, suggesting a convergence effect: Countries with low achievements in human development experience higher advances in IHDI as a result of an additional unit of social spending, *ceteris paribus*. The results for child mortality are also in line with our priors. We also estimated the main IHDI and child mortality regressions excluding the lagged dependent variables (Column 6 of Tables 1 and 2) and the results remain broadly unaffected.

7.4 Additional Control Variables

To ensure that omitted variables are not biasing our results, we expand the set of control variables in the IHDI and child mortality equations. In the IHDI equation, the additional controls are: aid flows as percentage of GNI; the share of domestic credit to private sector in GDP; and the ICRG index of corruption. In the child mortality equation, we included the following set of additional controls: aid flows as percentage of GNI; the percentage of population aged under 5; the prevalence of undernutrition; the index of ethnolinguistic fractionalization of Alesina *et al*. (2003); and the percentage of Muslim population.[21] The results are presented in Tables 5–7 and remain in general unaffected.

Only some of the additional controls are significant at conventional levels. The finding that aid has an insignificant effect on IHDI is not surprising. Most of the countries in the sample are middle-income countries that receive far less official development assistance than low-income countries.

Turning to the child mortality regressions, the inclusion of additional controls does not affect the main results. Aid (lagged one-period) has a desirable significant negative effect on child mortality rate in the FE specification.[22] Moreover, the positive coefficients on ethnolinguistic fractionalization and 'predominantly Muslim' are consistent with, *inter alia*, Filmer and Pritchett (1999) and Rajkumar and Swaroop (2008), who found that child mortality rates tend to be higher in countries with a predominantly Muslim population, and with higher ethnolinguistic diversity. Note, however, that some of these results should be interpreted with caution as the instruments appear weak in some of these alternative specifications.

7.5 Disaggregating Social Spending

So far, we have focused on the effectiveness of government social spending, which aggregates expenditures on health, education and social protection. In this subsection,

[21]We allow these variables to enter the regressions individually because of the limited overlap between them, which would have led to a considerable loss of degrees of freedom.
[22]In contrast, aid has a positive and significant (at the 10% level) coefficient in the 2SLS regression. However, the FE result seems plausible given that the 2SLS regression does not control for country fixed-effects.

DOI: 10.1002/jid

Table 5. IHDI equation: more control variables

Dependent variable: IHDI									
Method	2SLS			FE			SGMM		
Regression	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged IHDI							0.94	0.95	0.93
							(35.91)***	(32.83)***	(37.35)***
Social spending (% GDP) (*ln*)	0.014	0.013	0.013	0.015	0.012	0.013	0.003	0.004	0.004
	(6.31)***	(5.82)***	(5.07)***	(2.68)***	(2.65)***	(2.69)***	(1.91)*	(2.59)***	(2.21)**
Aid (% GNI) (*t*-1)	0.002			0.001			−0.001		
	(0.02)			(0.97)			(0.16)		
Finance		−0.004			−0.003			−0.002	
		(3.12)***			(3.59)***			(2.37)**	
Corruption			0.003			0.001			0.001
			(2.35)**			(1.36)			(0.54)
Countries	52	52	52	33	38	38	37	42	42
Observations	451	503	504	364	417	417	153	175	175
Kleibergen–Paap F	49.64	45.69	35.79	7.38	9.77	9.40			
Stock–Wright	19.70	17.63	15.78	7.68	6.57	6.81			
(*p*-value)	0.00	0.00	0.00	0.02	0.04	0.03			
Hansen test[×]	0.95	0.96	0.66	0.33	0.59	0.64	0.35	0.54	0.59
Difference-in-Hansen[×]							0.70	0.41	0.73
Autocorrelation (2nd order)[×]							0.02	0.03	0.04
Autocorrelation (3rd order)[×]							0.67	0.87	0.74

2SLS, two-stage least squares; FE, fixed-effects; GDP, gross domestic product; GNI, gross national income; IHDI, Inequality-adjusted Human Development Index; SGMM, System GMM.
[×]Denotes *p*-value.
*10% significance level.
**5% significance level.
***1% significance level.

Table 6. HDI and IHDI equations: incorporating *social spending* × *democracy*

Dependent variable	IHDI			HDI		
Method	2SLS	FE	SGMM	2SLS	FE	SGMM
Regression	(1)	(2)	(3)	(4)	(5)	(6)
Lagged IHDI			0.93 (40.44)***			0.93 (37.21)***
Social spending (% GDP) (*ln*)	0.015 (4.91)***	0.011 (2.46)**	0.004 (1.91)*	0.033 (3.66)***	0.023 (2.31)**	0.012 (2.47)**
Democracy	0.001 (1.86)*	0.0002 (1.22)	0.002 (0.46)			
Spending × democracy (% GDP)	−0.0001 (0.60)	−0.0003 (2.74)***	−0.001 (0.49)			
Number of countries	51	38	42			42
Observations	504	417	175			175
Kleibergen–Paap F statistic	19.88	10.64		18.64	13.50	
Stock–Wright LM statistic	12.97	5.89		7.25	5.77	
(*p*-value)	0.00	0.05		0.027	0.056	
Hansen test[×]	0.78	0.49	0.71	0.84	0.48	0.73
Difference-in-Hansen test[×]			0.87			0.89
Autocorrelation (2nd order)[×]			0.50			0.81
Autocorrelation (3rd order)[×]			0.12			0.11

2SLS, two-stage least squares; FE, fixed-effects; GDP, gross domestic product; HDI, Human Development Index; IHDI, Inequality-adjusted Human Development Index; SGMM, System GMM.
[×]Denotes *p*-value.
*10% significance level.
**5% significance level.
***1% significance level.

Table 7. Child mortality [ln(*CM*)] equation: more control variables

Method	2SLS					FE		
Regression	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Health spending (% GDP) (*ln*)	−0.17 (5.09)***	−0.141 (3.75)***	−0.139 (3.38)***	−0.184 (5.64)***	−0.169 (4.65)***	−0.103 (2.70)***	−0.055 (2.17)**	−0.048 (2.31)**
Under-5 population	0.095 (3.62)***					−0.005 (0.33)		
Aid (% GNI) (*t*-1)		0.011 (1.90)*					−0.005 (2.75)***	
Undernutrition (*ln*)			0.13 (2.37)**					−0.026 (0.54)
Fractionalization				0.174 (1.75)*				
Predominantly Muslim					0.004 (4.23)***			
Number of countries	55	55	55	55	55	43	34	42
Observations	522	435	434	532	466	414	302	367
R-squared	0.87	0.86	0.87	0.86	0.89	0.90	0.92	0.92
Kleibergen–Paap F	68.25	35.81	34.53	79.89	52.87	17.69	46.81	56.46
Stock–Wright LM	15.09	12.67	9.49	21.71	15.40	8.53	3.97	6.05
(*p*-value)	0.00	0.00	0.009	0.00	0.001	0.01	0.14	0.049
Hansen test (*p*-value)	0.22	0.13	0.20	0.95	0.26	0.85	0.90	0.42

2SLS, two-stage least squares; FE, fixed-effects; GDP, gross domestic product; GNI, gross national income.
ˣDenotes *p*-value.
*10% significance level.
**5% significance level.
***1% significance level.

we investigate the potential differential effects of the different components of social spending on aggregate welfare. Table 8 reports the SGMM results. We find that health spending has a significantly positive impact on IHDI, whereas the coefficients on education and social protection expenditures appear insignificant at conventional levels. This result is robust to changes in the set of instruments. Our findings seem to support the evidence reported in Hanushek (1995), Mingat and Tan (1998) and Wolf (2004) that show a weak correlation between education spending and welfare outcomes. Nevertheless, these results should be taken with caution, especially when considering the number of instruments that becomes large when social spending is disaggregated.

7.6 Social Spending, Aggregate Welfare and Democracy

We now consider the possibility that the efficacy of social spending might hinge on democratic governance. Some studies contend that government spending tends to be more effective in countries with democratic institutions that provide an institutionalized check on governments (Svensson, 1999). Boone (1996) also argues that liberal democracies perform better in human development achievements than repressive regimes. The underlying assumption is that with more political freedoms and better channels to expressed voice, redistributive struggles between political and socio-economic groups may lead to more effective allocation of resources. Thus, other things being equal, it would be plausible to expect that social spending is more effective in countries with stronger democratic institutions. This suggests that social spending would be more effective in countries with stronger democratic institutions. Tables 6 and 9 add the interaction terms *social spending* × *democracy* and *health spending* × *democracy* to the baseline IHDI and

Table 8. IHDI equation (disaggregating social spending)

SGMM regressions (dependent variable: IHDI)			
	(1)	(2)	(3)
Lagged IHDI	0.99 (41.77)***	0.97 (31.82)***	0.93 (21.03)***
Health spending (% GDP) (ln)	0.003 (3.37)***	0.004 (2.11)**	0.004 (2.18)**
Education spending (% GDP) (*ln*)	0.001 (0.40)	−0.002 (1.22)	−0.003 (1.27)
Social protection spending (% GDP) (*ln*)	−0.001 (1.43)	−0.0002 (0.22)	−0.0003 (0.24)
GDP per capita (*ln*)	0.002 (3.91)***	0.002 (1.84)*	0.004 (3.16)***
Number of countries	41	40	40
Observations	184	162	162
Number of instruments	39	49	46
Hansen test (*p*-value)	0.50	0.88	0.81
Difference-in-Hansen test[×]	0.95	1.00	0.92
Autocorrelation (2nd order)[×]	0.40	0.30	0.89
Autocorrelation (3rd order)[×]	0.06	0.75	0.11

Column 1 includes only the variables shown here; columns 2 and 3 include the covariates included in Table 2; columns 1 and 2 add second and longer lags of health, education and social protection spending to the instrument set in Table 2 (column 2); column 3 uses only the aforementioned internal instruments.
IHDI, Inequality-adjusted Human Development Index; GDP, gross domestic product; SGMM, System GMM.
[×]Denotes *p*-value.
*10% significance level.
**5% significance level.
***1% significance level.

Table 9. Child mortality [ln(*CM*)] equation: more controls and *spending* × *democracy*

Method	SGMM regressions						
Regressions	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged child mortality (*ln*)	0.93 (15.35)***	0.87 (15.62)***	0.90 (15.12)***	0.89 (15.88)***	0.92 (13.39)***	0.92 (13.85)***	0.97 (16.80)***
Health spending (% GDP) (*ln*)	−0.046 (2.99)***	−0.063 (2.12)**	−0.064 (3.18)***	−0.055 (3.52)***	−0.054 (3.02)***	−0.059 (2.76)***	
Social spending (% GDP) (*ln*)							−0.066 (2.56)**
Under-5 population	−0.011 (0.92)						
Aid (% GNI) (*t*-1)		0.001 (0.71)					
Undernutrition (*ln*)			−0.001 (0.04)				
Fractionalization				0.036 (0.74)			
Predominantly Muslim					0.0002 (0.53)		
Democracy						0.002 (0.90)	
Spending × democracy (% GDP)						0.001 (0.30)	
Number of countries	43	38	42	43	44	44	43
Observations	188	163	173	192	193	193	195
Hansen test[×]	0.24	0.50	0.45	0.26	0.17	0.28	0.14
Difference-in-Hansen test[×]	0.09	0.22	0.08	0.25	0.10	0.20	0.10
Autocorrelation (2nd order)[×]	0.70	0.35	0.29	0.90	0.99	0.97	0.41
Autocorrelation (3rd order)[×]	0.12	0.07	0.07	0.10	0.12	0.11	0.55

GDP, gross domestic product; GNI, gross national income; SGMM, System GMM.
[×]Denotes *p*-value.
*10% significance level.
**5% significance level.
***1% significance level.

child mortality regressions, respectively. Our approach is similar to that of Burnside and Dollar (2000), who employ interaction terms to address the question of whether aid has a stronger impact on growth in countries with better policies.

In the IHDI model, the interaction term enters the 2SLS and SGMM regressions with negative insignificant statistical power, whereas it becomes significant in the FE specification. In all specifications, social spending has a significantly positive effect on the IHDI. In the child mortality model, health spending has a desirable negative effect on child mortality rates, while the corresponding interaction term between health spending and democracy is insignificant. To ensure that our results are not artefact of the Polity democracy index, we rerun the models using the ICRG index on democratic accountability, which measures how responsive a government is to its people. We find similar results. Overall, we do not find strong evidence to suggest that democratic institutions are a *conditio sine qua non* for the effective allocation of public resources to improve the welfare of nations.

8 CONCLUSIONS

In this study, we investigate the long standing and contested question of whether government social spending has a causal effect on human development. We focus on three measures of aggregate welfare, the IHDI, child mortality and the conventional HDI using a panel of 55 low-income and middle-income countries over the period 1990–2009.

Our study provides evidence that supports the proposition that social spending is a strong predictor of improved aggregate welfare in low-income and middle-income countries. More specifically, we find that social spending has a significantly positive causal effect on the IHDI, while health spending has a desirable significant negative effect on child mortality. The preferred SGMM specification indicates that a 1 per cent increase in social spending increases the IHDI by 0.004 points, which appears modest, albeit not negligible. The implied long-run effect of a similar increase in social spending is an increase in the IHDI of about 0.057 points.

The results are fairly robust to the method of estimation, the use of alternative instruments to control for the endogeneity of social spending, the set of control variables included in the estimations and the use of alternative samples.

The economic interpretation of our findings draw attention to the significant gaps in human development achievements that prevail in the developing world, and which may take decades to converge to the levels observed in industrialized nations, even under situations of considerable increases in government social spending.

Further analysis using the conventional HDI suggests that, *ceteris paribus*, existing distributional inequalities in the domains of education, health and income seem to constrain, at least partly, the effectiveness of social spending. The far-reaching implications of our findings require further analysis, which is beyond the scope of this paper.

Finally, we do not find strong evidence that the effectiveness of social spending hinges on democratic governance. Our findings support previous studies that point out that government spending on the social sectors can improve the welfare of societies even in nations with less-advanced democratic institutions (Ames, 1987; Alesina & Rodrik, 1994). However, further research is needed to address this policy concern more thoroughly.

ACKNOWLEDGEMENTS

We are grateful to Ravi Kanbur, Andy Mckay, Mansoob Murshed, Jukka Pirttilä, and seminar participants at UNU-WIDER, the International Institute of Social Studies in The Hague, the Development Research Group at the World Bank, the 17th World Congress of the International Economic Association in Jordan, and the 2015 Nordic Conference in Development Economics in Copenhagen, for their helpful comments on earlier versions of this paper. We are particularly grateful to the anonymous references for their suggestions that helped improve our analysis. We gratefully acknowledge support for this research from the UNU-WIDER. Naturally, any remaining errors are ours.

REFERENCES

Abed GT, Gupta S. 2002. *Governance, Corruption, and Economic Performance*. International Monetary Fund: Washington DC; 564.

Addison T, Niño-Zarazúa M, Tarp F. 2015. Aid, social policy and development. *Journal of International Development* **27**(8): 1351–1365.

Ahmad E, Stern N. 1991. *The Theory and Practice of Tax Reform in Developing Countries*. Cambridge University Press: Cambridge.

Alesina A, Baqir R, Easterly W. 1999. Public Goods and Ethnic Divisions. *Quarterly Journal of Economics* **114**(4): 1243–1284.

Alesina A, Devleeschauwer A, Easterly W, Kurlat S, Wacziarg R. 2003. Fractionalization. *Journal of Economic Growth* **8**(2): 155–194.

Alesina A, Rodrik D. 1994. Distributive Politics and Economic Growth. *Quarterly Journal of Economics* **109**(2): 465–490.

Ames B. 1987. *Political Survival: Politicians and Public Policy in Latin America*. University of California Press: Berkeley.

Anand S, Ravallion M. 1993. Human Development in Poor Countries: On the Role of Private Incomes and Public Services. *Journal of Economic Perspectives* **7**: 133–150.

Arellano M, Bond S. 1991. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies* **58**: 277–297.

Aschauer DA. 1989. Is public expenditure productive? *Journal of Monetary Economics* **23**(2): 177–200.

Atkinson AB. 1970. On the measurement of inequality. *Journal of Economic Theory* **2**(3): 244–263.

Baker DP, Leon J, Smith Greenaway EG, Collins J, Movit M. 2011. The Education Effect on Population Health: A Reassessment. *Population and Development Review* **37**(2): 307–332.

Baldacci E, Clements B, Gupta S, Cui Q. 2008. Social Spending, Human Capital, and Growth in Developing Countries. *World Development* **36**(8): 1317–1341.

Baldacci E, Guin-Siu Maria T, De Mello L. 2003. More on the Effectiveness of Public Spending on Health Care and Education: A Covariance Structure Model. *Journal of International Development* **15**: 709–725.

Bank World. 2013. *World Development Indicators 2013*. World Bank: Washington, D.C.

Barro RJ. 1990. Government Spending in a Simple Model of Endogeneous Growth. *Journal of Political Economy* **98**(5): S103–S125.

Barro R. 1991. Economic Growth in a Cross Section of Countries. *Quarterly Journal of Economics* **106**(2): 407–443.

Baum CF, Schaffer ME, Stillman S. 2007. Enhanced routines for IV/GMM estimation and testing. *Stata Journal* **7**(4): 465–506.

Becker GS. 1962. Investment in Human Capital: A Theoretical Analysis. *Journal of Political Economy* **70**(5, Part 2): 9–49.

Benhabib J, Spiegel MM. 1994. The Role of Human Capital in Economic Development. *Journal of Monetary Economics* **34**: 143–173.

Bidani B, Ravallion M. 1997. Decomposing Social Indicators Using Distributional Data. *Journal of Econometrics* **77**: 125–139.

Bloom DE, Canning D, Sevilla J. 2004. The Effect of Health on Economic Growth: A Production Function Approach. *World Development* **32**(1): 1–13.

Blundell R, Bond S. 1998. Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of Econometrics* **87**: 115–143.

Bokhari FA, Gai Y, Gottret P. 2007. Government Health Expenditures and Health Outcomes. *Health Economics* **16**(3): 257–273.

Boone P. 1996. Politics and the effectiveness of foreign aid. *European Economic Review* **40**(2): 289–329.

Bun M, Windmeijer F. 2010. The Weak Instrument Problem of the System GMM Estimator in Dynamic Panel Data Models. *The Econometrics Journal* **13**(1): 95–126.

Burnside C, Dollar D. 2000. Aid, Policies, and Growth. *American Economic Review* **90**(4): 847–868.

Chiripanhura B, Niño-Zarazúa M. 2015. Aid, Political Business Cycles and Growth in Africa. *Journal of International Development* **27**(8): 1387–1421.

Chudik A, Pesaran H. 2015. Large panel data models with cross-sectional dependence: a survey. In *The Oxford Handbook of Panel Data*, Badi HB (ed). Oxford University Press: Oxford.

Chudik A, Raissi M, Pesaran MH, Mohaddes K. 2016. Long-run effects in large heterogeneous panel data models with cross-sectionally correlated errors. In *Advances in Econometrics. Essays in Honor of Aman Ullah*, Fomby TB, Carter Hill R, Jeliazkov I, Escanciano JC, Hillebrand E (eds), **36**. Emerald Group Publishing Limited: Bingley; 85–135.

Cutler D, Lleras-Muney A. 2008. Education and health: evaluating theories and evidence. In *Making Americans Healthier: Social and Economic Policy as Health Policy*, House J et al. (eds). Russell Sage Foundation: New York.

Cutler D, Lleras-Muney A. 2010. Understanding Differences in Health Behaviors by Education. *Journal of Health Economics* **29**(1): 1–28.

Devarajan S, Swaroop V, Zou H-f. 1996. The composition of public expenditure and economic growth. *Journal of Monetary Economics* **37**(2): 313–344.

Dollar D, Kraay A. 2002. Growth is Good for the Poor. *Journal of Economic Growth* **7**(3): 195–225.

Dreher A, Nunnenkamp P, Thiele R. 2008. Does Aid for Education Educate Children? Evidence from Panel Data. *World Bank Economic Review* **22**(2): 291–314.

Easterly W, Rebelo S. 1993. Fiscal Policy and Economic Growth: An Empirical Investigation. *Journal of Monetary Economics* **32**: 417–458.

Filmer D, Hammer JS, Pritchett L. 2000. Weak Links in the Chain: A Diagnosis of Health Policy in Poor Countries. *World Bank Research Observer* **15**: 199–224.

Filmer D, Pritchett L. 1999. The Impact of Public Spending on Health: Does Money Matter? *Social Science and Medicine* **49**: 1309–1323.

Flug K, Spilimbergo A, Wachtenheim E. 1998. Investment in Education: Do Economic Volatility and Credit Constraints Matter? *Journal of Development Economics* **55**: 465–481.

Gebregziabher F, Niño-Zarazúa M. 2014. Social Spending and Aggregate Welfare in Developing and Transition Economies. WIDER Working Paper Series 2014/082. UNU-WIDER. Helsinki.

Gisselquist RM, Leiderer S, Niño-Zarazúa M. 2016. Ethnic Heterogeneity and Public Goods Provision in Zambia: Evidence of a Subnational "Diversity Dividend". *World Development* **78**: 308–323.

Gomanee K, Girma S, Morrissey O. 2005. Aid, Public Spending, and Welfare: Evidence from Quantile Regressions. *Journal of International Development* **17**: 299–309.

Gomanee K, Morrissey O, Mosley P, Verschoor A. 2005. Aid, Government Expenditure, and Aggregate Welfare. *World Development* **33**(3): 355–370.

Gupta S, Verhoeven M, Tiongson E. 2002. The Effectiveness of Government Spending on Education and Health Care in Developing and Transition Economies. *European Journal of Political Economy* **18**(4): 717–737.

Gupta S, Verhoeven M, Tiongson E. 2003. Public Spending on Health Care and the Poor. *Health Economics* **12**(8): 685–696.

Hanushek E. 1995. Interpreting Recent Research on Schooling in Developing Countries. *World Bank Research Observer* **10**(2): 227–246.

Hausmann R, Pritchett L, Rodrik, D. 2005. Growth Accelerations. *Journal of Economic Growth* **10**(4): 303–329.

Hicks DA. 1997. The Inequality-adjusted Human Development Index: A Constructive Proposal. *World Development* **25**(8): 1283–1298.

Hojman DE. 1996. Economic and Other Determinants of Infant and Child Mortality in Small Developing Countries. *Applied Economics* **28**: 281–290.

Huang Y, Quibria MG. 2013. The Global Partnership for Inclusive Growth. WIDER Working Paper no. 059. Helsinki: UNU-WIDER.

IMF. 2011. Government Finance Statistics: Compilation Guide for Developing Countries.

IMF. 2012. *World Economy Outlook. Coping with High Debt and Sluggish Growth*. International Monetary Fund: Washington, D.C.

International Monetary Fund (IMF). 2001. *A Manual on Government Finance Statistics*. International Monetary Fund: Washington, DC.

Kaufmann D, Kraay A, Mastruzzi M. 2004. Governance Matters III: Governance Indicators for 1996, 1998, 2000, and 2002. *The World Bank Economic Review* **18**(2): 253–287.

Kim K, Moody PM. 1992. More resources better health? A cross-national perspective. *Social Science and Medicine* **34**: 837–842.

King RG, Rebelo S. 1990. Public Policy and Economic Growth: Developing Neoclassical Implications. *Journal of Political Economy* **98**(5, Part 2): S126–SS50.

Kosack S. 2003. Effective Aid: How Democracy Allows Development Aid to Improve the Quality of Life. *World Development* **31**(1): 1–22.

La Porta R, Lopez-de-Silanes F, Shleifer A, Vishny R. 1999. The Quality of Government. *Journal of Law, Economics, and Organization* **15**(1): 222–279.

Levine R, Renelt D. 1992. A Sensitivity Analysis of Cross-Country Growth Regressions. *The American Economic Review* **82**(4): 942–963.

Lucas RE. 1988. On the Mechanic of Economic Development. *Journal of Monetary Economics* **22**(1): 3–42.

Marshall MG, Gurr TD, Jaggers K. 2013. *Polity IV Project: Dataset Users' Manual*. University of Maryland: College Park, MD.

Mauro P. 1998. Corruption and the composition of government expenditure. *Journal of Public Economics* **69**(2): 263–279.

Mingat A, Tan J-P. 1998. The Mechanics of Progress in Education: Evidence from Cross-country Data. Working paper no. 2015. Washington, DC: World Bank.

Mishra P, Newhouse D. 2009. Does Health Aid Matter? *Journal of Health Economics* **28**: 855–872.

Mittnik S, Neumann T. 2003. Time-Series Evidence on the Nonlinearity Hypothesis for Public Spending. *Economic Inquiry* **41**(4): 565–573.

Mosley P, Hudson J, Verschoor A. 2004. Aid, Poverty Reduction and the 'New Conditionality'. *Economic Journal* **114**: 217–243.

Poterba JM. 1996. Government intervention in the markets for education and health care: how and why? In *Individual and Social Responsibility: Child Care, Education, Medical Care, and Long-term Care in America*, Fuchs VR (ed). University of Chicago Press: Chicago; 277–308.

Pritchett L, Summers LH. 1996. Wealthier is Healthier. *Journal of Human Resources* **31**(4): 841–868.

Psacharopoulos G. 1994. Returns to Investment in Education: A Global Update. *World Development* **22**(9): 1325–1343.

Psacharopoulos G, Patrinos HA. 2004. Returns to Investment in Education: A Further Update. *Education Economics* **12**(2): 111–134.

Rajkumar A, Swaroop V. 2008. Public Spending and Outcomes: Does Governance Matter? *Journal of Development Economics* **86**: 96–111.

Ravallion M, Chen S. 1997. What Can New Survey Data Tell Us About Recent Changes in Distribution and Poverty? *World Bank Economic Review* **11**(2): 357–382.

Reddy S, Pogge T. 2010. How not to count the poor. In *Measuring Global Poverty*, Anand S, Stiglitz J (eds). Oxford University Press: Oxford.

Roberts RD. 1984. A Positive Model of Private Charity and Public Transfers. *Journal of Political Economy* **92**(1): 136–148.

Rodrik D, Subramanian A, Trebbi F. 2004. Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development. *Journal of Economic Growth* **9**(2): 131–165.

Romer PM. 1994. The Origins of Endogenous Growth. *Journal of Economic Perspectives* **8**(1): 3–22.

Roodman DM. 2009a. How to Do xtabond2: An Introduction to Difference and System GMM in Stata. *Stata Journal* **9**(1): 86–136.

Roodman DM. 2009b. A Note on the Theme of Too Many Instruments. *Oxford Bulletin of Economics and Statistics* **71**: 135–158.

Ross CE, Wu C-l. 1995. The Links Between Education and Health. *American Sociological Review* **60**(5): 719–745.

Schultz TW. 1961. Investment in Human Capital. *The American Economic Review* **51**(1): 1–17.

Schultz TW. 1971. *Investment in Human Capital: The Role of Education and of Research*. Free Press: New York.

Schultz TW. 1993. Investments in the Schooling and Health of Women and Men: Quantities and Returns. *Journal of Human Resources* **28**(4): 694–734.

Seiferling M. 2013. Recent Improvements to the *GFS* Yearbook Database in Response to Analytical Needs. *IMF Working Papers* no. 15. Washington, DC: IMF.

Squire L. 1993. Fighting Poverty. *American Economic Review* **83**(2): 377–382.

Staiger D, Stock JH. 1997. Instrumental Variables Regression with Weak Instruments. *Econometrica* **65**: 557–586.

Stiglitz JE. 1989. Markets, Market Failures, and Development. *The American Economic Review* **79**(2): 197–203.

Svensson J. 1999. Aid, Growth and Democracy. *Economics and Politics* **11**(3): 275–297.

Tanzi V. 1992. Structural factors and tax revenue in developing countries. In *Open Economies, Structural Adjustment and Agriculture*, Goldin I, Winters LA (eds). CEPR and OECD: Paris; 267–285.

UNDP. 2011. *Sustainability and Equity: A Better Future for All*. Palgrave Macmillan: New York, NY.

Von Hagen J. 2005. Political Economy of Fiscal Institutions. GESY Discussion paper no. 149. Germany: Mannheim University.

Weisbrod BA. 1962. Education and Investment in Human Capital. *Journal of Political Economy* **70**(5, Part 2): 106–123.

Windmeijer F. 2005. A Finite Sample Correction for the Variance of Linear Efficient Two-step GMM Estimators. *Journal of Econometrics* **126**(1): 25–51.

Wolf A. 2004. Education and Economic Performance: Simplistic Theories and Their Policy Consequences. *Oxford Review of Economic Policy* **20**(2): 315–333.
World Bank. 2004. *World Development Report 2005*. World Bank: Washington, D.C.
World Bank. 2012. *World Development Indicators 2012*. World Bank: Washington, DC.

A. APPENDIX

Table A1. Data description and source

Variable	Description and source
GDP per capita	Gross Domestic Product per capita, PPP (constant 2005 international dollar). Source: World Development Indicators (WDI).
Child mortality rate	The number of new born babies out of 1000 that die before reaching the age of 5, if subject to current age-specific mortality rates. Source: WDI.
Social spending	Central government (CG) spending (current and capital) on health, education and social protection. Source: IMF (2011).
Openness	Sum of exports and imports of goods and services (% GDP). Source: WDI.
Terms of trade	The ratio of export price index to import price index. Source: WDI.
Inflation	Log of one plus the inflation rate. Source: WDI.
Age dependency ratio	The ratio of dependents (people younger than 15 or older than 64 years) to working age population (those aged between 15 and 64 years). Source: WDI.
Bureaucratic quality	Assesses how much strength and expertise bureaucrats have to govern without drastic alterations in policy or interruptions in government services. It measures the soundness of institutions and the quality of the civil service. Scale is from 1 to 4. Source: ICRG.
Corruption	Index measuring corruption in government, based on the subjective evaluation of experts. Scale is from 0 to 6. Source: ICRG.
Democracy index	Comprises two components: democracy (*Dc*) and autocracy (*Ac*), ranging from 0 to 10, where 10 represents full democracy and full autocracy respectively. It is computed by deducting *Ac* from *Dc* and thus ranges from −10 to 10. Source: Marshall, Gurr, and Jaggers (2013).
Aid	Net Official Development Assistance (% GNI). Source: WDI
Finance	Domestic credit to private sector (% GDP). Source: WDI
Female education	Share of female students in primary & secondary schools. Source: WDI
Degree of urbanization	Percentage of population living in areas defined as urban by each country. Source: WDI
Sanitation	Access to improved sanitation facilities (% population) Source: WDI.
Safe water	Access to improved drinking water source (% population) Source: WDI.
Fertility rate	Number of births per woman. Source: WDI.
Democratic accountability	This index ranges from 1 to 6 and measures how responsive government is to its people. Source: ICRG.
Population	Total population. Source: WDI.
Under-5 population	Percentage of population aged under 5. Source: WDI.
Muslim	Percentage of population that is Muslim. Source: La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1999).
Undernutrition	Prevalence of undernourishment (% population). Source: WDI.
Ethnolinguistic fractionalization	Measures the probability that two randomly selected individuals from a population do not belong to the same ethnolinguistic group. Source: Alesina *et al*. (2003).
Ethnic tensions	Measures the degree of tension within a country stemming from differences in race, nationality, or language: the higher the tension, the lower the rating. Scale is from 1 to 6. Source: ICRG.
Agriculture	Agriculture, value added (% GDP). Source: WDI.
Military spending	Military expenditures (% total CG spending) Source: WDI.
Budget deficit	CG budget deficit (% GDP). Source WDI (2013) and IMF (2011).

Table A2. Summary statistics

Panel A: IHDI specification					
Variable	Obs.	Mean	Std. dev.	Min	Max
GDP per capita (2005 PPP)	1017	5360.51	3923.98	433.76	21190.58
Social spending (% of GDP)	785	9.29	6.20	0.14	46.01
HDI	982	0.595	0.133	0.259	0.813
IHDI	962	0.199	0.044	0.086	0.271
Terms of trade	846	104.8	24.3	50.93	251.85
Openness	1007	76.04	39.95	0.31	223.06
Inflation	952	28.93	190.75	−17.63	4734.92
Age dependency ratio	1020	67.14	17.83	38.95	120.82
Bureaucratic quality	840	1.89	0.75	0	3.5
Democracy	972	3.95	5.58	−9	10
Panel B: Child mortality specification					
GDP per capita (2005 PPP)	1097	5382.322	3874.504	433.76	21190.58
Health spending (% of GDP)	830	1.88	1.78	0.03	20.82
Child mortality rate	1100	51.49	41.98	6.6	204
Degree of urbanization	1100	49.39	21.82	6.27	92.35
Female education	931	49.4	21.82	30.49	53.97
Fertility rate	1094	47.79	3.17	1.09	8.67
Access to sanitation	1059	68.04	26.39	2.3	100
Access to safe water	1078	83.15	17.43	13.6	100

IHDI, Inequality-adjusted Human Development Index; GDP, gross domestic product; PPP, purchasing power parity; HDI, Human Development Index.

Table A3. Countries with data partly in cash and partly in accrual and data gaps

Country	Years available		Data gaps	Country	Years available		Data gaps
	Cash	Accrual			Cash	Accrual	
Algeria	2000–2005	2006–09	None	Indonesia	1990–2004	None	2000
Argentina	1990–2001	2002–04	None	Lebanon	1993–99	2000–09	None
Bolivia	1990–2001	2002–07	None	Lithuania	1999–2000	2001–09	None
Chile	1990–2001	2002–09	None	Madagascar	1990–97	2001–09	1998–2001
Costa Rica	1990–2007	None	1992–93; 2004	Malaysia	1990–2009	None	1996–2001
Domincan Republic	1990–2003	None	2001	Mongolia	1992–2002	None	1999
Ethiopia	1990–2005	None	2000	Morocco	1990–99	None	1996
Fiji	1990–1996; 2004–2006	None	1997–2003	Thailand	1990–2001	2002–09	None
				Zambia	1990–2007	None	2000

Panel B. List of countries included in the sample

Algeria, Argentina, Bangladesh, Belarus, Bhutan, Bolivia, Bulgaria, Burundi, Chile, Columbia, Costa Rica, Dominican Republic, Egypt, El Salvador, Ethiopia, Fiji, Georgia, Guatemala, India, Indonesia, Iran, Jamaica, Jordan, Kazakhstan, Kenya, Kyrgyz Republic, Latvia, Lebanon, Lithuania, Madagascar, Malaysia, Maldives, Mauritius, Mexico, Moldova, Mongolia, Morocco, Myanmar, Nepal, Pakistan, Panama, Papua New Guinea, Philippines, Romania, Russian Federation, Seychelles, Sri Lanka, Thailand, Tunisia, Turkey, Uganda, Ukraine, Uruguay, Yemen, Zambia.