THE IMPACT OF PUBLIC DEBT ON THE SUSTAINABILITY OF THE ECONOMY

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Abstract

Did increased public debt jeopardize the sustainability of the economy, taking all dimensions into account? Research to date has focused on the role of gross public debt in financial sustainability. Two opposing views on sustainability of the economy have emerged: strong sustainability, requiring separate preservation of all environmental assets, and weak sustainability, allowing a high degree of substitutability among produced capital, human capital, and natural capital. Our study focuses on weak sustainability. Although debt build-up can finance capital expenditure, debt servicing can increase pressure on natural resources that are essential for a sustainable economy, affecting all components of adjusted net saving or the inclusive wealth index, both of which measure economic sustainability. We gathered data on gross debt as a percentage of gross domestic product for 80 low-income countries over the period 1990–2017. Using the Arellano and Bond (1991) estimator, we found that an increase in public debt translated to a higher adjusted net saving rate. Debt scaling-up in low-income countries from 2010 was thus associated with progress towards sustainability. However, although debt sustainability appeared to be associated with sustainability of an economy, the public debt coefficient was negative when using inclusive wealth growth to measure progress. Our study is the first attempt to assess the impact of gross public debt on economic sustainability, taking all dimensions into account. It contributes to ongoing efforts by the World Bank and the International Monetary Fund to improve the debt sustainability framework for low-income countries and help them move towards more sustainable economies. Our findings are particularly relevant for the Sustainable Development Goals (Goal 12: Ensure sustainable consumption and production patterns) in the context of post-covid-19 recovery.

Keywords: *adjusted net saving, public debt, low-income countries, panel generalized methods of moments, inclusive wealth index, sustainability*

1. INTRODUCTION

From the early 1970s to the mid-1990s, low-income countries (LICs) borrowed heavily. Their government debt relative to gross domestic product (GDP) increased sharply from 32.1 percent in 1970 to 115.6 percent in 1996 (Kose *et al.* 2020). The key drivers of debt accumulation during this period were low real interest rates and the development of syndicated loan markets. Prolonged government debt accumulation translated into sovereign debt crises in most LICs during the 1980s.

In response to these crises, multilateral organizations including the World Bank, the International Monetary Fund (IMF) and Paris Club bilateral creditors jointly announced the Heavily Indebted Poor Countries (HIPC) initiative in 1996. This aimed to provide comprehensive debt relief to seven eligible HIPCs and to eliminate debt overhang. The initiative was enhanced in 1999 to increase the number of eligible countries and accelerate access to debt relief (Kose *et al.* 2020). In 2005, the Multilateral Debt Relief Initiative (MDRI) was launched, aiming to cancel the remaining debt due to multilateral creditors (the IMF, the World Bank, the African Development Bank and the Inter-American Development Bank).

Under the HIPC and MDRI initiatives, 36 out of 39 eligible or potentially eligible HIPCs received debt relief. The external debt of the poorest countries was reduced by 90 percent over the 2000s (Buffie *et al.* 2012) and debt levels fell sharply in LICs between 2000 and 2010 (Kose *et al.* 2020). Thirty of the 36 were African HIPCs. They received substantial debt relief over the period 1986–2012 and 'experienced a sufficient post-debt relief period to benefit from potential fiscal space' (Cassimon *et al.* 2015).

These initiatives were inspired by the theory of debt overhang, developed by Krugman (1988) and Sachs (1989). This theory predicts that, whereas high debt levels depress public investment, debt relief fosters public investment and is positive for both creditors and debtors. Debt relief can create fiscal space by freeing up public resources previously devoted to debt servicing. It can also have conditionality (Cassimon *et al.* 2015) and liquidity effects (Claessens & Diwan 1990). The combination of these effects is expected to have a positive impact on public investment, in health and education for example.

Much of the existing empirical literature focuses on the role and effects of debt levels on debt sustainability in LICs. Authors that have studied this include Kraay & Nehru (2006) and Bal Gündüz (2017). They find that a high debt burden is a significant determinant of debt distress. So far, research has focused on the role of gross public debt in financial sustainability.

In this paper, in contrast, we assess the effects of debt level on sustainability of the economy, taking all dimensions into account. Sustainability supposes a non-decrease of a country's wealth over time. Two opposing views of sustainability have emerged: the strong view of sustainability (that requires a separate preservation of all environmental assets) and the weak view of sustainability (that allows a high degree of substitutability among produced capital, human capital, and natural capital). In this paper we focus on weak sustainability. Existing approaches to the measurement of weak sustainability include the comprehensive wealth framework developed by the World Bank (adjusted net saving – ANS) and the inclusive wealth framework (the inclusive wealth index – IWI) developed by the United Nations Environmental Programme (UNEP).

Did an increase in public debt jeopardize sustainability of the economy? In some countries (Niger for example) debt build-up was reflected in a positive change in ANS (progress towards sustainability) through the scaling-up of public investment. However, in countries like Mauritania and Mozambique, where debt accumulation was reflected in higher public investment, ANS declined sharply (reducing progress towards sustainability). In others (such as Ghana), debt accumulation was not reflected in higher public investment. However, ANS increased significantly in Ghana. An apparent paradox emerges from this analysis. Lange, Wodon & Carey (2018) found a similar result when they studied the cases of Ghana and Niger.

ANS is computed as follows: ANS is equal to gross national saving minus consumption of fixed capital plus current public expenditure on education minus net forest depletion minus depletion of fossil energy resources minus depletion of metals and minerals minus carbon dioxide damage minus air pollution damage. The alternative indicator, IWI, is computed as follows: IWI = PMC *MC + PHC * HC + PNC *NC where MC is manufactured capital, HC, human capital, NC, natural capital, and PMC, PHC, and PNC are their respective shadow prices.

Very few studies have attempted to identify the determinants of ANS. Dietz, Neumayer & de Soysa (2007) assess the effects of three indicators of institutional quality on genuine saving (ANS). However, most empirical studies have focused on the determinants of the components (investment in produced capital or human capital) of ANS. Previous literature that has focused on the effects of public indebtedness on public investment include for instance Lora (2007) and Buffie *et al.* (2012). Other papers such as Cassimon *et al*. (2015) are interested in the impact of debt relief on public investment in HIPCs and find that the HIPC and MDRI initiatives have had positive effects on public investment. To our knowledge, no paper has assessed the direct effects of public debt on ANS or IWI in LICs. Our paper tries to do this.

To answer our research question, we gathered data on gross debt as a percentage of GDP for 80 LICs over the period 1990–2017 and used the Arellano and Bond (1991) estimator. We regressed ANS as a percentage of gross national income (GNI) (alternatively changes in the IWI) on lagged changes in central government debt-to-GDP ratios, and on lagged changes in other explanatory variables. We show that an increase in public debt translated to a higher ANS rate. Debt scaling-up in LICs from 2010 was thus associated with progress towards sustainability. More generally, the main explanatory variables of debt distress events in LICs (debt burden, country GDP growth, Country Policy and Institutional Assessment (CPIA), reserves cover, and remittances) are also statistically significant in our regression. We do not, in this paper, investigate the role of global growth, another determinant of debt distress in

LICs. Debt sustainability thus appeared to be associated with the sustainability of an economy, when taking all dimensions into account. However, the coefficient of public debt was negative when using inclusive wealth growth to measure progress towards sustainability of the economy.

The remainder of the paper is structured as follows. Section 2 deals with the so-called strong/weak sustainability debate. Section 3 concerns the measurement of sustainability. In section 4 we describe the channels through which debt could affect ANS or the IWI, in theory as well as in practice. Section 5 reviews the literature. Sections 6 and 7 deal respectively with the data and the empirical specifications used for this study. In section 8, we present our empirical results and in section 9 our conclusions.

2. STRONG AND WEAK SUSTAINABILITY

Several sustainability concepts are used in the literature. Pezzey (1989) offers comprehensive review of the literature on sustainability concepts. He examined three concepts of sustainability: sustainable growth, sustainable development and sustainable resource use. Of these concepts, the one that is most relevant when studying low-income countries that are mostly resource-dependent is the third one, given the natural resource depletion in these countries (Pearce 1988). But how do we precisely define the notion of sustainable use of natural resources? Pezzey (1989, p. 13) derives four definitions of sustainable resource use: (i) non-declining of every renewable resource stock over time; (ii) non-declining of every renewable resource stock and non-increasing pollution stocks over time; (iii) non-declining of the economy's total renewable resource stock over time; (iv) non-declining of the total natural resource (renewable and non-renewable) stock over time. When we extend the fourth of these to take into account man-made capital and human capital, sustainability means non-declining of the total capital stock (produced capital, human capital, and natural capital) following Hanley, Dupuy & McLaughlin (2015). A country's wealth encompasses these three forms of capital. In other words, sustainability requires non-declining total wealth. According to Hicks (1946), resource exploitation to meet current needs should be done without depleting the wealth that generates income. This means changes in the total wealth are important when assessing whether a country is following a sustainable path or not. Sustainability can be weak or strong, depending on the degree of substitutability among produced capital, human capital, and natural capital. When we assume a high degree of substitutability among these three forms of capital, we talk about weak sustainability. In this case, there are substitutes for all assets. This means, for instance, that a given country can deplete its natural capital or degrade its environment as long as income from the depletion of natural resources is reinvested in other forms of assets to maintain the total value of all assets constant. Strong sustainability, on the other hand, assumes the existence of 'critical' natural capital that cannot be replaced (Pearce, Markandya & Barbier 1989). For a country to be on a sustainable path, critical natural capital must therefore be preserved.

3. MEASURING SUSTAINABILITY

Several indicators are used to measure sustainability. Among the many existing indicators of sustainability, the World Bank's adjusted net (or genuine) saving (ANS) and the United Nations Environmental Programme (UNEP)'s inclusive wealth index (IWI) are widely used by economists. We will now look in more detail at each of these.

3.1. The comprehensive wealth framework: adjusted net saving

Many economists have posed the question whether ANS is a satisfactory indicator of sustainability. Hamilton & Clemens (1999) use a model of green national accounting to demonstrate that genuine saving is a 'useful indicator of sustainability'. Lange, Wodon & Carey (2018) argue, in addition, that ANS is a 'very useful concept that does not correspond exactly to changes in wealth'. ANS does not include changes in prices or new discoveries of energy and mineral resources, for instance. It is a partial indicator of weak sustainability, but useful for policymakers. Authors such as Everett & Wilks (1999), Thiry & Cassiers (2010), and Neumayer (2000) among others have criticized the World Bank's ANS. Several authors have computed country-level and regional ANS using different methodologies (e.g. Pearce & Atkinson 1993; Hamilton & Clemens 1999; and World Bank 1997, 1999, 2003, 2019). The

early empirical estimates of ANS are by Pearce & Atkinson (1993), who present data for 20 countries. More recently, the World Bank published cross-country estimates of ANS for the first time (World Bank, 1997). The World Development Indicators first included ANS estimates in 1999 for over 100 countries (World Bank 1999). Hamilton & Clemens (1999) also present country-level data on genuine saving for 103 countries between 1970 and 1993. Their database, which covers developing and developed countries, has several shortcomings, however. A key element excluded from their empirical estimates, in particular for LICs, is the valuation of soil erosion given the extent of agriculture in most LICs. Fish stocks are also omitted. The 2003 World Development Indicators include ANS estimates for 136 countries for 1970–2001. These estimates also have several limitations. They are not truly comprehensive, omitting agricultural land, fresh water, and fisheries, to name but a few aspects. The 2019 World Development Indicators also include estimates of genuine saving, labelled 'adjusted net saving' and based on sources and methods from Lange, Wodon & Carey (2018). These estimates by World Bank staff cover the period from 1990 to 2017. Lange, Wodon & Carey (2018) argue that, notwithstanding some limitations such as the exclusion of changes in prices, new discoveries of energy and mineral resources, changes in agricultural land, water, and fisheries from the current measurement of ANS, changes in methodology and data sources do provide accurate ANS. A country-level ANS estimate for any given year can be positive or negative. A negative ANS at a point in time indicates unsustainability. Conversely, a positive ANS generally means that the country is on a sustainable path, at least in theory. In practice, as Hamilton (2000, p. 6) states, '…, a point measure of genuine saving does not necessarily imply that the country in question is fated for an unsustainable development path; it does imply, however, that continuing the current policy mix is unsustainable'. Dietz & Neumayer (2007) argue that resource-abundant countries with negative ANS rates could theoretically be on a sustainable path.

3.2. The inclusive wealth framework: the inclusive wealth index

Weak sustainability can also be measured by the IWI, which, like ANS, is derived from an economic welfare model. Neither of them is a 'direct measurement of sustainability' (Bartelmus 2013). However, the IWI is distinct from ANS in a different manner. At the theoretical level, the key difference between ANS and the IWI is the assumption of the sustainability of consumption. ANS assumes a sustainable flow of consumption, whereas the IWI does not. UNEP computes its IWI from stocks. It measures the shadow value of a country's total capital assets, which captures the sustainability of a country's capital assets in both the present and the future period. ANS, on the other hand, is mainly computed from flows of consumption. It measures the present value of flow of consumption. As with ANS, several authors have criticized the IWI. Thiry & Roman (2014) argue that most elements of the IWI are computed at market prices and not shadow prices. As a result, the 'whole architecture of the indicator collapses' and it is not a satisfactory indicator of sustainability. Other authors such as Cairns (2013), Cairns & Martinet (2014), and Bartelmus (2013) have also highlighted the theoretical and methodological limitations of the IWI. Given these shortcomings, some authors advocate an alternative sustainability indicator. Bartelmus (2009), for instance, proposes to narrow sustainability to environment issues only, while Munda (2014) proposes a multi-criteria analysis of sustainability as an alternative.

4. PUBLIC DEBT LEVELS AND ADJUSTED NET SAVING

This section examines channels through which public debt levels can affect the components of ANS (investment in physical capital and human capital). The scaling-up of public debt can have adverse effects on investment. Krugman (1988) and Sachs (1989) have developed theories supporting the hypothesis of adverse effects of external debt build-up on investment under the well-known concept of debt overhang. The theory of debt overhang suggests that when a country's debt is expected to be higher than its capacity for repayment, domestic and foreign investors will anticipate a rise in taxation and a decline in future returns on investment. This discourages investment in the country and leads to a decline in physical capital formation. In addition, Cohen (1993) shows that beyond a certain threshold, foreign borrowing can depress investment. A large accumulation of public debt can also depress investment in physical capital in a country by increasing the uncertainty of policies and actions (devaluation of the currency, increased taxes, and distortionary measures) implemented by the country's government to

repay its debt. In this context, potential investors prefer to wait. Moreover, rapid public debt accumulation can crowd out credit available for private investment. Finally, high debt service can depress public investment by increasing the government's interest bill and reducing public savings. A large interest bill can reduce the resources available for investment in infrastructure and human capital. Through the channel of investment, rapid debt accumulations can adversely affect ANS. Other authors, including Borensztein (1990) and Claessens & Diwan (1990), have also argued that huge debt levels are an adverse incentive to public and private investment. As the theory shows, both high debt level and debt servicing are expected to reduce the level of investment in a country.

Some theoretical literature shows that external debt has a positive effect on investment in physical capital. Cohen (1993) suggests that up to a certain threshold, debt can promote investment in a country. In addition, when outstanding debt is not wasted in countries with good institutions, it can fund investment in physical and human capital. Several authors advocated cancelling public debt to promote investment, particularly in heavily indebted countries. Cancelling debt would free up resources previously used by the country to meet its debt servicing obligations, making them available for more investment in infrastructure and human capital. This idea is supported by Claessens & Diwan (1990) and Heller (2005). Debt relief can also have a disincentive effect on investments. Cancelling debt can encourage previously indebted countries to rapidly accumulate new borrowings in anticipation of future debt reductions (the idea of moral hazard). Authors that support the idea of adverse effects of debt relief include Koeda (2008), Corden (1988), and Tengstam (2006). Cassimon *et al*. (2015) assess the impact of debt relief (debt reductions under the HIPC and MDRI initiatives) on investment in HIPCs. Using a vector autoregressive approach to panel data spanning 24 African HIPCs over the period 1986–2012, they found that debt relief had a positive impact on public investment as a percentage of GDP (the main component of ANS or the IWI) in recipient countries. More precisely, they found that 'an increase in debt service savings from debt relief initiative by 10% in T is associated with a 3.5% increase in public investment in T+1'.

5. REVIEW OF THE LITERATURE

In contrast to the extensive literature on the determinants of gross savings, very few studies have attempted to identify the determinants of ANS. A recent contribution by Dietz, Neumayer & de Soysa (2007) assesses the effects of three indicators of institutional quality (corruption, bureaucratic quality, and the rule of law) on genuine saving by using panel data in a sample of 115 countries over 18 years. Their key finding is that low genuine saving rates in resource-rich countries can be explained by corruption. Consequently, reducing corruption in resource-rich countries leads to higher genuine saving rates. Most empirical studies have focused on the determinants of the components of ANS (investment in produced capital or human capital) as the variables of interest. Some papers have attempted to assess the determinants of public investment. Studies that have focused on the effects of public indebtedness on public investment include that by Lora (2007). This author examines the influence of public indebtedness on public investment in infrastructure in seven Latin American countries over the period 1987–2001. Using panel data, the author finds that 'exogenous (debt changes)' increases of debt lead to higher public investment in infrastructure (power, land transportation, water, and telecommunications). Buffie *et al*. (2012) studied the impact of debt on public infrastructure investment in LICs in Sub-Saharan Africa. They found that public infrastructure scaling-up financed by debt translates into the increase of output and consumption and can be self-financing in the long term when structural conditions are strong. To our knowledge, no paper has focused on the impact of public debt accumulation on ANS in LICs.

6. VARIABLES AND DATA SOURCES

The dependent variable is the adjusted net (or genuine) saving-to-GNI ratio. It measures the net change in the value of a country's capital stocks. Annual data on genuine savings are available from 1990 to 2017. The choice of starting period is based on the availability of data on the dependent variable – the World Development Indicators now contain data on ANS ratios back to 1990. Alternatively, we use

unadjusted inclusive wealth growth as a dependent variable. Data on unadjusted inclusive wealth cover the period from 1990 to 2010 and are taken from UNEP (http://unep.org/) and Environment Live (https://environmentlive.unep.org/). Data on adjusted inclusive wealth are not publicly available.

Independent variables include public debt-to-GDP ratios (our main variable of interest). Public debt is narrowed down to central government debt-to-GDP ratio. Data on this independent variable are taken from the Global Debt Database. We also include reserves cover in months of imports, remittances inflows (scaled by nominal GDP) and annual percentage domestic growth rate of GDP at market prices based on constant local currency. Data on reserves cover are taken from the IMF's International Debt Statistics. Data on country GDP growth are taken from the World Development Indicators. Data on remittances inflows are taken from World Bank staff calculations based on data from the IMF Balance of Payments Statistics database and data releases from central banks, national statistics agencies and World Bank country desks. We also include, separately, quality of governance indicators (control of corruption, rule of law and regulatory quality) and CPIA as independent variables. The variables measuring quality of governance are taken from the Worldwide Governance Indicators and scaled from -2.5 (weak) to 2.5 (strong) governance performances. The CPIA scores are from 1 (lowest) to 6 (highest). Data on CPIA are taken from World Bank Group, CPIA database (http://www.worldbank.org/ida).

7. METHODOLOGY

We estimated the following basic model in level: $y_{i,t} = \alpha y_{i,t-1} + \beta' x_{i,t-1} + \beta_1 gov_t + \delta t + \mu_i + \varepsilon_{i,t}$ (1) , where : $y_{i,t}$ is the adjusted net saving ratio or unadjusted inclusive wealth growth for country $_i$ at time $_t$ and $y_{i,t-1}$ is its lag one year; gov_t is governance quality or CPIA, $x_{i,t-1}$ are the other explanatory variables; t, μ_i, and $\varepsilon_{i,t}$ are respectively a time trend, the country-specific effects, and the error terms. We lagged all explanatory variables ($x_{i,t-1}$) by one year to limit simultaneity bias. The presence of a lagged dependent variable ($y_{i,t-1}$) among the regressors raises the problem of simultaneity: the lagged dependent variable is correlated with the error terms when taking first differences. In addition, there is a correlation between the country-specific effects and the explanatory variables. These issues lead to inconsistent estimates of the parameters α, β_1 and β' when estimating the equation (1) with the ordinary least square estimator. To deal with these problems, we applied the Arellano and Bond (1991) estimator that removes the country-specific effects by transforming the equation (1) in first difference as follows: $\Delta y_{i,t} = \alpha \Delta y_{i,t-1} + \beta' \Delta x_{i,t-1} + \beta_1 \Delta gov_t + \delta \Delta t + \Delta \varepsilon_{i,t}$ (2). This transformation also deals with the non-stationarity issue (panel unit root tests are not reported). The one-year-lagged dependent variable is instrumented by its lags ($y_{i,t-2}$, $y_{i,t-3}$, etc.) and the explanatory variables by their lags: two periods in level for $x_{i,t-1}$ and one period for gov_t. These instruments may be weakly correlated with the explanatory variables and the differenced error term may show second order serial correlation. This will render the estimates inconsistent. Two tests are commonly used in the literature to check the validity of the instruments and the absence of second serial correlation in the error term: the Sargan/Hansen test of over-identifying restrictions and the Arellano and Bond serial correlation test.

8. RESULTS

8.1. Descriptive statistics analyses

Table 1.1 shows that LICs had low ANS (savings adjusted for depletion of natural resources). The average ANS as a share of GNI was 1.680%. This low ANS was associated with relatively high levels of public debt as a percentage of GDP. The average public debt level reached 68.690% between 1990 and 2017.

It also shows that resource-dependent LICs tend to have a negative ANS-to-GNI ratio. The annual average ANS for all resource-rich LICs between 1990 and 2017 was -1.763%. However, non-resource-dependent countries tended to have positive ANS, with their annual average ANS reaching 5.015% during the period. The former country group has made less progress towards sustainability than the latter. Furthermore, negative ANS in resource-dependent LICs was associated with higher public debt

as a share of GDP (81.580% on average) and positive ANS in non-resource-dependent LICs was associated with lower public debt as a share of GDP (57.590% on average).

The changes in the unadjusted inclusive wealth of the 35 resource-dependent LICs and the 45 non-resource-dependent LICs, calculated by annual average growth rates over the past 28 years, did not show a clear trend in terms of progress towards sustainability for resource-dependent LICs relative to non-resource-dependent LICs. The annual average growth rate in the unadjusted inclusive wealth of resource-dependent LICs was 0.026% and that for the non-resource-dependent economies was 0.016%. However, data on adjusted IWI show that progress towards sustainability was higher in non-resource-dependent countries than in resource-dependent countries (UNEP 2018).

Table 1.1. Summary statistics

Variable	**Number of observations**	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
Adjusted net saving	1305* 642** 663***	1.680* -1.763** 5.015***	17.161	-98.961	57.774
Inclusive wealth index growth	979* 519** 460***	0.022* 0.026** 0.016***	0.282	-0.896	8.766
Public debt	1835* 849** 986***	68.690* 81.580** 57.590***	63.071	0.000	677.180
GDP growth	2088	3.996	6.942	-50.248	149.973
Control of corruption	1509	-0.614	0.622	-1.869	1.568
Rule of law	1517	-0.643	0.674	-2.606	1.058
Regulatory quality	1496	-0.637	0.624	-2.645	1.241
Reserves cover	1543	3.633	2.400	0.002	19.210
CPIA	914	3.296	0.468	1.400	4.442
Remittances	1619	0.066	0.115	1.83E-06	1.674

Note: * All LICs; ** Resource-dependent LICs; ***Non-resource-dependent LICs.

Table 1.2 reports the bivariate correlation matrix. It shows that the quality of governance indicators (control of corruption, rule of law, CPIA and regulatory quality) are highly correlated. However, there are weak correlations among the other explanatory variables.

Table 1.2. Pairwise correlations

Variable	**1.**	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10**
1. Adjusted net saving	1.00									
2. Public debt	-0.30	1.00								
3. GDP growth	0.11	-0.07	1.00							
4. Reserves cover	0.22	-0.22	0.01	1.00						
5. Control of corruption	0.22	0.01	-0.07	0.03	1.00					
6. Rule of law	0.28	-0.12	-0.07	-0.02	0.87	1.00				
7. Regulatory quality	0.29	-0.18	-0.04	-0.07	0.66	0.77	1.00			
8. Inclusive wealth growth	0.01	-0.02	0.04	-0.03	0.02	0.04	0.03	1.00		
9. CPIA	0.37	-0.24	0.12	0.06	0.58	0.68	0.83	0.00	1.00	
10. Remittances	0.20	-0.08	-0.01	0.03	0.05	0.11	0.10	-0.00	0.17	1.00

8.2. Econometric analyses

Table 1.3 presents the results of our estimation for all LICs. The discussions are based on the two-step estimation for which there is a lack of second serial correlation and a problem of the validity of the instruments. When the variable quality of governance takes alternatively control of corruption, regulatory quality, or rule of law, for which data are available back to 1996, the coefficient of public debt is negative and statistically significant. The availability of data on the quality of governance covers the prolonged period of declining public debt that started in 1990 and ended in 2010. The negative relationship between public debt and the sustainability of LICs' economies (measured by ANS-to-GNI ratios) could be interpreted as a positive effect of debt-relief measures taken in the late 1990s and 2000s (efforts to make debt levels sustainable from 1996) on the sustainability of economies. Indeed, by significantly reducing debt servicing in these countries and freeing up resources for investment, debt relief has improved the sustainability of LICs.

Table 1.3. Dynamic Arellano and Bond estimates (All LICs)

	Quality of governance: Control of corruption		Quality of governance: Regulatory quality		Quality of governance: Rule of law	
	One-step	Two-step	One-step	Two-step	One-step	Two-step
Adjusted net saving (t-1)	-0.105	-0.102***	-0.161	-0.161***	-0.279	-0.278***
	(0.214)	(0.004)	(0.190)	(0.003)	(0.165)	(0.002)
Public debt (t-1)	-0.058***	-0.058***	-0.085***	-0.086***	-0.046	-0.045***
	(0.016)	(0.001)	(0.022)	(0.001)	(0.026)	(0.001)
Quality of governance (t)	-6.331	-6.175***	-4.189	-3.423***	-3.983	-3.815***
	(16.177)	(0.309)	(4.649)	(1.115)	(11.203)	(0.344)
GDP growth (t-1)	0.310	0.303***	0.226	0.242***	0.355	0.353***
	(0.194)	(0.021)	(0.173)	(0.029)	(0.220)	(0.006)
Reserves (t-1)	-0.551	-0.604***	-0.635	-0.673***	0.331	0.328***
	(0.823)	(0.095)	(0.909)	(0.069)	(1.045)	(0.015)

Remittances (t-1)	-8.822 (71.340)	-12.230*** (3.575)	-21.756 (65.869)	-21.203*** (1.711)	40.453 (66.153)	40.658*** (0.515)
Number of instruments	10	10	9	9	9	9
Sargan/Hansen test	0.000	0.584	0.000	0.368	0.000	0.524
AR(2)	NA	0.998	NA	0.962	0.061	0.999
Number of observations	539	539	539	539	539	539
Number of countries	48	48	48	48	48	48

Note: The dependent variable is adjusted net saving to gross national income ratios; Robust standard errors in parentheses (one-step estimation); Year-specific time dummies excluded; AR (2) are p-values of the tests for second order serial correlation in the differenced error terms; ***, **, * denote statistical significance at the 1, 5, 10% levels respectively; We use lags -2 up -6, -2 up -5, and -3 up -6 for the instruments of adjusted net saving when we include, respectively, control of corruption, regulatory quality, and the rule of law in the regression.

By measuring progress towards sustainability of the economy using inclusive wealth growth (data on inclusive wealth growth and quality of governance variables covering the period 1990–2010) the coefficient of public debt is also negative and statistically significant (Table 1.4). These results validate the theory of debt overhang predicting that reducing public debt leads to higher investment, the main component of ANS and inclusive wealth.

Empirically, Dietz, Neumayer & de Soysa (2007) found that GDP growth is a significant and positive determinant of ANS when institutional quality (lack of corruption, bureaucratic quality, or rule of law) is included as a control variable. In our study, we found a similar result for both ANS and inclusive wealth.

Table 1.4. Dynamic Arellano and Bond estimates (All LICs)

	Quality of governance: Control of corruption		Quality of governance: Regulatory quality		Quality of governance: Rule of law	
	One-step	Two-step	One-step	Two-step	One-step	Two-step
Inclusive wealth growth (t-1)	-0.443*** (0.028)	-0.442*** (0.003)	-0.416*** (0.009)	-0.417*** (0.001)	-0.423 (0.011)	-0.419*** (0.003)
Public debt (t-1)	-0.002 (0.002)	-0.002*** (0.000)	-0.001 (0.001)	-0.001*** (0.000)	-0.002 (0.002)	-0.002*** (0.000)
Quality of governance (t)	-1.334 (1.291)	-1.159*** (0.208)	-0.708 (0.815)	-0.726*** (0.041)	-0.902 (0.801)	-0.807*** (0.128)
GDP growth (t-1)	0.016 (0.018)	0.013*** (0.002)	0.015 (0.015)	0.014*** (0.001)	0.018 (0.019)	0.013*** (0.004)

Reserves (t-1)	-0.014 (0.035)	-0.017*** (0.003)	0.001 (0.018)	-0.002 (0.004)	-0.025 (0.033)	-0.020*** (0.005)
Remittances (t-1)	-2.529 (3.432)	-2.077*** (0.548)	-1.653 (2.707)	-1.452*** (0.354)	-0.989 (2.484)	-0.025 (0.879)
Number of instruments	9	9	9	9	9	9
Sargan/Hansen test	0.000	0.438	0.000	0.306	0.000	0.547
AR(2)	0.000	0.341	0.000	0.302	0.000	0.327
Number of observations	245	245	245	245	245	245
Number of countries	34	34	34	34	34	34

Note: The dependent variable is inclusive wealth growth; Robust standard errors in parentheses (one-step estimation); Year-specific time dummies excluded; AR (2) are p-values of the tests for second order serial correlation in the differenced error terms; ***, **, * denote statistical significance at the 1, 5, 10% levels respectively; We use lags -2 up -5, -2 up -5, and -2 up -5 for the instruments of inclusive wealth growth when we include, respectively, control of corruption, regulatory quality, and the rule of law in the regression.

When the variable measuring the quality of governance is replaced by a measure of the quality of policy and institutions (CPIA) for which data are publicly available back to 2005, the coefficient of public debt becomes positive (Table 1.5). This means that an increase in public debt translated to a higher adjusted net saving rate. Debt relief has created fiscal space by lowering the debt burden (high debt levels and high interest payments over the period 1970–1989) so that more resources from new borrowings could be directed towards investment. Debt scaling-up from 2010 in LICs was thus associated with progress towards sustainability. More generally, the main explanatory variables of debt distress events in LICs (debt burden, country GDP growth, CPIA, reserves cover, and remittances) are also statistically significant in our regression. We do not, in this paper, investigate the role of global growth, another determinant of debt distress in LICs. Debt sustainability appeared to be associated with sustainability of an economy, when taking all dimensions into account. However, the coefficient of public debt continues to be negative when using inclusive wealth growth to measure progress towards sustainability of the economy.

Table 1.5. Dynamic Arellano and Bond estimates (All LICs)

Dependent variables	**Adjusted net saving**		**Inclusive wealth growth**	
	One-step	Two-step	One-step	Two-step
Adjusted net saving (t-1)	0.120 (0.129)	0.113*** (0.012)		
Inclusive wealth growth (t-1)			-0.435 (0.034)	-0.430*** (0.007)
Public debt (t-1)	0.043 (0.066)	0.042*** (0.003)	-0.005 (0.007)	-0.004*** (0.001)

CPIA (t)	8.545	9.646***	-7.385	-6.853***
	(10.209)	(1.502)	(7.399)	(0.832)
GDP growth (t-1)	0.354**	0.351***	0.036	0.032***
	(0.166)	(0.020)	(0.037)	(0.005)
Reserves (t-1)	-0.220	-0.170*	0.069	0.075***
	(0.798)	(0.102)	(0.106)	(0.015)
Remittances (t-1)	12.561	10.488***	0.538	-0.199
	(32.847)	(2.485)	(7.945)	(1.411)
Number of instruments	10	10	10	10
Sargan/Hansen test	0.003	0.404	0.000	0.440
AR (2)	0.017	0.989	0.000	0.269
Number of observations	416	416	150	150
Number of countries	46	46	32	32

Note: Robust standard errors in parentheses (one-step estimation); Year-specific time dummies excluded; AR (2) are p-values of the tests for second order serial correlation in the differenced error terms; ***, **, * denote statistical significance at the 1, 5, 10% levels respectively; We use lags -2 up -6 both for the instruments of adjusted net saving and inclusive wealth growth.

We next examined the impact of debt on the sustainability of the economy by restricting the country sample to the 36 Heavily Indebted Poor Countries that reached completion point. As Table 1.6 shows, the public debt coefficient is positive when measuring progress towards sustainability of the economy alternatively using adjusted net saving or inclusive wealth growth. This confirms that, as mentioned earlier, an increase in public debt has a positive impact on the sustainability of the economy when the debt burden is low.

Table 1.6. Dynamic Arellano and Bond estimates (HIPCs)

Dependent variables	**Adjusted net saving**		**Inclusive wealth growth**	
	One-step	Two-step	One-step	Two-step
Adjusted net saving (t-1)	-0.079	-0.089**		
	(0.189)	(0.034)		
Inclusive wealth growth (t-1)			0.270	0.258***
			(0.236)	(0.014)
Public debt (t-1)	0.063	0.062***	0.000	0.000***
	(0.039)	(0.005)	(0.000)	(0.000)
CPIA (t)	29.891	30.101***	0.012	0.011***
	(28.719)	(2.739)	(0.017)	(0.002)
GDP growth (t-1)	0.124	0.113*	-0.000	0.000
	(0.515)	(0.059)	(0.000)	(0.000)

Reserves (t-1)	-0.289	-0.466**	0.001	0.001***
	(1.554)	(0.200)	(0.001)	(0.000)
Remittances (t-1)	-8.819	-11.712*	0.006	0.010
	(29.958)	(6.092)	(0.033)	(0.007)
Number of instruments	7	7	9	9
Sargan/Hansen test	0.000	0.260	0.091	0.351
AR (2)	0.718	0.563	0.269	0.412
Number of observations	213	213	77	77
Number of countries	21	21	17	17

Note: Robust standard errors in parentheses (one-step estimation); Year-specific time dummies excluded; AR (2) are p-values of the tests for second order serial correlation in the differenced error terms; ***, **, * denote statistical significance at the 1, 5, 10% levels respectively; We use lags -4 up -5 and –3 up -6 for the instruments of adjusted net saving and inclusive wealth growth respectively.

We also investigated the impact of debt on the sustainability of the economy in the Non-Heavily Indebted Poor Countries. We looked at the remaining LICs sample, with the exception of pre-decision-point countries (Eritrea, Somalia and Sudan) and Chad (which reached completion point in 2015). The results show that the impact of an increase in public debt on the sustainability of the economy is positive when sustainability is measured using ANS, and negative if it is measured using inclusive wealth growth (Table 1.7).

Table 1.7. Dynamic Arellano and Bond estimates (Non-HIPCs)

Dependent variables	**Adjusted net saving**		**Inclusive wealth growth**	
	One-step	Two-step	One-step	Two-step
Adjusted net saving (t-1)	0.170	0.145**		
	(0.147)	(0.059)		
Inclusive wealth growth (t-1)			-1.002***	-0.887***
			(0.289)	(0.095)
Public debt (t-1)	0.101	0.137*	-0.061	-0.028*
	(0.132)	(0.078)	(0.054)	(0.015)
CPIA (t)	17.457	27.445***	-6.543	-2.938
	(17.483)	(10.258)	(7.772)	(1.980)
GDP growth (t-1)	0.451**	0.505***	0.021	0.007
	(0.183)	(0.122)	(0.022)	(0.006)
Reserves (t-1)	-0.074	0.037	-0.234	-0.035
	(0.724)	(0.356)	(0.263)	(0.031)
Remittances (t-1)	46.187	14.584	-12.370	-2.923
	(43.387)	(40.885)	(14.159)	(3.006)

Number of instruments	8	8	7	7
Sargan/Hansen test	0.497	0.569	0.001	0.896
AR (2)	0.154	0.925	0.005	0.439
Number of observations	203	203	73	73
Number of countries	25	25	15	15

Note: Robust standard errors in parentheses (one-step estimation); Year-specific time dummies excluded; AR (2) are p-values of the tests for second order serial correlation in the differenced error terms; ***, **, * denote statistical significance at the 1, 5, 10% levels respectively; We use lags -2 up -4 and –4 up -5 for the instruments of adjusted net saving and inclusive wealth growth respectively.

We next compared a group of resource-rich low-income countries with a group of countries that are not resource-rich. Earlier, we found through the descriptive analysis that resource-rich countries tend to have negative ANS. Does public debt matter? Table 1.8 presents the results of our estimation when the country sample is restricted to resource-dependent LICs. The results show that the impact of an increase in public debt on the sustainability of the economy is positive when sustainability is measured using ANS and negative if it is measured using unadjusted inclusive wealth growth.

Table 1.8. Dynamic Arellano and Bond estimates (Resource-dependent countries)

	Adjusted net saving		**Inclusive wealth growth**	
	One-step	Two-step	One-step	Two-step
Adjusted net saving (t-1)	0.244* (0.146)	0.288*** (0.059)		
Inclusive wealth growth (t-1)			-0.086 (0.113)	-0.041 (0.056)
Public debt (t-1)	0.082 (0.055)	0.084*** (0.008)	-0.009 (0.012)	-0.009* (0.005)
CPIA (t)	9.152 (13.699)	10.233*** (3.352)	-17.099 (12.502)	-12.613*** (3.342)
GDP growth (t-1)	0.404 (0.261)	0.441*** (0.077)	-0.053 (0.062)	-0.124*** (0.041)
Reserves (t-1)	0.612 (1.374)	0.258 (0.361)	0.360 (0.226)	0.238** (0.093)
Remittances (t-1)	11.159 (29.510)	16.648** (7.610)	-2.045 (7.329)	-15.987* (8.926)
Number of instruments	7	7	8	8
Sargan/Hansen test	0.049	0.499	0.004	0.863
AR (2)	0.017	0.475	0.405	0.992
Number of observations	203	203	74	74

Number of countries	21	21	17	17

Note: Robust standard errors in parentheses (one-step estimation); Year-specific time dummies excluded; AR (2) are p-values of the tests for second order serial correlation in the differenced error terms; ***, **, * denote statistical significance at the 1, 5, 10% levels respectively; We use lags -4 up -5 and –3 up -5 for the instruments of adjusted net saving and inclusive wealth growth respectively.

The results of our estimation for non-resource-dependent LICs are reported in Table 1.9. Contrary to the results for resource-dependent countries, public debt had a negative impact on the sustainability of the economy when sustainability is measured using ANS and positive if it is measured using unadjusted inclusive wealth growth. These findings are similar to the paradoxical findings of Lange, Wodon & Carey (2018) when they studied the cases of Ghana and Niger, both of which are resource-rich LICs.

Table 1.9. Dynamic Arellano and Bond estimates (Non-resource-dependent countries)

Dependent variables	**Adjusted net saving**		**Inclusive wealth growth**	
	One-step	Two-step	One-step	Two-step
Adjusted net saving (t-1)	-0.132 (0.111)	-0.123*** (0.025)		
Inclusive wealth growth (t-1)			-0.072 (0.374)	-0.217 (0.176)
Public debt (t-1)	-0.026 (0.058)	-0.038** (0.019)	0.000 (0.000)	0.000*** (0.000)
CPIA (t)	18.510 (17.324)	18.035*** (2.213)	0.021 (0.045)	0.026 (0.024)
GDP growth (t-1)	0.181 (0.181)	0.178*** (0.045)	0.000 (0.000)	0.000** (0.000)
Reserves (t-1)	-1.037 (0.707)	-0.889*** (0.327)	-0.001 (0.002)	-0.001 (0.001)
Remittances (t-1)	63.547 (55.420)	41.909* (22.920)	0.034 (0.098)	0.023 (0.056)
Number of instruments	7	7	7	7
Sargan/Hansen test	0.007	0.214	0.033	0.370
AR (2)	0.048	0.564	0.543	0.895
Number of observations	213	213	76	76
Number of countries	25	25	15	15

Note: Robust standard errors in parentheses (one-step estimation); Year-specific time dummies excluded; AR (2) are p-values of the tests for second order serial correlation in the differenced error terms; ***, **, * denote statistical significance at the 1, 5, 10% levels respectively; We use lags -2 up -3 and –3 up -4 for the instruments of adjusted net saving and inclusive wealth growth respectively.

9. CONCLUSION

A significant number of empirical investigations have assessed the role of public debt on debt sustainability in LICs. These papers have narrowed sustainability analysis to financial issues. In this paper we go further by examining whether public debt build-up has jeopardized the sustainability of the low-income economy, taking all dimensions into account. Our approach has consisted in gathering data on gross debt as a percentage of GDP for 80 LICs over the period 1990–2017 and using the Arellano and Bond (1991) estimator. We found that an increase in public debt translated to a higher adjusted net saving rate. Thus, debt scaling-up from 2010 in LICs was associated with progress towards sustainability. More generally, the main explanatory variables of debt distress events in LICs (debt burden, country GDP growth, CPIA, reserves cover, and remittances) are also statistically significant in our regression. We do not, in this paper, investigate the role of global growth, another determinant of debt distress in LICs. Debt sustainability appeared to be associated with the sustainability of an economy, when taking all dimensions into account. However, the coefficient of public debt is negative when using inclusive wealth growth to measure progress towards sustainability of the economy. Our results could be used by policymakers, but we should keep in mind the controversial views about the usefulness of adjusted net saving or genuine saving as a measure of sustainability, and different interpretations made by economists about the negative or positive values of adjusted net saving in terms of an economy being, in theory, on a sustainable or an unsustainable path.

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REFERENCES

Bal Gündüz, Y 2017, ‘Debt sustainability in low-income countries: Policies, institutions, or shocks?’, International Monetary Fund working paper, WP/17/114.

Bartelmus, P 2009, ‘The cost of natural capital consumption: Accounting for a sustainable world economy’, *Ecological Economics*, vol. 68, issue 6, pp 1850-1857.

Bartelmus, P 2013, ‘The future we want: Green growth or sustainable development?’, *Environmental Development*, vol 7, pp 165-1170.

Borensztein, E 1990, ‘Debt overhang, credit rationing and investment’, *Journal of Development Economics*, vol. 32, issue 2, pp 315-335.

Buffie, E, Berg, A, Pattillo, C, Portillo, R & Zanna, LF 2012, ‘Public Investment, Growth, and Debt Sustainability: Putting Together the Pieces’’ IMF Working Paper WP/12/144, International Monetary Fund, Washington, DC.

Cairns, RD 2013, ‘Sustainability or the measurement of wealth?’, *Environment and Development Economics*, vol. 18, issue 5, pp 640–648. doi:10.1017/S1355770X13000296.

Cairns, RD & Martinet, V 2014, ‘An environmental-economic measure of sustainable development’, *European Economic Review*, vol 69, pp 4-17. doi: 10.1016/j.euroecorev.2014.03.001.

Cassimon D, van Campenhout, B, Ferry M & Raffinot, M 2015, ‘Africa: Out of debt, into fiscal space? Dynamic fiscal impact of the debt relief initiatives on African Heavily Indebted Poor Countries (HIPCs)’, *International Economics*, vol 144, pp 29–52.

Claessens, S & Diwan, I 1990, ‘Investment Incentives: New Money, Debt Relief, and the Critical Role of Conditionality in the Debt Crisis’, *The World Bank Economic Review*, vol 4, no 1, pp 21-41.

Cohen, D 1993, ‘Low Investment and Large LDC Debt in the 1980s’, *American Economic Review*, vol 83, no 3, pp 437-49.

Corden, WM 1988, 'Debt relief and adjustment incentives', IMF Staff Papers, vol 35, no 4, pp 628-643.

Dietz, S & Neumayer, E 2004, 'Genuine savings: a critical analysis of its policy-guiding value', *International Journal of Environment and Sustainable Development*, vol 3, no 3-4, pp 276-292.

Dietz, S, Neumayer, E & de Soysa, I 2007, 'Corruption, the resource curse and genuine saving', *Environment and Development Economics*, vol 12, issue 1, pp 33-53.

Everett, G & Wilks, A 1999, 'The World Bank's Genuine Savings Indicator: a Useful Measure of Sustainability?', Bretton Woods Project.

Ferry, M & Raffinot, M 2018, 'Curse or Blessing? Has the Impact of Debt Relief Lived up to Expectations? A Review of the Effects of the Multilateral Debt Relief Initiatives for Low-Income Countries', *The Journal of Development Studies*, DOI: 10.1080/00220388.2018.1499895.

Hamilton, K 2000, 'Genuine saving as a Sustainability Indicator', *Environment Department Papers*, no 77, Environmental economics series, World Bank, Washington, DC.

Hamilton, K & Clemens, M 1999, 'Genuine saving rates in developing countries', *The World Bank Economic Review*, vol 13, issue 2, pp 333-356.

Hanley, N, Dupuy, L & McLaughlin, E 2015, 'Genuine Savings and Sustainability', *Journal of Economic Surveys*, vol 29, issue 4, pp 779-806.

Heller, PS 2005, 'Understanding fiscal space', IMF Policy Discussion Paper, PDP/05/04, International Monetary Fund, Washington, DC.

Hicks, JR 1946, *Value and Capital*, 2nd edn, Oxford University Press, Oxford.

Koeda, J 2008, 'A Debt Overhang Model for Low-Income Countries', IMF Staff Papers, vol 55, no 4, pp 654-678.

Kose, MA, Nagle, P, Ohnsorge, F & Sugawara, N 2020, *Global Waves of Debt: Causes and Consequences*. Advance Edition. The World Bank, Washington DC. License: Creative Commons Attribution CC BY 3.0 IGO.

Kraay, A, & Nehru, V 2006, 'When is external debt sustainable?' *The World Bank Economic Review*, vol 20, issue 3, pp 341-365.

Krugman, P 1988, 'Financing vs. forgiving a debt overhang: Some analytical issues', NBER Working Paper No. 2486.

Lange, G-M, Wodon, Q & Carey, K (eds) 2018. *The Changing Wealth of Nations 2018: Building a Sustainable Future*. The World Bank, Washington DC. doi:10.1596/978-1-4648-1046-6. License: Creative Commons Attribution CC BY 3.0 IGO.

Lora, E 2007, 'Public Investment in Infrastructure in Latin America: Is Debt the Culprit?', Working Paper 595. Research department, Inter-American Development Bank, Washington DC.

Munda, G 2014, 'On the Use of Shadow Prices for Sustainable Well-Being Measurement', *Social Indicators Research*, vol 118, no 2, pp 911–918.

Neumayer, E 2000, 'Resource Accounting in Measures of Unsustainability: Challenging the World Bank's Conclusions', *Environmental and Resource Economics*, vol 15, no 3, pp 257-278.

Pearce, DW 1988, 'The sustainable use of natural resources in developing countries', in RK Turner (ed), *Sustainable Environmental Management: Principles and Practice*, Belhaven Press, London, pp.102–117.

Pearce, D, Markandya, A & Barbier, E 1989, Blueprint for a Green Economy, Earthscan, London.

Pearce, DW & Atkinson, GD 1993, 'Capital theory and the measurement of sustainable development: an indicator of "weak" sustainability', *Ecological Economics*, vol 8, issue 2, pp 103-108.

Pezzey, J 1989, 'Economic Analysis of Sustainable Growth and Sustainable Development', Environment Department Working Paper no ENV 15, The World Bank, Washington DC.

Sachs, J 1989, 'The Debt Overhang of Developing Countries', in Calvo, GA *et al* (eds) *Debt, Stabilization and Development: Essays in Memory of Carlos Diaz Alejandro*, Basil Blackwell, Oxford, pp 80-102.

Tengstam, S 2006, 'Debt relief and adjustment effort in a multi-period model', *Economics Letters*, vol 91, issue 1, pp 127–130.

Thiry, G & Cassiers, I 2010, 'Alternative Indicators to GDP: Values behind Numbers. Adjusted Net Savings in Question', IRES (Institut de Recherches Economiques et Sociales de l'Université catholique de Louvain) Discussion Paper 2010-18.

Thiry, G & Roman, P 2014, 'The Inclusive Wealth Index. A Sustainability Indicator, Really?', Fondation Maison des sciences de l'homme, Working Papers Series, no 71, Halshs-01011250.

United Nations Environment Programme, 2018, *The Inclusive Wealth Report 2018: Measuring Sustainability and Well Being*.

UNU-IHDP and UNEP, 2014. Inclusive wealth report 2014. Measuring Progress Toward Sustainability. Cambridge University Press, Cambridge.

World Bank, 1997. *Expanding the Measure of Wealth: Indicators of Environmentally Sustainable Development*, Environmentally Sustainable Development Studies and Monographs Series no 17, World Bank Group, Washington DC.

World Bank, 1999, *World Development Indicators 1999*, World Bank Group, Washington DC.

World Bank, 2003, *World Development Indicators 2003*, World Bank Group, Washington DC.

World Bank, 2019, *World Development Indicators 2019*, World Bank Group, Washington DC.