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To my parents for their endless support ...

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Abstract

The purpose of this thesis is to contribute to our understanding of ongoing problems which continue to hinder the effectiveness of debt relief and fiscal consolidation policies in developing countries. As such, the main findings are disclosed in three self-contained, but related, empirical chapters (chapters 2-4). A detailed discussion of the theoretical and empirical underpinnings is provided in each chapter.

Chapter 2 examines the transmission channels of the effects of debt relief on human welfare across different classifications of developing countries based on their level of dependency on primary commodities. It utilizes a newly generated dataset (of present value) of debt relief for 80 developing countries over 1990-2016. It is found that debt relief only uplifts human welfare in non-natural resource dependent HIPC countries, unlike the remaining group of countries (i.e., natural resource dependent HIPCs). This effect remains robust even after accounting for the role of debt overhang and institutional quality in panel regressions. An analysis of the underlying transmission channels shows that national income and education are the main contributors to the overall positive effect of debt relief on human welfare.

Chapter 3 investigates the impact of debt relief stemming from HIPC and MDRI assistances on the budget of 30 African beneficiary governments. A theoretical framework is developed to allow for endogenous debt relief and different categories of government expenditure. To test the underlying inferences, empirical analysis is conducted using a new dataset which is built on debt service savings from debt relief by using the International Monetary Fund (IMF) country reports such as articles IV reports, and HIPC and MDRI completion point documents. Results indicate that debt service savings from debt relief help African HIPC countries to increase domestic tax collection and create fiscal space for public spending in general and social spending in particular. However, such positive fiscal responses are significantly more pronounced in fragile HIPC countries when compared to their non-fragile counterparts. Government expenditure on education is revealed to be ineffective in both fragile and non-fragile African HIPC countries.

Chapter 4 examines the effect of fiscal consolidation actions – motivated by the desire to reduce government debt levels – on the performance of more than 118,279 firms in

developing countries. A novel dataset of more than 544 fiscal consolidation actions is constructed by using IMF staff reports (e.g., Article IV consultations and IMF Program documents), and countries' specific reports from the African Development Bank, Asian Development Bank and Inter-American Development Bank. This new narrative dataset of fiscal policy actions is combined with the World Bank Enterprise Survey (WBES) covering a large database of more than 98 developing countries over 2006–2018. Findings reveal that firm performance declines with fiscal consolidation policies and this decline is mitigated when consolidation is higher than 1.5 percent of GDP. Moreover, debt-driven consolidation efforts based on tax hikes are more contractionary than those based on spending cuts, even though these contractionary effects are mitigated when spending cuts are large.

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Chapter 1

Introduction

1.1 Background

Over the last three decades, debt relief has increasingly gained relevance not only on the agenda of the international community but also as a macroeconomic policy tool for international institutions and policymakers alike (Cohen, 2001; Easterly, 2002; Pattillo et al., 2011). The potential relationship between debt relief and economic growth has induced the international financial institutions to embark on an ambitious mission with the view to accelerating economic development and poverty reduction in developing nations especially in low-income countries (Dooley, 1989; Cohen, 1993; Obstfeld et al., 1996). For instance, Cohen (1993) points out that public spending in sectors such as health, education and infrastructure are crowded out by debt service obligations. Thus, by reducing the face value of external debt, investment and growth should increase and debt service payments encouraged (Dooley, 1989). The policy relevance of these findings was demonstrated in September of 1996 with the advent of the Heavily Indebted Poor Countries (HIPC) initiative established by the World Bank and the International Monetary Fund (IMF, 2006). The HIPC initiative aimed, at first, to write off debt burdens of the world's poorest and most indebted countries to sustainable levels – i.e., when the debtor country is fully able to meet its debt service payments without recourse to debt relief, accumulation of arrears and rescheduling (IMF and IDA, 2011). In 1999, it was enhanced[1] through a comprehensive review to provide broader, faster and deeper debt relief and to establish a linkage between debt relief, social policies and poverty reduction.[2]

In the same vein, an alliance of non-governmental organizations called Jubilee 2000 was formed in the mid-1990s and promoted a campaign that sought to provide debt cancellation to the poorest countries by the end of the last century. They gathered more than 24 million signatures to support their aim while establishing themselves in approximately 100 nations. A significant number of civic groupings and church officials had appealed to the IMF and World Bank attention to write off HIPC debt with the pretext of starving children, particularly in Africa. Thereafter, developed countries especially those sponsoring the HIPC initiative via the IMF and the World Bank supported the Jubilee 2000 campaign and its causes. Nevertheless, these initiatives were not novel in the international community since the Paris Club group of bilateral official creditors started to display some signs of debt relief in the late 1980s by delaying the debt service payments of most low-income countries. However, the Net Present Value (NPV) of their debt remained unchanged.

[1] Consistent with Rugumamu (2001) one of the reasons for the enhancement is because 250 percent of the Net Present Value (NPV) of the foreign debt as a percentage of exports threshold was regarded as high and arbitrary.

[2] In 2000 under the enhanced HIPC Initiative, Benin, Cameroon, Gambia, Guinea, Guinea-Bissau, Honduras, Madagascar, Malawi, Mauritania, Nicaragua, Niger, Rwanda, Sao Tome and Principe, Senegal, Tanzania, and Zambia reached their decision points.

Six years later, in an attempt to speedily reach the Millennium Development Goals (MDGs) by the end of 2015, the initial HIPC program was supplemented by the Multilateral Debt Relief Initiative (MDRI) at the G8 Gleneagles Summit. The MDRI allowed for full debt relief by three multilateral institutions[3] for nations that successfully completed the HIPC initiative process. All these different debt relief initiatives have helped the recipient countries to alleviate their debt burdens to sustainable levels as defined in the HIPC initiative (IMF, 2017; World Bank, 2017*a*). Between 2001 and 2015 thirty-six countries reached the completion point under the HIPC initiative, leading to higher spending on their poverty-alleviation programs by about 1.5 percentage points of GDP (World Bank, 2017*a*). Besides, the average debt-to-GDP ratio for those group of 36 countries which reached their HIPC completion point declined from 114 percent in 1999 to 22 percent in 2015. Nonetheless, it cost over US$76.9 billion in present value terms to the creditors (World Bank, 2017*a*).

Indeed, there exists a moral argument for debt relief which arises from the fact that in most of these HIPCs the population are living below the poverty line.[4] Thus, spending the savings from the debt relief on poverty-reducing initiatives is far more important than expenses on debt services to creditors, particularly those in the industrialised countries (Collier and Dollar, 2002; Cohen and Vellutini, 2004; Dijkstra, 2007). Furthermore, apart from the moral arguments, there are also economic reasons which support debt relief. For example, one of these reasons is the so-called debt overhang hypothesis introduced by Sachs (1983) and Krugman (1988). According to this theory, investors in a country with unsustainable levels of debt will anticipate higher future taxes to finance debt service payments. Hence, it might lead to sub-optimal investment in the private sector which, in turn, negatively affects economic growth. Moreover, a high debt burden might discourage the government from undertaking important macroeconomic reforms which could make funds available for debt service payments (Koeda, 2008; Siddique et al., 2016).

By contrast, the implications of the debt overhang theory as well as the positive relationship between debt relief and economic growth have not reached a consensus in the literature yet. In particular, critics have asserted that low-income countries suffer from a low institutional quality and poor macroeconomic policies rather than debt overhang (Easterly, 2002; Cordella and Ricci, 2010; Johansson, 2010; Freytag et al., 2017). For example, Easterly (2002) argues that debt relief is channelled into the same government account that uses the funds for virtuous and immoral uses alike. Thus, the author believes that most of these nations are dominated by spendthrift governments and privileged rent-seeking elites. As such, debt relief should only be granted to countries that have an

[3]Along with the International Monetary Fund and the World Bank, the third institution was the African Development Bank.

[4]Poverty line represents the monetary value (to acquire good and services) needed to have the minimum level of standard of living formed in society (Kenny, 2015).

established history of successful inclusive human development programs over a long-time period. By the same token, Cordella and Ricci (2010) illustrated that there is not any significant relationship between debt relief and economic growth, suggesting that a null hypothesis that debt relief does not influence economic welfare cannot be rejected within their sample of 79 developing countries between 1970 and 2002. Similarly, Johansson (2010) concludes that in non-HIPC countries such as Cambodia, Vietnam, Botswana and Seychelles, debt relief facilitates investment and growth in contrast with countries classified as HIPC. The author supports her findings by suggesting problems such as moral hazard and low institutional quality in the HIPC countries as the reasons why debt relief might be less effective in HIPCs. Given this lack of consensus in the academic literature, it is deemed necessary to review how poor countries became heavily indebted.

1.2 Developing country debt crisis: What have we learned from the past?

The aim of this section is to provide a historical overview of the Third World debt crisis which took place in the 1970s and 1980s. It summarizes the evolution and causes of the debt crisis and the several strategies which have been implemented over the years to resolve the problem. The argument is organized under the following headings; (i) Evolution of the debt crisis; (ii) Causes of the debt crisis; and (iii) Implemented strategies to manage the Debt Crisis.

1.2.1 Evolution of the debt crisis

Three decades after World War II, developing nations especially Latin American Countries (LACs) appeared to be condemned to a life of despair. By the end of the 1970s, high levels of external debt and a deteriorating balance of payments forced many developing countries to request debt relief (Kaminsky and Pereira, 1996). Loans to middle-income countries by private creditors[5] (mostly commercial banks) expanded progressively, while access to the international capital market by low-income countries was increasingly restricted which made them borrow from either donor governments or multilateral financial institutions. In the 1970s, almost 20 percent of LACs' long-term public and publicly-guaranteed debt was from commercial banks as the amount owed to private creditors represented 48 percent of the total debt. However, by the first half of the 1980s, debt to

[5]Private creditors include private commercial banks, private bondholders, suppliers of goods that have a commercial claim and other private financial institutions. This does not include debt owed to governments and public-sector agencies.

private creditors was 77 percent of the total loans and more than 71 percent of which represented debt to commercial banks (Nasa, 2009). Although much attention had shifted to the study of the circumstances of the large indebted economies (i.e. Mexico, Argentina, Brazil and Venezuela), it should be noted that the smaller economies also faced the same plight (Bertola and Ocampo, 2012). For instance, the economies of smaller-sized countries such as Peru, Ecuador, Bolivia and a number of Caribbean states collapsed and worsened the misery of the poorest populations of the Western Hemisphere.

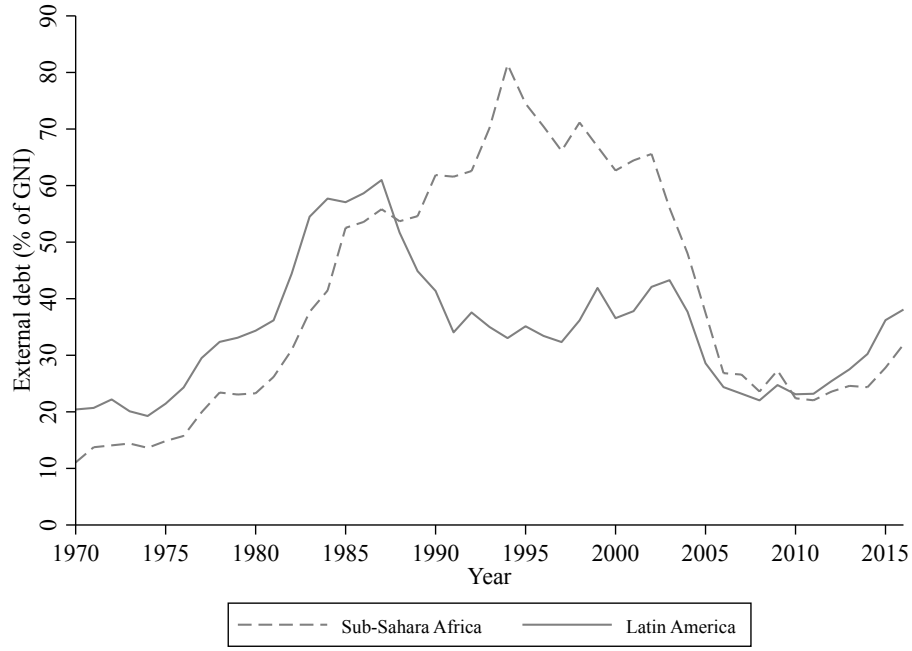
The African economies had not escaped from this debt problem. Difficulties with external finance in general and the growing debt crisis in particular were some of the major problems in Africa (Daseking and Powell, 1999). The African debt problem was in several ways remarkably different from that of the LACs countries. Firstly, at the end of 1988, the total African external debt was around US$230 billion which is fairly low when compared to the massive debt of LACs (Ndegwa, 1990). For example, the external debt of 44 Sub-Sahara Africa (SSA) countries was approximately the same as Brazil's foreign debt and only 9 out of these 44 countries exceeded US$5 billion in external debt (UNECA, 1989). Secondly, while the proportion of external debt owed by LACs to private creditors was large (i.e. more than US$ 222 billion and 26 percent of GDP), in the group of 48 SSA states this amount was small in absolute and relative terms (i.e. more than US$ 32 billion and 11 percent of GDP). For instance, by the end of the 1980s, only 25 percent of the total debt of the group of SSA countries was owed to private creditors compared with 53 percent owed to the group of LAC countries. The relatively low proportion of private debt in SSA countries was mostly because of their restricted access to the international capital market (Stephens, 2002). Indeed, data shows that most of these countries' external debt had been extensively associated with the two Bretton Woods institutions – i.e. The World Bank and the International Monetary Fund. The share of these two institutions in total debt in the continent as a whole stood at around 24 percent compared to 11 percent for the LACs in 1989 (Ndegwa, 1990).

Even though the debt of SSA countries had not received much international publicity, the conventional debt indicators illustrate that when one considers the consequences of its payment on the productive capacity of these countries, the external debt of SSA nations and the related servicing burden were reported as unsustainable by a number of researchers, most notably Greene and Khan (1990); Cohen et al. (1997); Stambuli (1998); Brooks et al. (1998); Easterly (2002). For example, Cohen et al. (1997) and Easterly (2002) noted that the present value of debt-to-GDP ratio of most SSA countries enlarged from 40 percent in 1979 to more than 78 percent in 1994, well above the 50 percent thought to be sustainable.[6] These authors claim that these unsustainable levels

[6]While Cohen et al. (1997) estimated a Debt-to-GNI ratio of 50 percent as the threshold of debt sustainability, the World Bank estimated a range of 40-50 percent (1998, p. 56).

of debt were reached not only because of new borrowing but because of disinvestment in productive potential. In tandem, Brooks et al. (1998) computed data which illustrated that from the early 1970s to the periods of 1976-80 and 1991-95 the debt-to-export ratio expressed as a ratio of present value had risen at a minimum of 4 times in most SSA countries with the most extreme examples being a group of 4 SSA countries (i.e. Côte d'Ivoire, Democratic Republic of Congo, Niger and Zambia) which increased from about 100 percent to more than 500 percent, on average. This latter was far above the range of 150-200 percent which was considered to be sustainable. Besides, the trade balance of SSA countries was also severely affected by the debt crisis as reported by Greene and Khan (1990). They estimated a trade surplus of African countries at the beginning of the 1980s which turned into a trade deficit of 1.1 percent at the end of the same decade.

Figure 1.1: External debt (%GNI) in Latin America and Sub-Sahara Africa

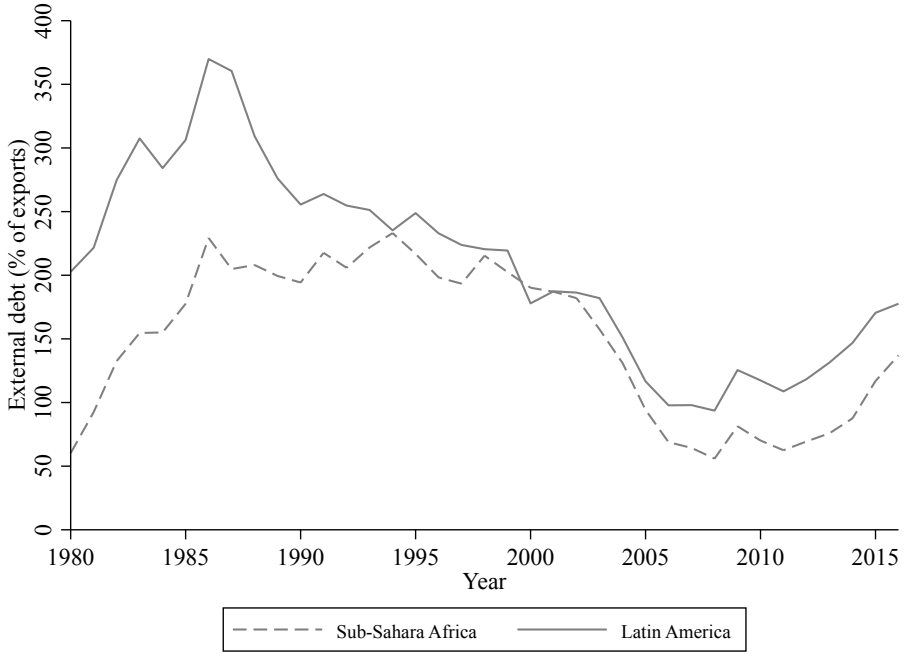


Data source: Own computation based on World Bank's WDI, 1970-2016.

Figure 1.1 depicts the external debt of Latin America and Sub-Sahara Africa countries as a percentage of Gross National Income (GNI) between 1970 and 2016. It shows that the external debt ratios of LAC and SSA countries broadly followed the same trend between 1970 and 1985 with an initial sharp rise. Subsequently, the debt-to-GNI ratio of LACs continued to grow, albeit at a reduced rate, before reaching its peak at about 61 percent in 1988 which represented the highest proportion over the previous three decades (1986-2016). This ratio was above the threshold of 50 percent considered to be sustainable as reported by Cohen et al. (1997). Correspondingly, the debt to GNI ratio of SSA nations also followed the same upward trend, although for a longer period, reaching a peak of 81 percent in 1994 which was almost twice as large as the range percentage (i.e., 40-50)

considered to be sustainable. Therefore, the debt relative to the repayment ability as measured by the present value of GNI was higher for SSA than LAC countries, despite this later group of economies having higher debt levels in absolute value terms as earlier noted. The reason for this arises from the fact that most of LAC nations are middle income with an average GNI of US$ 581.2 in 1970 to US$ 7,955.5 in 2016 as reported by the World Development Indicators (WDI).

Figure 1.2: External debt (% of exports) in Latin America and Sub-Sahara Africa



Data source: Own computation based on World Bank's WDI, 1980-2016.

Figure 1.2 shows the external debt of Latin America and Sub-Sahara Africa countries as a percentage of exports between 1980 and 2016.[7] As the figure reveals, there had been an ascendant trend of debt to export ratio in both SSA and LAC economies between 1980 and 1986. While they had followed a similar trend during the underlined period, the debt to export ratio of LAC countries was nearly 2 times higher than SSA countries. The highest debt-to-export ratio of the LAC zone was reached in 1986 at 370 percent before plummeting dramatically to its lowest ratio of 94 percent in 2008. On the other hand, the debt to export ratio of SSA countries peaked later in 1994 at 233 percent before dipping gradually to its lowest rate of 56 percent in 2008. Thereafter, the debt-to-export ratio of either LAC or SSA nations started to rise again with the advent of the global financial crisis of 2008. They stood at 137 percent for LAC and 178 percent for SSA countries in 2016, the latest figure available from the WDI. The debt to export ratio of both economies between the 1980s and 1990s registered higher proportions than the range of 150-200 percent considered to be sustainable as reported in previous studies (Brooks

[7]Differently from figure 1.1 where we used data from 1970, here we use data from 1980 because of data availability in reliable sources.

et al., 1998; Easterly, 2001). Notwithstanding, with the advent of structural adjustment to combat the debt crisis, the debt-to-export ratio of LAC or SSA countries decreased considerably from 249 percent and 217 percent in 1995 to 171 percent and 117 percent in 2015, respectively.

The LAC and SSA states had generally depended on the business cycle of the Organization for Economic Co-operation and Development (OECD) countries (Da Costa, 1991) as the GDP growth of the two regions had also relied mostly on the commodity price, interest rate, inflation, increasing protectionism and poor macroeconomic policies (Stambuli, 1998; Shadlen, 2006; Primo Braga and Dömeland, 2009). As estimated by the World Bank (1993), between the 1970s and mid-1980s, approximately 10 percent of the reduction of the growth rate in both regions was due to falling trade balances. Figure A.1 in appendix A shows the relation between trade balance as a percentage of GDP and GDP per capita growth during 1970-2016 for the LAC region in 4-years average data. As can be seen, even though the average trade balance to GDP ratio was relatively a small deficit of 1.1 percent averaged from 1970 to 1974, it didn't prevent the LAC economies from registering a peak average growth rate of 4.8 percent during these four years. However, between 1975 and 1979, the average growth rate was nearly halved to 2.6 percent. This was related to a worsening trade deficit of roughly 1.7 percent. Such was subsequently accompanied by a significant economic recession between 1980 and 1984 with economic growth falling to 0.8 percent, on average, in spite of the slight recovery of the trade balance at 1.2 percent during the period under review. Thereafter, economic growth nearly remained unchanged during the periods of 1990-1994 and 1995-1999 even if the average trade balance worsened to 0.1 percent and 1.2 percent in the respective periods.

On the other hand, figure A.2 in appendix A illustrates the relationship between trade balance as a percentage of GDP and GDP per capita growth in 4-years average data between 1970 and 2016 for the SSA region. We observe that the average trade deficit of around 1.5 percent of GDP in the first four years 1970 to 1974 was associated with an economic growth rate of about 3.7 percent. Nevertheless, the economies of SSA countries were deeply worsened by a recession of about 1.9 percent associated with a trade deficit of about 2.9 percent, on average, between 1980 and 1984. What is striking in this figure is that the region enjoyed a "golden era" of 2.7 and 2.8 percent growth between 2000-2004 and 2005-2009 while the trade balance rose to 1.9 and 1.5 percent, on average, in each period in that order. Thereafter, the trade balance started to worsen reaching 0.5 percent of GDP during 2010-2014, partly as a result of the consequences of the "credit crunch" in the group of OECD countries. This deficit in the trade balance deteriorated in the subsequent years to about 4.7 percent of GDP which was allied with an economic recession of around 0.6 percent.

1.2.2 Causes of the debt crisis

The Third World's debt crisis was triggered by an interaction among several interdependent factors which have been frequently cited in the literature (Bulow and Rogoff, 1990; George, 1992; Cohen, 1993; Kaminsky and Pereira, 1996; Easterly, 2002). These authors identified the rise of the oil price that began in 1973/1974, recycling of petro-dollars, the increase of the global interest rate and falling terms of trade as the key factors among others that instigated the debt crisis. We may deal with each in turn.

The considerable **rise in the oil price** between 1973 and 1974 was linked to the decision by the group of 12 Organization of the Petroleum Exporting Countries (OPEC) to significantly reduce the supply of oil to the international market.[8] As commented by Eichengreen and Lindert (1992), the primary reason for this increment in commodity prices, including oil, was related to the breakdown of the Bretton Woods Agreement in August of 1971 when the USA floated the US dollar and abandoned the Gold Exchange Standard. [9] Subsequently, other developed economies started to float their currencies as part of their policies to liberate their monetary policy from the restrictions imposed by the hitherto fixed parity exchange rate system (Shadlen, 2006). The resulting depreciation in the US dollar as well as in other world currencies was associated with a fall in the real value of the revenue of the oil exporting countries as the oil price was largely traded in US dollars. Indeed, between 1974 and 1977, the oil price remained relatively steady before abruptly soaring at the end of the 1970s[10] when OPEC tried to respond to the new market conditions by pegging the price of a barrel of crude oil to the price of gold (Lowenthal, 1990). Given the fact that the demand for oil is inelastic, an increase in its price was inevitable so that demand could equal the supply.

Petro-dollar recycling is the term commonly used to describe the triangular flow of funds, in which oil revenues from OPEC members are deposited in accounts in international commercial banks and then transformed into loans to oil importing countries (Cleaver, 1989; Eichengreen and Lindert, 1992; Shadlen, 2006; Reinhart and Rogoff, 2008). According to these writers, the excess profit generated by oil-exporting countries from the high oil price was deposited in international commercial banks in industrialized countries. In fact, statistics show that countries such as Saudi Arabia, Nigeria, Kuwait and Iran recorded a significant surplus in their trade balance from 1972 to 1979 (see figure 1.3). For example, Saudi Arabia (left axis) and Kuwait (right axis) registered a trade balance

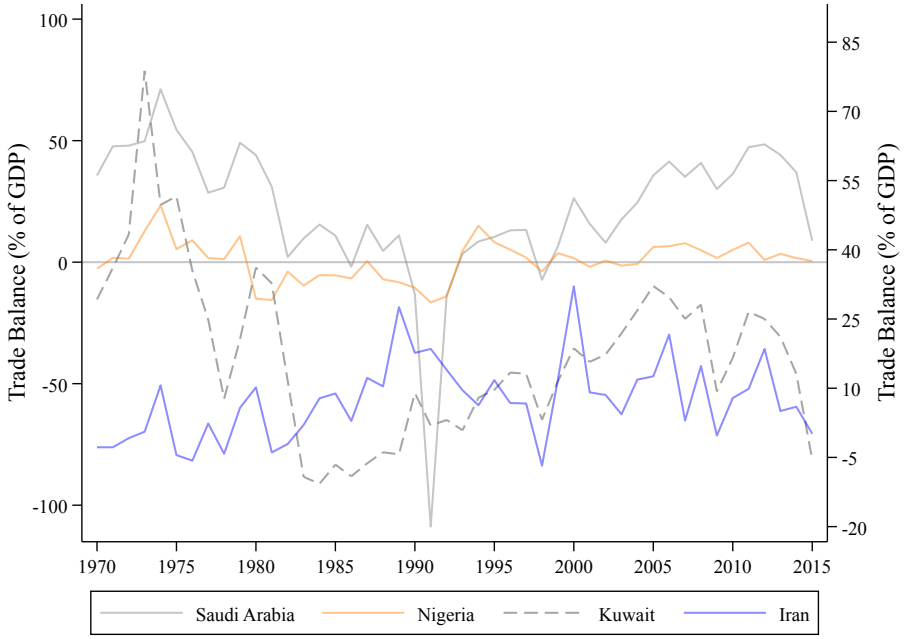
[8] OPEC aimed to resist pressures to reduce oil prices from seven multinational oil companies (i.e. Exxon, British Petroleum, Shell, Gulf, Texaco, Socal, and Mobil) also known as the "Seven Sisters". For more details see Alhajji and Huettner (2000).

[9] Under the Gold Exchange Standard, the US dollar was the only currency fixed to the price of Gold (US$ 35 an ounce) and the remaining currencies were fixed to the price of the US dollar within a 1 percent band.

[10] See figure 1.4

as a percentage of GDP of about 79 percent in 1973 and 71 percent in 1974, respectively. Iran (right axis) and Nigeria (left axis) also benefited from the rise of the oil price with a surplus of approximately 23 and 11 percent, respectively, in their trade balance in 1974.

Figure 1.3: Trade balance of selected oil exporting countries



Data source: Own computation based on World Bank's WDI, 1970-2016.

On the other hand, in order to benefit from the rise in their cash deposits, commercial banks accelerated their loans to the oil importing developing countries which were particularly struggling with balance of payments problems owing to the considerable deterioration in their trade balances. Consequently, external debt of the group of developing countries as a whole rose six-fold to US$ 500 billion from 1972 to 1981 which represented more than twice the increase in their rates of either exports or GDP in real terms (World Bank, 1993).

In fact, several scholars claimed that the policies of developing nations have also exacerbated the debt crisis (O'Cleireacain, 1990; Afxentiou, 1993). For example, (Afxentiou, 1993) noted that a significant amount of these foreign loans was wasted on various unproductive activities such as corruption, smuggling, civil conflict and inefficiencies. Perhaps, if developing countries had invested the funds in more productive sectors, they would have been able to repay their debt. Moreover, O'Cleireacain (1990) asserted that the import substitution strategy implemented by most developing countries proved to be an ineffective development and trade strategy at that time. Thus, most of these nations were characterized by historical and structural problems.

The increase in **global interest rate** allied with a rise in the inflation rate in industrialized countries including the USA and the UK is another possible cause of the debt

crisis in developing economies. To deal with such inflation rates, these countries tightened their monetary policy, leading to an increase in interest rates (Ocampo, 2016). As a result, the debt service payments of developing countries increased dramatically which incited huge financial difficulties. The international community became aware of the severe financial burden that external debt imposed on developing countries when Mexico announced that it was unable to meet the repayment of its foreign debt in August of 1982 (Callaghy Thomas, 2004). Apparently, the difficulty faced by Mexico was due to the marked increase in the cost of its debt-service payments which rose from about US$ 1.3 billion in 1970 to US$ 15.7 billion in 1982. The difficulty faced by oil exporting countries including Mexico was exacerbated by the considerable fall in the oil price from a peak of US$ 37.42 in 1982 to US$ 14.44 per barrel in 1986. To continue to honour their debt commitments to international banks, most of the developing countries, in particular, the poorest nations in the World had to implement stringent economic reforms such as austerity. Therefore, the increase in the global interest rate was estimated to have added more than US$ 41 billion to the stock of developing nations' debt between 1976 and 1982 (Inter-American Development Bank, 1985).

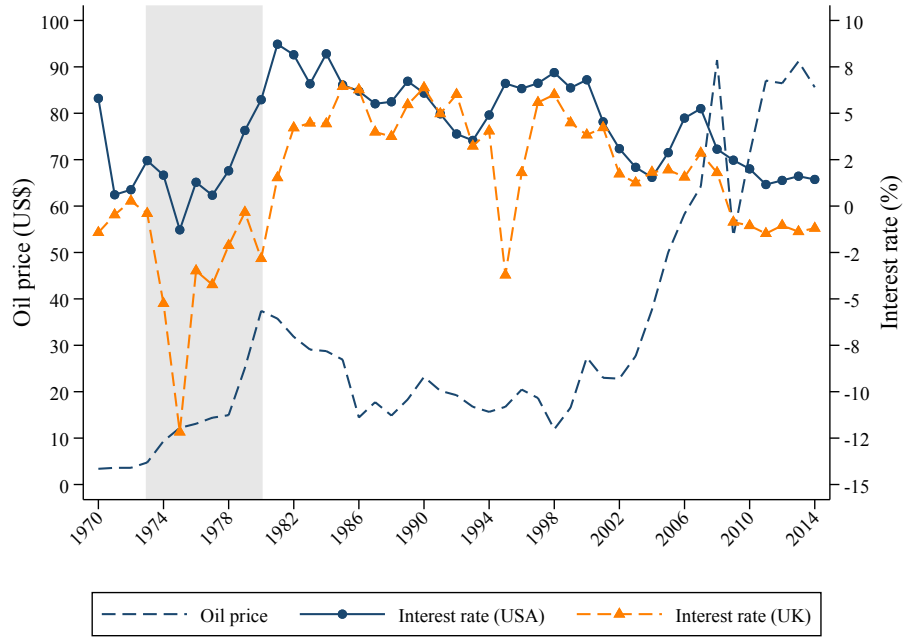
Figure 1.4 illustrates the relationship between crude oil price and the real interest rate of the USA and the UK during 1970-2014. The gray shaded area represents the period in which the oil price shock occurred. The figure shows that between 1970 and early 1973 the oil price was steady at around US$ 3.6 per barrel, however, by the end of 1973 it started to increase dramatically when the oil price shock took place and rocketed to US$ 37.42 per barrel at the end of the 1970s. As explained earlier, the real interest rate of the USA and the UK also rose significantly from -1.3 percent in 1975 to 8.7 percent in 1981 and from -12.2 percent in 1975 to 6.4 percent in 1985, respectively. This rise in the real interest rate was to compensate for the high inflation.

The **falling terms of trade** measured as the price of exports relative to imports also played a key role in the Third World debt crisis. The higher inflation rate that spread around the world forced developed countries to reduce their imports, particularly agricultural commodities. The resulting fall in the prices of such agricultural commodities was associated with a worsening in the terms of trade for non-oil-exporting countries since the total export basket of many of these countries was comprised primarily of agricultural products such as banana, coffee and cotton.

1.2.3 Implemented strategies to manage the Debt Crisis

At the beginning of the 1980s when the reality of the debt crisis was becoming more apparent, various debt management strategies to resolve the Third World debt crisis had been implemented from 1982 onwards. This section seeks to discuss them as follows:

Figure 1.4: Crude oil price and the real interest rate of the USA and the UK (1970-2014)



Data source: Own computation based on data collected from Bloomberg, 1970-2014.

1.2.3.1. Structural adjustments, containment and austerity, 1.2.3.2. The Baker Plan, 1.2.3.3. The Brandy Plan, 1.2.3.4. Heavily Indebted Poor Counties (HIPC) initiative and 1.2.3.5. The Multilateral Debt Relief Initiative (MDRI).

1.2.3.1 Structural adjustments, containment and austerity (1982-1985)

In an attempt to respond to the possibility that developing countries might default on their loans in the early to mid-1980s, the group of industrialized OECD nations attempted to stimulate growth in the economies of the poorest heavily indebted non-oil-exporting countries through the implementation of structural adjustment reforms. The concern was that debt default on such a large scale might lead to a breakdown of the international banking system. As a result, priority was given to the rescheduling of loans that were soon to expire as well as providing new concessionary loans through the International Monetary Fund (IMF), and other multilateral credit agencies. However, for the first time, such debt rearrangement was coupled with the implementation of structural adjustment measures such as cutting government expenditure, limiting imports, raising taxes as well as improving their collection (Shadlen, 2006). The debt problem was treated as being one of liquidity rather than solvency. Consequently, the objective of the debt rescheduling strategy was to provide the heavily indebted poor nations with enough time to resolve their foreign trade imbalances.

In the year following the conditional debt relief, the plan seemed to work reasonably

well as banks were receiving the agreed interest payments on time and countries were not defaulting (Cline, 1995). However, after two years, it became clear that the Third World debt crisis was far from at an end. Most indebted countries went into a severe economic recession that caused the collapse of many international banks, even though these countries were still being supported by the donor agencies (Hepp, 2005). For example, Venezuela and Mexico seemed to be in a worse situation after the oil price downturn in the mid-1980s,[11] while Brazil and Bolivia had annual inflation of 242 percent and 8000 percent, respectively, (Nasa, 2009).

1.2.3.2 The Baker Plan (1985-1988)

To overcome this situation, James Baker, the US Secretary of the Treasury under the Reagan administration, announced in 1985 a three-year plan with the aim of stimulating new bank loans to heavily indebted countries based upon market conditionality and sustainable economic growth. The modus operandi proposed by the Baker Plan was a transfer of new loans of circa US$ 9 billion and US$ 20 billion per annum from multilateral agencies and commercial banks, respectively, in exchange for market-oriented policies – including the privatization of state enterprises, trade liberalization and increased foreign investment – in beneficiary countries (World Bank, 1993).[12] Although the Baker Plan regarded the Third World debt crisis as a long-term problem that could be resolved through a better macroeconomic performance of developing countries, it failed to achieve its fundamental objectives. For example, heavily indebted poor countries kept paying back more principal and interest than what they were receiving as new loans. Besides, the privatisation of state enterprises was not implemented to the recommended scale in most of the debtor countries. As a result, foreign investment failed to grow as expected. As noted by Cline (1995), new loans from international commercial banks and net lending from the public sector amounted to US$ 12.8 billion and US$ 15.7 billion, respectively, between 1985 and 1988 in the Baker Plan countries.

1.2.3.3 The Brandy Plan (1988-1996)

In 1989, when the Bush administration came into office, Nicholas Brandy, the new US Secretary of the Treasury believed that the only solution to the Third World debt crisis was to encourage creditors to voluntarily provide debt and debt services write-offs to developing countries (Vasquez, 1996). Brandy's idea was based on the assumption that

[11] The annual inflation rate in Mexico and Venezuela grew by more than 180 percent between 1981-1986 and 1982-1985, respectively.

[12] The recipient countries included 15 heavily indebted countries: Venezuela, Uruguay, Chile, Brazil Argentina, Mexico, Ecuador, Bolivia, Peru, Yugoslavia, the Philippines, Morocco, Nigeria, Ivory Coast and Colombia.

developing countries would not benefit from new loans and foreign investment would not be made unless existing debt had been reduced (Ramirez, 1991). Even though the application of the Brandy Plan differed across countries, this new plan involved debt reduction operations for Severely Indebted Middle-Income Countries (SIMICs) which were also supported by the World Bank and IMF. Meanwhile, African countries were encouraged to launch the Special Program of Assistance for the poor (SPA) by the World Bank. This initiative helped them to apply most of the conditional structural adjustment programs suggested in section 1.2.3.1 (Greene and Khan, 1990). As mentioned earlier, most of the African debt was owed to official creditors and it did not appear to be too detrimental to the international banking system. Although the debt owed by African countries was not greater than in Latin America countries, the debt severely harmed the economic growth of the continent[13] as we saw in figure A.2 in appendix A.

1.2.3.4 Heavily Indebted Poor Counties (HIPC)

In 1996, the International Monetary Fund and the World Bank launched the Heavily Indebted Poor Countries initiative after two decades of unsuccessful strategies to manage the debt crisis of developing countries. This was the first time that multilateral creditors had conceived debt relief in relation to their own money as they were being confronted by recurrent public pressures – e.g., the Jubilee Debt Campaign. While other previous debt management strategies varied across countries and were based on short-term cash flows, the HIPC initiative was a pioneer in analyzing the total debt and entailing a joint negotiation of the debt between the debtor and all its lenders (Callaghy Thomas, 2004). This represented a clear sign that the international financial community had shifted their view of the Third World debt crisis from being a liquidity to a solvency problem. The purpose of the HIPC initiative was to lower the debt burden of the heavily indebted poor countries by ensuring that they were not overwhelmed by unmanageable debt burdens (World Bank, 2017*b*).

Notwithstanding, it became obvious that the HIPC was failing to provide a permanent exit from high levels of debt. Thus, it was reviewed and modified with the advent of the enhanced HIPC initiative in 1999 which allowed for a provision of faster, broader and deeper debt reduction, while strengthening the linkage between debt relief, poverty reduction and debt sustainability (World Bank, 2017*a*). The enhanced HIPC was the first initiative which required that the additional resources freed up from debt relief were spent on social expenditures. According to IMF (2016), the eligibility criteria for HIPC are as follows:

[13]While most of the Latin American countries were middle-income, the majority of African countries were low-income with weak economic reforms and thus their productive capacity to repay their loans was low (Callaghy Thomas, 2004).

1. Be eligible to borrow from the IMF's Poverty Reduction and Growth Trust (PRGT) and the World Bank's International Development Agency (IDA)

2. Face an unmanageable debt problem after using in full the traditional debt relief mechanisms – i.e. relief granted by the Paris Club[14] and other creditors

3. Have established a three-year track record of good macroeconomic performance and sound policies through the IMF and the World Bank supported programs

4. Have prepared a Poverty Reduction Strategy Paper (PRSP) through a broad-based participatory process (i.e. civil society) in the country.

Once a country satisfies all of the above criteria, a decision from the executive boards of the IMF and World Bank on its eligibility for debt relief and a commitment by the international community to write down the debt to a sustainable level should be made. This process is referred to as the "decision point". Thereafter, interim relief on its debt service falling due might be immediately available, once a country reaches its decision point (IMF, 2016). Furthermore, the country might receive full and irrevocable debt relief available under the HIPC initiative, if it satisfies the following criteria:

1. Have established a further track record of good macroeconomic performance through the IMF and the World Bank supported programs

2. Carry out satisfactorily key reforms agreed at the decision point

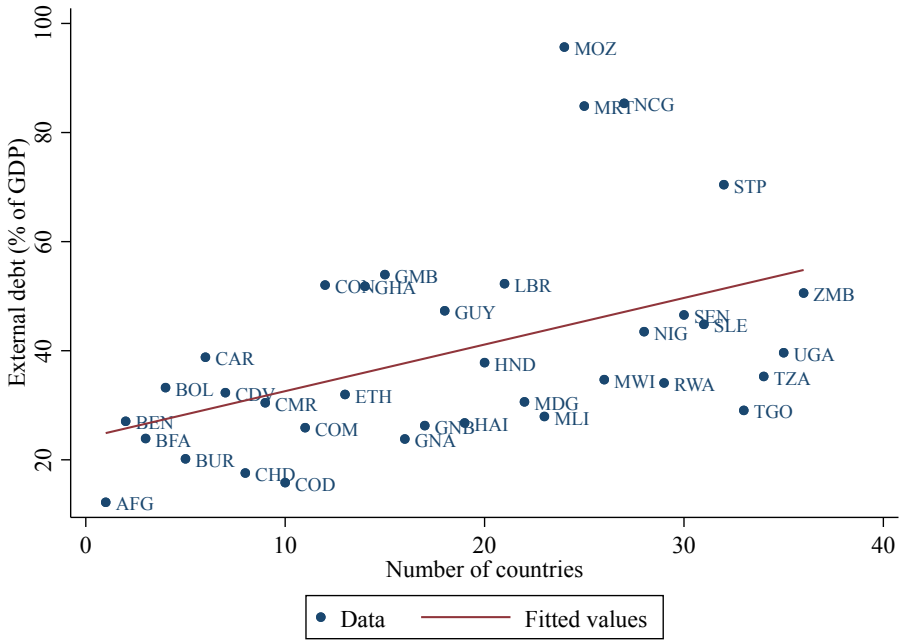
3. Implement and adopt the IMF PRSP approach for a minimum of one year.

Once all the above-mentioned criteria have been satisfied, the country should expect to reach its "completion point" as the creditors are expected to provide the full debt relief committed at the decision point. At present, 39 countries are eligible for HIPC assistance of which thirty-six[15] (see figure 1.5) are receiving full debt relief from the IMF, World Bank and other creditors, while three – Eritrea, Somalia and Sudan – have not reached the completion point (World Bank, 2017*a*).

[14]As we referred to in the introductory section of the thesis, this is an informal group of financial officials with 20 permanent members concerned with the debt relief of the indebted countries.

[15]Name and country codes are as follows: AFG=Afghanistan; GMB=The Gambia; NCG=Nicaragua; BEN=Benin; GHA=Ghana; NIG=Niger; BOL=Bolivia; GNA=Guinea; RWA=Rwanda; BFA=Burkina Faso; GNB=Guinea-Bissau; STP=São Tomé & Príncipe; BUR=Burundi; GUY=Guyana; SEN=Senegal; CMR=Cameroon; HAI=Haiti; SLE=Sierra Leone; CAR=Central African Republic; HND=Honduras; TZA=Tanzania; CHD=Chad; LBR=Liberia; TGO=Togo; COM=Comoros; MDG=Madagascar; UGA=Uganda; CON=Republic of Congo; MWI=Malawi; ZMB=Zambia; COD=Democratic Republic of Congo; MLI=Mali; CDV=Côte d'Ivoire; MRT=Mauritania; ETH=Ethiopia; MOZ=Mozambique.

Figure 1.5: HIPC countries and external debt-to-GNI ratio, 2016



Data source: Own computation based on World Bank's WDI, 2016.

1.2.3.5 The Multilateral Debt Relief Initiative

In order to accelerate progress toward the Millennium Development Goals (MDGs), the Multilateral Debt Relief Initiative (MDRI) was launched in 2005 at the G8 Summit in Gleneagles, Scotland. The MDRI encompassed the following three multilateral institutions: the IMF, the International Development Association (IDA) of the World Bank and the African Development Fund (AfDF). They aimed to provide 100 percent debt relief for countries which had reached or would reach the completion point (IMF, 2017).

Unlike the traditional HIPC framework, the MDRI did not contemplate any parallel debt relief on the part of other multilateral institutions, official bilateral or private creditors beyond the commitment by IMF, IDA and the AfDF. Nonetheless, five HIPC countries in the Western Hemisphere also received similar debt relief from the Inter-American Development Bank in 2007. Moreover, the IMF also decided to extend the debt relief program to non-HIPC countries whose GDP per capita income was less than US$ 380[16] per year. Currently, thirty-five HIPCs which reached their completion point by the end of 2016 have received debt relief under the MDRI as well as two non-HIPC countries – Cambodia and Tajikistan – which have benefited from assistance from the IMF.

In total, as shown in figure A.3 in appendix A, before and after the traditional debt

[16] All non-HIPC countries with outstanding debt to the IMF and per capita income below US$ 380 at the end of 2004 were also eligible for the MDRI.

relief initiatives in the 1980s, the debt stocks of the 36 countries which reached the decision point (under the Enhanced HICP) was approximately US$ 141 billion and US$118 billion in present value terms, respectively. However, after the implementation of the Enhanced HIPC initiative and its additional bilateral debt relief, this amount was more than halved to US$ 58 and 47 billion, respectively, in present value terms by the end of 2015. By the same token, the debt stocks of the countries that reached the decision point under the MDRI significantly fell to US$ 5 billion in present values terms.

1.2.4 Concluding remarks

From the aspects discussed, one may notice that the reasons for foreign lending had varied across regions during the 1980s and 1990s. For example, while in the LAC region where most of the nations are middle income the creditors were primarily motivated by commercial ends, in SSA region the bulk of lending provided by official creditors was essentially motivated by humanitarian and strategic concerns. Furthermore, from the figures illustrated, we could preliminarily conclude that the HIPC initiative has broadly reached its objectives – i.e. reducing the external debt burden of heavily indebted poor countries to sustainable levels while increasing poverty-reduction expenditure. However, contrary to wishful thoughts, among some borrowers and lenders, the debt problem is deemed to remain one of the dominant matters in the economic relationship between developing and industrialized countries.

Although the structural adjustment and macroeconomic reforms attached to the HIPC initiative require the resources to be spent on social expenditure, it is believed that the challenge still remains when one considers the quality of public investment as well as the debt management capacity of recipient countries (Lora and Olivera, 2007; Marcelino and Hakobyan, 2014). For instance, most of the low-income countries have insufficient domestic resources to invest in the real sectors of the economy – i.e., basic infrastructure, energy, industrial, agricultural, education and health – which effectively boost domestic production and consequently economic growth. On one hand, they demand such goods and services on the international market (i.e., developed countries) and, on the other hand, they resort to external borrowing to finance such needs. This could be one of the reasons why external debt in developing countries has been rising again over the last 7 years (see figures 1.1 and 1.2). In addition, because of the conditionality attached to Official Development Assistance (ODA) – i.e., debt relief and foreign aid – such as acquiring goods and services from the creditors regardless of the price and quality when compared to the international market, such arrangements may sometimes be questionable. In this way, the exit door from the debt crisis for heavily indebted poor countries appears to be unknown yet. Thus, our question at the beginning of this section is still well-

grounded: what have we learned from the past? This might require us to pursue a deep understanding of the theoretical aspects as well as the empirical evidence which underpins the debt-growth relationship.

1.3 Thesis overview: research motivation and outline

1.3.1 Research aim and objectives

In the light of the above discussion, there is a need to examine the role and importance of debt relief in developing countries, and the fundamental role of debt-driven fiscal consolidation for economic development. While it is widely accepted that the fiscal policy stance taken by the countries themselves is vital for debt sustainability, the adjustment problems confronted by many of these countries has remained relatively unexplored in the literature. As such, this thesis outlines the following three main interrelated research objectives:

1. To empirically examine the transmission channels through which debt relief affects human welfare in developing countries.
2. To explore and quantify the impacts of debt relief stemming from HIPC initiatives on the budget of African beneficiary governments.
3. To empirically evaluate the extent to which debt-driven fiscal consolidation policies influence firm performance in developing countries.

1.3.2 Main contributions

This thesis contributes to the literature in three distinctive manners. First, it empirically examines, for the first time, the impact of debt relief on human welfare proxied by the Inequality Adjusted Human Development Index (IHDI). In order to disentangle the effect of debt relief on human welfare, this study disaggregates IHDI into its three components (e.g., Gross National Income, Education, and Life Expectancy) across four separate classifications of developing countries. Second, it provides a novel theoretical framework for endogenous debt relief and different classifications of government expenditure, while quantifying their impact on the budget of African countries granted debt relief assistance. Lastly, this study builds a new dataset of fiscal consolidation actions – motivated by the desire to reduce public debt levels – in 98 developing countries. It, therefore, empirically examines, for the first time, the effect of fiscal consolidation episodes on economic growth

taking a micro approach. The next section discusses the outline of the thesis and specific contributions in relation to each empirical chapter.

1.3.3 Thesis outline

The overall structure of the thesis takes the form of three self-reliant empirical chapters (chapters 2-4) to fulfil the above objectives related to debt relief and fiscal consolidation in developing countries. Chapter 2 focuses on the transmission channels through which debt relief affects human welfare. It distinguishes developing countries across four separate classifications based upon their level of dependency on primary commodity exports. They are: (i) Natural resource dependent–HIPCs; (ii) Natural resource dependent–non HIPCs, (iii) Non–natural resource dependent–HIPCs; and (iv) Non–natural resource dependent non–HIPCs. To measure debt relief, a newly generated database based on present value of debt relief is constructed, while human welfare is measured by the Inequality Adjusted Human Development Index (IHDI). Considering a sample of 80 developing countries, the Generalized Method of Moments (GMM) framework is employed over the period 1990-2016. This chapter provides several contributions to the debt relief literature. First, it considers a much broader dimension of country specific characteristics including natural resource earnings and external debt burden conditions to examine the impact of debt relief on human welfare. Novel results indicate that debt relief uplifts human welfare in non-natural resource HIPC countries, even though the same relationship does not hold for the remaining group of countries. Second, chapter 2 investigates the possible transmission channels through which debt relief impacts human welfare. Results show that in non-natural resource–HIPC countries the main transmission channels of the effects of debt relief on human welfare are national income and improvements in education. Moreover, debt relief improves national income in natural resource dependent–HIPCs, even though this positive association is crowded out by the negative correlation with education and life expectancy, resulting in an overall decline in human welfare. Third, chapter 2 also examines whether the effect of debt relief on human welfare differs in the above-mentioned group of countries after accounting for the so-called debt overhang. Findings suggest that natural resource dependent–HIPCs do not suffer from debt overhang, while the opposite holds for non-natural resource HIPC countries.

Chapter 3 quantifies the impact of debt relief granted under the HIPC initiative on the budget of 30 African beneficiary governments. It presents a new fiscal response model which allows for endogenous debt relief and different types of government expenditure. To test the model empirically, a new dataset on debt service savings from debt relief is constructed with data from IMF country reports such as article IV reports and HIPC completion point documents. To abstain the estimates from any endogeneity concern,

a panel Vector Autoregressive (p-VAR) technique based on the GMM framework with Gaussian approximation of 500 Monte Carlo draws is employed. The first contribution of this chapter is to shed light on the extent to which debt service savings from HIPC initiatives benefit the public finance of African countries. Estimates confirm that debt relief increases domestic resource mobilization and public spending in recipient countries, although spending on education appears to be inert to debt relief shocks. Furthermore, this chapter contributes to the debt relief literature by providing a more comprehensive assessment of how the effect of debt service savings from enhanced HIPC and MDRI assistance differs after accounting for the fragility condition of beneficiary countries. Results illustrate that the fiscal response of domestic tax collection and public spending is more pronounced in fragile HIPC countries than in their non-fragile counterparts. These findings are robust to an extensive array of robustness exercises.

Lastly, chapter 4 critically examines the influence of fiscal consolidation actions – motivated by the desire to reduce government debt levels – on the performance of more than 118,279 firms in developing countries. To measure fiscal adjustment actions, IMF staff reports (e.g. Article IV consultations and IMF Program documents) were used to construct a novel dataset of more than 544 fiscal consolidation policies, while firm performance is proxied by sales growth built with data retrieved from the World Bank Enterprise Survey (WBES). The value added to the body of knowledge is threefold. Firstly, this chapter uses a unique dataset to evaluate, for the first time, how fiscal policy actions affect the economic activity in 98 developing countries taking a micro approach. Findings indicate that firm performance declines with debt-driven fiscal consolidations and this negative association is mitigated when consolidations are large (e.g. higher than 1.5 percent of GDP). Moreover, when the debt-cycle of each country is allowed to differ, it is found that debt-driven fiscal consolidation is more relevant for high-debt-risk developing countries than their low-debt-risk counterparts.

Secondly, this chapter investigates how different types of consolidation packages (e.g. tax hikes and spending cuts) affect the economic activity in developing countries. Results reveal that debt-driven consolidation packages based on tax hikes are more contractionary than those based on spending cuts, even though consolidations based on this latter are mitigated when spending cuts are large. Besides, fiscal consolidation efforts based on capital spending cuts are more contractionary than those based on current spending cuts. Thirdly, it explores whether the effect of fiscal consolidation on firm performance in developing countries is contingent on some firms' characteristics. It discriminates among small, medium and large firms, and firms that are deemed to be exporters and domestic. Evidence shows that the contractionary effect of debt-driven consolidation efforts is lower as the size of the firm becomes smaller. In addition, exporting firms are less affected by fiscal retrenchments than their non-exporting counterparts because the former enjoy a

foreign tax advantage by moving their profits to low-tax jurisdictions.

In summary, the intent of this thesis is to uncover those problems which still hamper the impact of debt relief in developing countries and how debt-driven fiscal policy actions influence the economic activity in this group of countries. Because each chapter of the thesis presents its own hypotheses, estimation methodology and empirical evidence, the reader is able to follow the motivation and policy recommendation of each chapter in a simple and organized way. The remaining part of the thesis proceeds as follows. Chapter 2 discusses the transmission channels of the effects of debt relief on human welfare. Chapter 3 examines the interconnection between debt relief and fiscal response, while Chapter 4 explores the effects of debt-driven fiscal consolidation policies on firm performance in developing countries. Lastly, chapter 5 presents the general conclusions, policy implications and areas for future research.

Chapter 2

The transmission channels of the effect of Debt Relief on Human Welfare: evidence from Developing Countries

2.1 Introduction

Most of the cross-country studies of external debt in developing countries have focused on the relationship between the level of indebtedness and economic growth. Since long time series data on Gross Domestic Product (GDP) is promptly available for many developing countries, it has been a convenient measure of economic wellbeing in cross-country empirical studies. However, as part of the initiatives to resolve the debt crisis of the late 1980s and early 1990s, bilateral and multilateral lenders intensified their commitment to increase the flow of resources from external debt restructuring to poverty-reducing public spending (IMF and IDA, 2011). This intention was consolidated in the mid-1990s with the implementation of the Heavily Indebted Poor Countries (HIPC) initiative and later with the Multilateral Debt Relief Initiative (MDRI) in 2005. The major aims of these programs were to write off debt burden of some of the world's poorest countries to sustainable levels[1] while compelling their governments to utilize the resources freed up from debt relief to increase social spending in priority sectors such as health and education (World Bank, 2017*a*).

Despite the popularity of GDP, it is often argued that this measure does not accurately capture all aspects of economic growth and development (Ranis et al., 2000). Most essentially, providers of debt relief usually target a range of activities and welfare programs whose impacts are not necessarily reflected in the changes in short-run GDP. Since debt relief is designed to reduce poverty and improve human welfare, GDP figures do not represent the distribution of income and its components derived from non-market activities. Therefore, using GDP as the sole convenient measure of economic welfare may narrow the scope of the impacts of debt relief (World Bank, 2001).

In fact, it is a difficult exercise to study the direct effect of debt relief on poverty across countries given the scarcity of comparative cross-country data on aggregate measures of hardship for low-income countries. Although an indirect approach could be employed, it would necessarily require some basic assumptions to be made. As such, the primary aim of this paper is to assess the effect of debt relief on human welfare measured in terms of the Human Development Index adjusted for income inequality (IHDI). The underlying hypothesis is that debt relief is, *ceteris paribus*, significant and positively correlated with aggregate measures of human welfare[2] in countries which benefited from external debt assistance. The use of IHDI enhances our understanding of the interconnections between inequalities and wellbeing across population as well as the channels through which ex-

[1] This means that the debtor country in question is able to meet its debt service payments in full and on time without further recourse to debt relief, accumulation of arrears or rescheduling of outstanding debt.

[2] This is because human welfare is supposedly higher than it would be in the absence of debt relief since the resources that would otherwise be used for debt service are aimed to improve human welfare.

ternal debt relief with conditional policy initiatives foster a more equitable society.[3] The index adjusted of HDI is frequently used in the literature to study the impact of socio-economic programs and policies on aggregate and/or individual components of human welfare (see, for example, Kosack (2003) on aid and democracy; Gomanee et al. (2005) on government expenditure; Asongu and Nwachukwu (2018) on educational quality).

Surprisingly, empirical evidence on the effect of debt relief on human welfare in the group of HIPCs is very rare. This is probably because of a lack of data on the relevant economic development indicators. Nevertheless, developments in endogenous growth models coupled with improvements in the accessibility of a wide range of global databases from international organizations such as the United Nations Development Program (UNDP), the World Development Indicators (WDI) and the Food and Agricultural Organization (FAO) have fuelled a new wave of research in economic and social development issues. For example, researchers in the first decade of the 21st century were able to investigate the relationship between debt relief and the dimensions of human welfare. For instance, Cuaresma and Vincelette (2008) concluded that the external debt management with conditional policy reforms under the HIPC initiative had positive effects on education, while Gupta et al. (2002) noted the favourable impact of resources allied with debt restructuring on long and healthy life. By contrast, Easterly (2002); Depetris Chauvin and Kraay (2005); Arslanalp and Henry (2006); Johansson (2010) found no corroborating evidence of advantageous effects of debt relief on economic growth and development indicators. These conflicting outcomes in the academic literature cast doubt on the effectiveness of debt relief programmes including the HIPC initiative as a strategy for fostering economic welfare in some of the world's poorest countries.

Consequently, the objective of this study is threefold. First, it investigates the impact of foreign capital inflows accruing from debt relief programmes on the index of adjusted human development in HIPCs compared with non-HIPCs, irrespective of their level of earnings from natural resource exports from 1990 to 2016. One important observation to be made is that bilateral and multilateral creditors attach certain policy conditionalities to debt relief in the expectation that such requirements will simultaneously improve the quality of institutions and economic fundamentals in the beneficiary countries. It is anticipated that countries with good institutions are more likely to invest savings from debt relief into projects that stimulate development in physical and human capital and use these accumulated resources more efficiently to attain higher levels of economic development (Asiedu, 2003; Arslanalp and Henry, 2006). Consequently, in this study, we compare the sensitivity of the interconnections between institutional quality, debt relief

[3]For more details see United Nations (2018) *Human Development Indices and Indicators: 2018 Statistical Update*. Available from: http://hdr.undp.org/sites/default/files/hdr2018$_{t}$echnical$_{n}$otes.pdf.

and human welfare in HIPCs and non-HIPCs.

Second, it examines the effectiveness of debt relief assistance in promoting human welfare in natural-resource rich countries compared with non-natural resource economies, regardless of differences in their levels of external debt burden. This is presumably because these countries were opportune to invest in large scale social projects by combining funds from interest savings from external debt relief with the higher earnings from primary commodity exports. The prices for such natural commodities in the international market increased significantly during the first decade of the 21st century.

Third, it evaluates the impact of debt relief on human welfare in high-natural resource rich countries vis-à-vis non-natural resource rich economies, after accounting for their levels of debt overhang. Statistics show that the rate of decline of external debt as a share of GDP is considerably faster in natural resource rich countries than non-natural resource dependent nations. For example, evidence illustrates that natural resource rich non-HIPCs reduced their external debt as a share of GDP by 55 percent; from 80 percent in 1994 to 36 percent in 2014 while the debt level for their non-natural resource dependent counterparts only declined by 11.54 percent; from 52 percent to 46 percent of GDP over the same period (see figure B.2 in appendix B). Furthermore, despite the fact that interest savings from debt relief programs would have helped heavily indebted poor countries to significantly reduce their external debt burden, evidence shows that from the late 1990s to the late 2000s natural resource rich HIPCs had managed to lower external debt as a share of GDP by 14 percent, on average, when compared to 10 percent in their natural resource poor counterparts[4] (see figure B.1 in appendix B). It would seem that additional foreign capital inflows from primary commodity exports have played a key role in the management of external indebtedness, especially in the group of HIPCs.

Notwithstanding, it is well documented in the literature that high volatility in the price of primary commodities has been detrimental to poverty and borrowing rates of the Heavily Indebted Poor Countries (HIPCs) over the last three decades (IMF, 2003; Gilbert and Tabova, 2004; IMF, 2015). For instance, a more recent debt sustainability assessment by IMF (2019*b*) concluded that whereas nearly half of HIPCs are either debt distressed or at high risk of becoming so, 80 percent of these states are primary commodity dependent countries. This, in turn, implies that the benefits associated with additional income from the HIPC and MDRI programs are somewhat crowded-out by costs allied with the complications of debt overhang. Consequently, we examine whether the degree of responsiveness of the anticipated welfare benefits of debt relief varies between natural-resource dependent and non-natural resources dependent HIPCs.

We provide contributions to the sparse and inconclusive empirical literature on debt

[4]During this period, there were commodity price booms.

relief in several manners. Firstly, given the fact that debt relief policies should be tailored to country-specific characteristics as recently suggested by the Debt Sustainability Framework (DSF) in IMF (2017), we conduct an empirical investigation between debt relief and human welfare which allows for a much broader dimension of specific characteristics of countries in a sample which other studies failed to explore. Moreover, we deepen our analyses by desegregating our measure of human welfare in order to identify the possible transmission channels through which debt relief may promote human welfare.

Secondly, following the seminal work of Krugman (1988) and Sachs (1989) we generate a fresh insight into the debt overhang theory. More specifically, we empirically examine whether the debt overhang theory is more pronounced in natural resource rich countries when compared to those countries poor in natural resources abundance. Even though very few attempts have been made in the empirical debt relief literature (Imbs and Ranciere, 2005; Cordella et al., 2010; Johansson, 2010), it is still less clear about the response of the debt overhang hypothesis in a more refined control group of countries.

Thirdly, it is well known that lack of institutional quality and governance constitute a bottleneck for economic development (Asiedu, 2003; Presbitero, 2009). While several scholars have tried to investigate the impact of debt relief programs on growth and human development (Easterly, 2002; Schmid, 2009; Welander, 2016), the empirical question still remains of whether the conditionalities attached to debt relief would erase the underlying constraints for development. Therefore, we provide a sharper analysis on whether institutional quality affects the interconnection between debt relief, human welfare and its transmission channels. The remainder of this paper is organized as follows. Section 2.2 presents an overview of the literature on debt relief, economic growth and development. Section 2.3 describes the dataset and the methodology applied in this study. Section 2.4 discusses the results as well as the robustness checks. Finally, section 2.5 draws conclusion and policy implications.

2.2 Related literature

2.2.1 Debt relief, growth and development

Economists including Sachs (1983); Krugman (1988); Sachs (1989); Claessens (1990) have attempted to explain the riddle of the debt crisis by presenting theoretical models which could explain the incentive effects of debt forgiveness for countries suffering from high levels of public debt. In fact, the most preeminent theory is the debt overhang hypothe-

sis developed by Krugman (1988) and Sachs (1989).[5] According to these authors, higher future debt obligations for the debtor country is perceived by investors as an implicit tax since the expected debt service increasingly depends on the country's output level. The debtor country would balk to implement difficult economic reforms since existing external creditors would be the ones benefiting from taxation and growth (Corden, 1988). As a result, the indebted country has an incentive to partly default while investors will be reluctant to invest in a country suffering from debt overhang. This situation makes practically impossible for heavily indebted poor countries to escape from poverty because they will be unable to attract external inflows since new potential creditors are discouraged by the prospect of an immediate loss of capital (Nguyen et al., 2005).

Notwithstanding, a debt write-down would potentially make both parties, the debtor and the creditor country, better off because investment in the former will be encouraged which will also increase the expected debt service payments to the latter. This would ultimately foster economic growth as well as improve the standard of living in the debtor country (Poirson et al., 2004). This viewpoint has been contested by a large strand of the literature (Easterly, 2002; Cordella et al., 2010; Depetris Chauvin and Kraay, 2005). For instance, Easterly (2002) studied a sample of 41 HIPC countries between 1980 and 1997 by applying the log of initial income against an average of macroeconomic indicators as well as dummy variables for the HIPC status. He concluded that debt relief in most cases had led to profligate governments, interest group polarization and more debt accumulation. Moreover, Easterly (2002) posited that HIPC countries are likely to have poorer policy performance than non-HIPC countries. Similarly, Cordella et al. (2010) employed Ordinary Least Square (OLS) and the Generalized Method of Moments (GMM) in an unbalanced panel dataset of 79 developing countries between 1970 and 2002. The authors concluded that debt reduction is only relevant in countries with good policies and institutions since this group of countries face debt overhang when the net present value of debt increments above 20-25 percent of GDP. They did not find strong evidence of debt overhang in countries with bad policies and institutions. In the same vein, Johansson (2010) used a similar methodology as Cordella et al. (2010) with a more recent sample of 118 developing countries over the period of 1989-2004. Her findings proposed that debt relief does not have a significant impact on economic growth in HIPCs, although there is some evidence that debt reduction enables growth in countries not classified as HIPC as a consequence of a rise in the volume of investment. The above findings are broadly supported by other studies (Presbitero, 2009; Depetris Chauvin and Kraay, 2005; Marcelino and Hakobyan, 2014).

So far, however, the studies discussed above suggest that debt relief has not been

[5]The initial idea of Debt Overhang is usually attributed to Sachs (1983). See also Claessens (1990) and Corden (1988) for other useful discussion on the theory.

effective in helping recipient countries to either promote economic growth or significantly influence on the attainment of health and education targets. Even though these studies were probably the pioneers of the debt relief and growth literature, they only covered time frames which ended in the mid-2000s. This possibly made it difficult to assess the effectiveness of the grants from debt relief programs from 2000 onwards such as the Multilateral Debt Relief Initiative (MDRI). Therefore, this absence of strong empirical evidence may be owed to the short observation periods (Ferry and Raffinot, 2019). Nevertheless, a more recent study conducted by Djimeu (2018) attempted to remedy these limitations. He used a difference-in-difference approach in a cross-country study of 48 Sub-Sahara Africa countries (30 HIPCs and 18 non-HIPCs) during the period 1996-2014. Djimeu (2018) observed that although the HIPC initiatives and MDRI have had a positive impact on public spending, there is no evidence which confirms their impact on economic growth. The author concludes his analyses by pointing out that this lack of evidence is neither due to access to international capital markets nor the quality of institutions in the above group of countries.

Some other studies have concentrated on the effect of debt relief on socio-economic indicators (Thomas, 2006; Tsafack Temah, 2009; Schmid, 2009; Welander, 2016). For example, Thomas (2006) applied a GMM approach in a panel dataset of 110 developing countries between 1985 and 2004. He illustrates that declining in debt service to exports is significantly associated with increments in health and education expenditure among low-income countries. In the same way, Tsafack Temah (2009) examined a sample of 41 HIPC countries between 2001 and 2006. She employed a similar methodology as Thomas (2006) but used dummy variables for HIPC countries based on their completion and decision points. The author concluded that the HIPC initiative has helped to increase public health expenditure in beneficiary countries even though the funds of debt relief appear to be more misused in African HIPCs than in their Latin American and Asian counterparts.

Schmid (2009), on the other hand, used the difference-in-difference approach to estimate the impact of debt relief on the infant mortality rate in 31 developing countries over the period 1996-2007. He took advantage of household data retrieved from the Demographic and Health Survey (DHS) and re-computed the data at the national level. His results reveal that reduction in the infant mortality rate occurred temporarily between the decision and completion points of the HIPC program. Therefore, the author pointed out that poor people experienced improvements in socio-economic conditions during this period. A more recent study conducted by Welander (2016) reassessed Schmid's work, however, taking a micro approach. Welander (2016) compared the probability of babies, born before the decision point, surviving after their first year and an equal survival likelihood for the youngest sibling born after the decision point. Although she found no

evidence of the effects of the HIPC program after countries reached the completion point, her results posited that debt relief increased by 0.5 percentage points the probability of babies surviving in the interim period between the decision and completion points. This represented about 3,000 fewer deaths in Heavily Indebted Poor Countries, on average.

In general, the specifications and the nature of the panels employed in the discussed above studies yield divergent results. We can notice that some studies relied on a wide range of countries, including low to medium-income nations and others used dummy variables based on the decision and completion points date of the HIPC programs. While the first approach may increase the possible effects of self-selection already induced by the HIPC initiatives, the second one is questionable because the use of a binary variable, in this case, does not capture the liquidity effects of debt relief since it depends on the amount of relief granted. Perhaps this latter approach may work better when evaluating problems such as behavioral reactions of creditors and debtors, policy changes and conditionality effects (Ferry and Raffinot, 2019). Therefore, further studies with alternative econometric techniques need to be conducted – e.g., refined control groups of countries and better measures of outcome variables – in order to evaluate the effective impacts of debt relief on economic growth and development.

2.2.2 The missing link: Debt relief, human welfare and poverty reduction

The interconnection between indebtedness and human welfare is evident from the fact that, very often, the world's poorest countries with high levels of external debt, are also those with the poorest performance on human development indicators (Kraay and Nehru, 2006). In fact, the successful articulation of debt relief programs to achieve a broader set of human development goals is not only contingent on the continued efforts of sound economic policies but also on the implementation of long-lasting poverty reduction strategies. This justifies the need for a debt relief approach that concentrates more intensely on human welfare.

As a measure of human welfare, GDP has two remarkable caveats. First, it does not incorporate changes in some factors that income can and cannot buy (Alkire and Foster, 2010). Second, it fails to account for the distribution of income across society. While the HDI accommodates the first of these limitations by including two additional dimensions, long and healthy life and access to education, it still ignores the distribution of achievements across the population in its three dimensions – i.e., income, longevity, and knowledge. To this end, the IHDI discounts the average value of each dimension according to their level of inequality. It also prioritises capability enhancing services and

encourages a focus on the poor and poorest (Hulme, 2010). Indeed, the development financing chain of the proponents of debt relief initiatives is in line with increases in poverty reduction expenditures. Therefore, to understand whether beneficiary countries are meeting internationally agreed poverty reduction goals, it becomes imperative to explore the nexus between debt relief and IHDI as a proxy of human welfare.

Within the human welfare framework, it is important to highlight the concepts of poverty and inequality for a notable reason. Poverty relates to failure in enhancing basic capabilities whilst inequality portrays differences in individuals' capabilities that allow them to be or do what they find important in their lives (Kovacevic, 2010). Thus, the accomplishment of basic capabilities represents the ends and means of development (Gasper, 2002). This is particularly relevant for debt relief beneficiary countries to reduce poverty and inequality in all its dimensions and forms as postulated by the Sustainable Development Goals (SDGs).

With better recognition of the different dimensions of poverty reduction and inequality, debt relief policies can be more successful in identifying and improving basic human development needs. As such, to assess government efforts of beneficiary countries in reducing poverty and inequality, it is deemed relevant to select appropriate outcome variables in line with the donors lending operations and debt relief mechanisms. Hence, the link between debt relief and human welfare is a useful exercise to evaluate whether the donors' funds are not just being spent to secure a favourable economic reputation but also to prioritise social spending that will benefit the poor.

2.3 Data and methodology

2.3.1 Data

We examine the link between debt relief and human welfare in an unbalanced panel dataset of 80 developing countries[6] from 1990 to 2016.[7] Although we use several sources to construct the data set, the main variables of interest are gathered from the United Nations Development Program (UNDP), World Development Indicators (WDI), International Debt Statistics (IDS) and Government Finance Statistics (GFS). As explained earlier, our dependent variable is the Inequality Adjusted Human Development Index (IHDI) as a proxy of human welfare collected from the UNDP. Since this indicator was first published

[6]See table B.1 for list of countries.

[7]At the time of data collection, due to the need to obtain consistent and reasonable information on relevant variables (e.g., debt relief, inequality adjusted human development index and share of health and education) for some HIPC and non-HIPC countries, it was preferable to use the time-span of data from 1990 to 2016 only.

by the UNDP in 1990,[8] economic growth was no longer the only focus of development orientation. The IHDI represents a composite indicator of human welfare adjusted to inequality - i.e., it covers three dimensions: income, attainment in education and life expectancy - as it is used to rank countries by level of human development (Asongu and Nwachukwu, 2018; UNDP, 2018). Therefore, this measure seeks to provide a larger scale of characteristics of "development" than is viable by focusing on national income by itself (Ravallion, 2010). As such, we expect human welfare to be positively correlated with debt relief grants. Thus, we posit:

H_1: Debt relief improves human welfare in Heavily Indebted Poor Countries.

We rely on two alternative measures of debt relief. More specifically: i) debt relief as a share of GDP and ii) debt relief as a share of exports. The data is built on debt forgiven or reduction including interest and principal arrears forgiven which captures the nominal value of debt forgiven, and debt rescheduled. The data was taken from the World Bank's World Development Indicators database. It is well known that concessional loans represent a significant amount of external debt of developing countries (World Bank, 2017*b*). In this sense, we prefer to use the present value of debt relief rather than the nominal value to reflect the degree of concessionality of loans. The same approach has been used by previous studies (Depetris Chauvin and Kraay, 2005; Johansson, 2010)[9] as it allows us to more accurately compute the change in the debt stock from debt relief. Similarly, and to control for the debt overhang theory, we also rely on two measures of external debt stock including external debt stock: i) as a share of GDP and ii) as a share of exports. In an attempt to more accurately measure the expected burden of future debt service payments and to reflect the degree of concessionality of loans we calculate their present values. Following Dikhanov (2004) and IMF (2013), we compute the present value of external debt by discounting the stream of debt service, converted into US dollars, using a uniform discount rate.[10] This data is gathered from the World

[8]The conceptual underpinnings of Human Development Index are based on Amartya Sen's idea of functionings and capabilities (see Sen (1985)). Several alterations to its formulation have been carried out since its introduction in 1990. For example, real GDP per capita (living standard), life expectancy at birth (longevity), and a mixture of gross enrolment rate (education) and literacy rate (education) were the four variables used to construct HDI prior 2010. We discuss the new changes in more details in section 2.4. We also refer interested readers to UNDP (2018) for details on the technical notes.

[9]We assume that the concessionality rate of the debt forgiven or rescheduled equals the concessionality rate of the debt stock in the country. For more details see Depetris Chauvin and Kraay (2005).

[10]In 2013, under the debt sustainability framework (DSF) in low-income countries the World Bank and IMF unified the discount rate at 5 percent for calculations of the present value of external loans and grant elements (IMF, 2013). The previous discount rates were linked to the OECD's Commercial Interest Reference Rates as the methodology used to calculate and update the discount rates changed significantly and the system is complex and operationally difficult. As a result, following the persistent and historical low interest rates in advanced countries, reflecting the listless economic activity, these previous discount rates have become no longer a good measure for discounting cash flows over the long run. For more details please see IMF (2013).

Development Indicators and since it is on paid basis, we adjust by the accumulation of arrears (principal and interest) so that service could be estimated on due basis.

We use a set of standard control variables which includes population growth, inflation, aid (excluding debt relief) received as a percentage of GDP, the share of health and education, corruption and institutional quality. Following the neoclassical (Solow, 1956; Swan, 1956) and the new growth (Romer, 1986; Lucas, 1988; Barro, 1991) theories, it is well documented that population growth represents an important proxy for the growth rates of factors of inputs (human capital and labor) in the production process and therefore it is expected to influence positively our dependent variable. Nevertheless, high population growth may also have an adverse impact on growth and development via its effects on the quality of human capital and the dependency ratio (Barro, 1997; Petrakos et al., 2007).

The share of health and education is defined here as the government expenditure on health and education as a percentage of the total government expenditure. In fact, investment in these two social areas is frequently observed as having significant positive development effects (Gupta et al., 1998) and countries benefiting from the HIPC program, for example, are also expected to increment spending in these sectors. Since beneficiary countries of debt relief are expected to establish a track record of good macroeconomic performance and sound policies, we use inflation, corruption and institutional quality to control for these factors.[11] First, our inflation measure is based on the annual change in the consumer price index (CPI) and high rates of inflation suggest macroeconomic instability and an inefficient monetary policy (Primo Braga and Dömeland, 2009). Second, as a proxy of corruption, we use the corruption perception index provided by the Transparency International. This indicator ranks countries by their perceived levels of corruption in the public sector according to businesspeople and experts' views. It ranges from 0 (highly corrupted) to 100 (very clean). Lastly, our study controls for the role of institutions. The average of two proxies of institutional quality, political rights and civil liberties index, which were collected from Freedom House is employed. In the original indicators, lower values are associated with 'better' performance and higher values are associated with 'worse' performance. However, we inverted the scale so that 1 indicates the lowest level of institutional quality and 7 indicates the highest level. To avoid outliers driving our results, we 'winsorize' all continuous variables at the 1^{st} and 99^{th} percentiles.

[11] A different set of control variables is also used as a robustness exercise.

Table 2.1: Descriptive statistics and correlation

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Panel A: Descriptive statistics												
Mean	0.48	21.12	142.45	72.80	317.26	11.30	2.12	28.57	7.41	46.22	29.27	3.63
Std. Dev.	0.13	52.79	383.09	108.32	520.34	2.65	1.09	16.70	10.38	569.73	9.73	1.56
Min.	0.20	0.00	0.00	0.00	0.00	5.44	-6.18	0.00	–0.23	–72.729	4.00	1.00
Max	0.80	847.67	4941.54	1846.55	9254.62	18.27	7.92	97.26	105.32	23773.13	65.00	7.00
Obs.	1977	2148	2133	2151	2139	2082	2155	1447	2138	2096	1256	2160
Panel B: Correlations												
I. Human welfare (IHDI)	1.00											
II. PV of debt relief/GDP	–0.16***	1.00										
	(0.000)											
III. PV of debt relief/Exports	–0.19***	0.88***	1.00									
	(0.000)	(0.000)										
IV. External debt stock/GDP	–0.00	0.77***	0.66***	1.00								
	(0.99)	(0.000)	(0.000)									
V. External debt stock/Exports	–0.16***	0.50***	0.63***	0.56***	1.00							
	(0.000)	(0.000)	(0.000)	(0.000)								
VI. Log (GDP per capita)	0.06*	–0.10***	–0.11***	–0.10***	–0.14***	1.00						
	(0.051)	(0.000)	(0.000)	(0.000)	(0.000)							
VII. Population growth	–0.59***	0.23***	0.24***	0.00	0.13***	–0.03	1.00					
	(0.000)	(0.000)	(0.000)	(0.966)	(0.000)	(0.279)						
VIII. Share of health and education	–0.46***	0.09***	0.12***	0.01	0.12***	–0.04	0.26***	1.00				
	(0.000)	(0.000)	(0.000)	(0.659)	(0.000)	(0.208)	(0.000)					
IX. Aid/GDP	–0.45***	0.47***	0.46***	0.331***	0.31***	–0.15***	0.35***	0.45***	1.00			
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)				
X. Inflation	0.01	0.03	0.05*	0.084***	0.081***	–0.10***	0.07**	–0.06*	0.01	1.00		
	(0.67)	(0.292)	(0.090)	(0.006)	(0.008)	(0.000)	(0.021)	(0.06)	(0.701)			
XI. Corruption	0.21***	–0.16***	–0.14***	–0.03	–0.14***	–0.01	–0.28***	0.05	–0.11***	–0.162***	1.00	
	(0.000)	(0.000)	(0.000)	(0.963)	(0.000)	(0.699)	(0.000)	(0.126)	(0.000)	(0.000)		
XII. Institutional quality	0.19***	0.01	–0.00	0.11***	–0.05	–0.03	–0.21***	0.11***	–0.01	–0.105***	0.483***	1.00
	(0.000)	(0.80)	(0.963)	(0.000)	(0.137)	(0.302)	(0.000)	(0.000)	(0.618)	(0.000)	(0.000)	

Notes: This table illustrates the summary statistics (panel A) and correlations (panel B) for the variables used in this study. We provide the definition of the variables in Appendix B, Table B.2. *, **, ***: significance levels of 10%, 5% and 1% respectively. The numbers in parentheses are p-values. Data source: World Bank and UNDP, 1990-2016.

Table 2.1 summarizes descriptive statistics and the correlation matrix in panel A and B, respectively. As such, the correlation matrix in panel B exhibits preliminary results which may help us to avoid potential issues of multicollinearity[12] as well as provide some insights on expected signs of the variables. As the table shows, IHDI is, in general, significantly correlated with most of the baseline variables except inflation. Surprisingly, the debt relief indicators are negatively correlated with the outcome variable and thus implying that debt relief might be associated with lower levels of human welfare. Moreover, debt relief is positively associated with aid which means that countries obtaining more aid also obtain more debt relief. As expected, the debt burden variables exhibit a negative and significant relationship with human welfare.

2.3.2 Baseline specification

To explore the effect of debt relief on human welfare for the 1990–2016 period, we begin our specification with an empirical model that can nest much of the existing work on economic growth and development:

$$Y_{it} = \varphi_0 + \varphi_1 Y_{it-1} + \delta_1 DR_{it} + \delta_2 D_{it} + \varphi_2 X_{it} + n_i + \zeta_t + \varepsilon_{it} \tag{2.1}$$

Where Y_{it} denotes our dependent variable, Inequality Adjusted Human Development Index (IHDI); Y_{it-1} is the lagged dependent variable; DR_{it} and D_{it} represent the debt relief and the debt burden indicators, respectively, where the former is the main variable of interest; X_{it} is a vector of control variables as discussed in the previous section; n_i denotes the country specific-effect; ζ_t captures time-specific effect; and ε_{it} is a random noise error term.

Following the debt overhang theory, we believe that the effect of debt relief on growth and development depends on the level of the debt burden. Therefore, we are interested in testing whether the marginal effects of debt relief and debt burden, δ_1 and δ_2, are statistically significant. We augment equation 2.1 with an interaction term between debt relief and debt burden indicator to allow the effect of debt relief to vary with the level of indebtedness as follows:

$$Y_{it} = \varphi_0 + \varphi_1 Y_{it-1} + \delta_1 DR_{it} + \delta_2 D_{it} + \gamma_1 (DR_{it} * D_{it}) + \varphi_2 X_{it} + n_i + \zeta_t + \varepsilon_{it} \tag{2.2.1}$$

A simple way to understand how economic growth and development react to debt

[12]We also present the Variance Inflation Factors (VIFs) in appendix B.4 to further detect multicollinearity. As expected, the calculated values of VIF for all variables are less than 5 and, therefore, there is no sign of serious multicollinearity issues.

relief in countries with different level of indebtedness is to compute the marginal effect from equation (2):

$$\frac{\partial Y_{it}}{\partial DR_{it}} = \delta_1 + \gamma_1 D_{it} \tag{2.2.2}$$

Hence, the signs of the coefficient of DR_{it} and the interaction term, could be interpreted as follows: if $\delta_1 < 0$ and $\gamma_1 > 0$ this would suggest that the positive effect of debt relief is increasing with reductions in the level of the debt burden. Alternatively, if $\delta_1 < 0$ and $\gamma_1 < 0$ this would suggest that the positive impact of debt relief is decreasing with reductions in the level of debt burden.

One of the main downsides of cross-country panel estimation is related to the fact that it does not take into account the potential heterogeneity across countries in the relationship between the dependent and the right-hand side variables. The literature on debt-growth nexus has suggested that this relationship varies across countries (Imbs and Ranciere, 2005; Bayraktar and Fofack, 2011; Djimeu, 2018) and we also expect that in our study it is unlikely to be different. In order to examine if, controlling for other factors, the effects of debt relief on human welfare differs in HIPC and non-HIPC countries, we extend equation 2.1 with an HIPC dummy variable[13] which takes the value of one when it is a heavily indebted poor country and zero otherwise:

$$\begin{aligned} Y_{it} = \varphi_0 + \varphi_1 Y_{it-1} + \varphi_2 DR_{it} * HIPC + \varphi_3 DR_{it} * (1 - HIPC) + \\ \varphi_4 D_{it} + \varphi_5 X_{it} + n_i + \zeta_t + \varepsilon_{it} \end{aligned} \tag{2.3}$$

Where φ_2 is the coefficient that measures the effect of debt relief on Y_{it} as we expect this effect to be stronger and more significant in HIPC countries rather than non-HIPC ($|\varphi_2| > |\varphi_3|$). Moreover, we argue that the vulnerability to external shocks in many developing countries may also be crucial in determining the relationship between these two variables as the literature also corroborates this argument (see Çelik and Kóczán (2016), Melina et al. (2016), IMF (2017)). For instance, although the interest earned from a resource fund is normally lower than the interest cost of borrowing, some developing countries might borrow from overseas while saving resource revenues at the same time (Melina et al., 2016). Therefore, equation 2.3 is further augmented with interactive terms related to dummy natural resource (NR) dependency which is equal to one when the commodity exports of the country represent at least 80 percent of merchandise exports[14]

[13] Rather than estimating regressions for different sub-samples – e.g., HIPC and non-HIPC – we interact the debt relief variable with dummy variables in all our specifications as this will indicate different group of countries and time periods. This approach will help us to gain degrees of freedom, avoid problems of endogenous sample selection and most important, take into account that countries can transit between groups. See Thomas (2006) and Fernandes et al. (2019) for a similar approach.

[14] This is based on the United Nations Conference on Trade and Development annual report (UNCTD,

and zero otherwise:

$$Y_{it} = \varphi_0 + \varphi_1 Y_{it-1} + \varphi_2 DR_{it} * HIPC \times NR + \varphi_3 DR_{it} * (1 - HIPC) \times NR + \varphi_4 DR_{it} * HIPC \times (1 - NR) + \varphi_5 DR_{it} * (1 - HIPC) \times (1 - NR) + \varphi_6 D_{it} + \varphi_7 X_{it} + n_i + \zeta_t + \varepsilon_{it} \quad (2.4)$$

Where we expect the coefficients in natural resource dependent HIPC and non-HIPC countries to be weaker and less significant than non-natural resource dependent HIPC and non-HIPC countries ($|\varphi_2|\,;|\varphi_3| < |\varphi_4|\,;|\varphi_5|$). Finally, in line with the empirical evidence (Easterly, 2002; Cordella and Ricci, 2010) we argue that the quality of institutions affects the interconnection between debt relief and the outcome variable. In this setting, we capture this differential impact of institutional quality by interacting each of the dummy variables above identified with the indicators of institutional quality.

$$Y_{it} = \varphi_0 + \varphi_1 Y_{it-1} + [\varphi_2 DR_{it} * HIPC \times NR + \varphi_3 DR_{it} * (1 - HIPC) \times NR + \varphi_4 DR_{it} * HIPC \times (1 - NR) + \varphi_5 DR_{it} * (1 - HIPC) \times (1 - NR) * Institutional\ quality + \varphi_6 D_{it} + \varphi_7 X_{it} + n_i + \zeta_t + \varepsilon_{it} \quad (2.5)$$

In which the impact of debt relief on human welfare is expected to be positive and more enhanced in HIPC countries after we control for institutional quality.

2.3.3 Estimation methodology

Since the lagged dependent variable in equation 2.1 is, by construction, correlated with the error term, much of the empirical growth and development literature based on estimations of similar equations using a cross-sectional approach is biased and inconsistent. This is because of the potential endogeneity of the variables. In the present context, the traditional panel data techniques including fixed or random effects are not consistent because of bias created by the lagged dependent variable and the inconsistency of the within transformation (Nickell, 1981).

In an attempt to remedy the endogeneity problem, the economic literature has proposed the generalized method of moments (GMM) estimators pioneered by Arellano and Bond (1991) and further developed by Arellano and Bover (1995) and Blundell and Bond (1998). This approach corrects for the potential source of endogeneity, n_i, by taking the first difference to remove unobserved time-invariant country-specific effects and then using 'internal' instruments for the explanatory variables (Roodman, 2009*b*). By differencing

2016). See table B.1 for list of countries.

both sides of equation 2.1 we can obtain the following:

$$\Delta Y_{it} = \varphi_1 \Delta Y_{it-1} + \varphi_2 \Delta DR_{it} + \varphi_3 \Delta D_{it} + \Delta X_{it} + \Delta \zeta_t + \Delta \varepsilon_{it} \tag{2.6}$$

Indeed, after taking first differences, the lags of the dependent variable on the right hand side of equation 2.1 may still be correlated with the lags of the error term so that $cov\left(\Delta Y_{it-1}, \Delta \varepsilon_{it}\right) \neq 0$ and the endogeneity in the explanatory variables still remains. Nevertheless, Arellano and Bond (1991) posited that we can use lagged values as instruments if we assume the explanatory variables to be weakly exogenous (i.e., they have no correlation with future realizations of the residuals) and the transient residuals to be not serially correlated so that $cov\left(\varepsilon_{it}, \varepsilon_{it-p}\right) = 0$ for all $p \geq t$. In this setting, the differenced GMM would be defined by the following moment conditions:

$$\begin{gathered} \mathrm{E}[Y_{i,t-p}\left(\varepsilon_{it} - \varepsilon_{it-1}\right)] = 0, \\ \mathrm{E}[X_{i,t-p}\left(\varepsilon_{it} - \varepsilon_{it-1}\right)] = 0, \text{ for } p \geq 2;\ t = 3, \ldots T \end{gathered}$$

Therefore, 'deeper' internal instruments from period $t-2$ or earlier can be used as instruments. Notwithstanding, Arellano and Bover (1995) and Blundell and Bond (1998) advocated that in the event of persistent explanatory variables, lagged levels of these variables could be weak instruments for the regression equation especially in short panels which can result in downward biased estimates. As a result, we follow Aghion et al. (2009) and De V. Cavalcanti et al. (2015), *inter alia*, in employing an estimator that jointly combines in a system the regression in differences (equation 2.6) with the regression in levels (equation 2.1) to mitigate the potential biases associated with the difference estimator. Under the assumption that there is no serial correlation between the differences of the variables and the country-specific effects, these are the appropriate instruments as the system reveals to have superior finite sample properties (Arellano and Bover, 1995; Blundell and Bond, 1998). Thus, the additional moment conditions for the regression in levels (second part of the system) is given by:

$$\begin{gathered} \mathrm{E}[(Y_{i,t-p} - Y_{i,t-p-1}) \times (n_i + \varepsilon_{it})] = 0, \\ \mathrm{E}[(X_{i,t-p} - X_{i,t-p-1}) \times (n_i + \varepsilon_{it})] = 0, \text{ for } p = 1;\ t = 3, \ldots T \end{gathered}$$

As noted by Roodman (2009*b*) there exists a proliferation problem in the system GMM. This problem arises from the fact that a large number of instruments used in the estimation of finite samples can have serious consequences because they overfit the endogenous variables as the asymptotic results and related test of the estimators may be misleading. To deal with this, we employ two suggestions put forward by Calderon et al. (2002) and Roodman (2009*a*): firstly, rather than using all lags, we use certain lags

of instruments; secondly, we collapse the instrumental variables matrix and restrict the instrument set to the nearest potential lags of non-strictly exogenous variables.

To evaluate whether our GMM model is correctly specified and our instruments are legitimate, we consider two specifications tests suggested by Arellano and Bond (1991); Arellano and Bover (1995) and Blundell and Bond (1998). First, we compute the Hansen test of over-identifying restrictions to test for the overall validity of the instruments. Second, we inspect the hypothesis that the error term is not serially correlated. Lastly, as suggested by Windmeijer (2005) we compute robust two-step standard errors to correct for small sample biases.

2.4 Empirical evidence

2.4.1 Baseline results

We begin our analysis by estimating a preliminary model without interaction terms as illustrated in equation 2.1. The goal of this model is to assess the impact of debt relief on human welfare measured by the Inequality Adjusted Human Development Index (IHDI). As explained in the previous sections, the model includes a set of macroeconomic control variables along with two alternatively estimated variables of interest including debt relief as a share of GDP and Exports (see columns (1) and (2)). Thereafter, in columns (3) and (4), we augment the initial model with interactions between debt relief and dummy variables representing HIPC and non-HIPC countries as specified in equation 2.3. Table 2.2 presents the results of the regression in successive columns.

The empirical estimates as illustrated in columns (1) and (2) show that debt relief is not statistically significant in improving human welfare when we consider either measure of debt relief (i.e., debt relief as a percentage of GDP or exports). The same situation is observed when we turn to the extended model where the effect of debt relief is contingent on the HIPC status as illustrated in columns (3) and (4). As such, there is no evidence to confirm any significant effect of debt relief on either HIPC countries or non-HIPC states. Moreover, in columns (5) and (6) we interact the debt relief variable with both the natural resource and non-natural resource dummy variables. The significance of the results remains unchanged and show that the effect of debt relief on human welfare is not driven by natural resource conditions. This reinforces the idea of previous findings that debt relief is not significantly associated with improvements in growth and development.

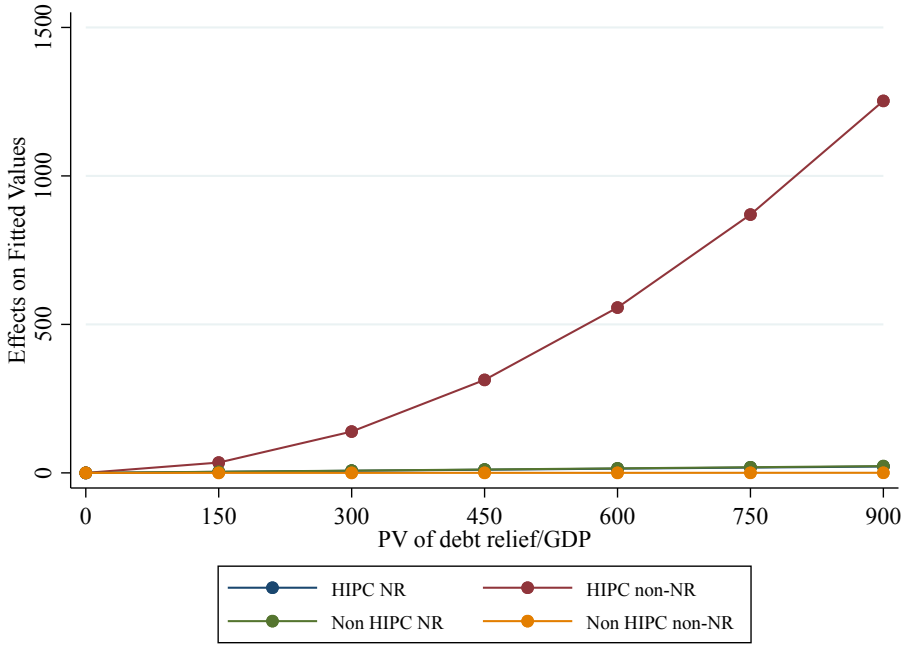
The coefficients on external debt variables carry the expected negative, albeit insignificant, signs in most specifications and therefore confirm the adverse influence of these variables for human welfare. In general terms, all control variables are in accordance

with our prior expectations. More specifically, population growth and share of health and education are negatively and significantly associated with human welfare while there is not enough evidence to support the idea that inflation, GDP per capita and aid exhibit the same significant relationship. Contrary to prior expectations, institutional quality carries a negative and insignificant sign on human welfare whereas corruption exerts a positive and significant influence in some specifications. Lastly, the diagnostic tests legitimate the reliability of the results as they do not show, in general, problems with the specification of the model and instruments choice. In particular, the Arellano-Bond test for autocorrelation and the Hansen J test for over-identifying restrictions illustrated at the bottom of the table support the validity of the model.

However, in line with the aims discussed in the previous sections, the major aim of our study is to compute the effect of debt relief in a more refined group of countries. Along with the reasons previously explained, the debt-growth literature also corroborates on the view that this relationship varies across countries (Imbs and Ranciere, 2005; Bayraktar and Fofack, 2011; Djimeu, 2018). Therefore, consistent with equation 2.4 we take this opportunity to test our main prediction by exploring the differential impacts of debt relief on human welfare in four different group of countries: (i) Natural resource dependent–HIPCs; (ii) Natural resource dependent–non HIPCs, (iii) Non–natural resource–HIPCs; and (iv) Non–natural resource–non HIPCs.

Accordingly, table 2.3 is set out to investigate whether the natural resource dependency and HIPC conditions are important dimensions in determining the relationship between debt relief and human welfare measured by the Inequality Adjusted Human Development Index. In doing so, we document a significantly different response of debt relief on human welfare in non-natural resource dependent HIPC countries $[HIPC \times (1 - NR)]$ when compared to their natural resource dependent $(HIPC \times NR)$ counterparts (columns (1) and (2)). In other terms, this finding suggests that debt relief is significantly associated with improvements in human welfare only in heavily indebted poor countries which are not dependent on natural resource exports. Furthermore, we do not seem to find any evidence of a significant relationship between debt relief and human welfare in either rich $[(1 - HIPC \times NR)]$ or poor $[(1 - HIPC \times (1 - NR)]$ natural resource non-HIPC countries. Figure 2.1 confirms these findings by displaying the average marginal impacts of debt relief as a share of GDP on human welfare. As the figure reveals, out of the four groups of countries, increments of debt relief (% of GDP) are positively increasing human welfare only in HIPCs non-natural resource dependents.

Figure 2.1: Average marginal effects of debt relief (% of GDP) on Human Welfare



Data source: Author's computation with data from the World Bank and UNDP

In an attempt to investigate whether the effect of debt relief on development is contingent on the level of indebtedness, we interact the debt relief indicators with our debt burden ratios. Besides, we also use an interaction term between debt relief and institutional quality with the aim of seeing the extent to which the quality of institutions may affect the interconnection between debt relief and human welfare. The results are summarized in columns (3)–(6) of table 2.3. With the interaction term between debt relief and the level of indebtedness, we can observe that the positive and significant effect of debt relief on human welfare is increasing with reductions in the level of debt burden in natural resource poor HIPC countries. This positive effect is robust and consistent in both measures of debt relief (columns (3) and (4)). A visual representation of this finding is provided in figure 2.2, which illustrates the average marginal effects of debt relief on human welfare in our four groups of countries. It is observed that the marginal positive effect of debt relief is increasing with reductions (by 25 percentage points) in the level of indebtedness whenever the 95% confidence interval does not include zero. This fact would confirm the hypothesis that debt ratio acts as a debt relief buffer in non-natural resource dependent HIPC countries, which therefore gives support to the debt overhang theory.

This result is not only statistically but also economically meaningful. More specifically, in non-commodity dependent HIPC countries where the average external debt to GDP ratio is 129.43 percent, a one percentage point reduction in the level of indebtedness would, therefore, increase the effect of debt relief on human welfare by about 0.39

Table 2.2: Debt relief and human welfare – SGMM: Preliminary results

Dependent variable	Inequality Adjusted Human Development Index (IHDI)					
	(I)	(II)	(III)	(IV)	(V)	(VI)
Constant	0.0748***	0.0659***	0.1001***	0.0764***	0.0913**	0.0728**
	(0.027)	(0.020)	(0.0343)	(0.029)	(0.037)	(0.029)
PV of debt relief/GDP	–0.00001					
	(0.000)					
PV of debt relief/Exports		–0.00001				
		(0.000)				
PV of debt relief/GDP*HIPC			–0.0026			
			(0.005)			
PV of debt relief/Exports*HIPC				0.0001		
				(0.000)		
PV of debt relief/GDP*(1–HIPC)			0.0001			
			(0.000)			
PV of debt relief/Exports*(1–HIPC)				0.0001		
				(0.000)		
PV of debt relief/GDP*NR					0.0001	
					(0.000)	
PV of debt relief/Exports*NR						0.0001
						(0.000)
PV of debt relief/GDP*(1–NR)					0.000	
					(0.000)	
PV of debt relief/Exports*(1–NR)						0.0001
						(0.000)
External Debt/GDP	–0.00001		0.0001		0.0001	
	(0.000)		(0.000)		(0.000)	
External Debt/Exports		–0.00001		0.0001		0.0001
		(0.000)		0.000		0.000
IHDI(-1)	0.902***	0.914***	0.905***	0.903***	0.911***	0.904***
	(0.037)	(0.032)	(0.037)	(0.032)	(0.037)	(0.032)
Log (GDP per capita)	0.0001	0.0001	–0.0001	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Share of health and education	–0.0002**	–0.0002**	–0.0004*	–0.0002*	–0.0003*	–0.0003*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Population growth	–0.00677**	–0.00566**	–0.0068**	–0.0065**	–0.0067**	–0.0061**
	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Inflation	–0.0000	–0.0000	–0.0002	0.000	–0.0002	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Aid/GDP	–0.0002	–0.0001	0.000	–0.0002	0.000	–0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Corruption	0.0001*	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Institutional quality	–0.0007	–0.0004	–0.001	–0.0007	–0.0012	–0.0004
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	1,256	1,174	1,107	1,174	1,107	1,174
Countries	80	80	80	80	80	80
Instruments	74	74	74	77	74	77
Hansen J test (p-value)	0.155	0.105	0.196	0.130	0.405	0.238
AR (1) test	0.000	0.000	0.000	0.000	0.000	0.000
AR (2) test	0.384	0.347	0.402	0.130	0.415	0.364

Notes: All specifications are estimated using two-step System GMM estimator with Windmeijer finite sample correction. AR (1) and AR (2) are Arellano-Bond's 1st and 2nd autocorrelation tests. The Hansen J-statistic reports the p-values for the null of instrument validity. Time fixed effects included but not reported. HIPC = Heavily Indebted Poor Country. NR = Natural Resource. *, **, ***: significance levels of 10%, 5% and 1% respectively. Robust standard errors are in parentheses. Data source: World Bank and UNDP, 1990-2016.

percentage points.[15] This finding does not corroborate with Johansson (2010) who finds no evidence of the marginal effect of debt relief increasing with downward changes in the level of indebtedness. Different to our study, she does not discriminate the marginal impact of debt relief in these two categories of HIPC countries: (I) natural resource and (II) non-natural resource dependent states.

Similarly, when we control for the role of institutions, one can note that the impact of debt relief on human welfare remains statistically significant for non-natural resource dependent HIPC countries (columns (5) and (6)). This is a novel finding which reveals that the institutional reforms attached to the HIPC program have been more effective in improving the relationship between debt relief and development in natural resource poor HIPC countries. This fact brings additional support to the debt overhang hypothesis. Yet, one other explanation could be given by the better macroeconomic performance of this group of countries when compared to their natural resource HIPC counterparts.[16]

Moreover, institutional quality does not seem to play a key role in determining the relationship between debt relief and development in the remaining group of countries (i.e., non-HIPC states). This finding partially corroborates with Depetris Chauvin and Kraay (2005) and Presbitero (2009) who found no evidence of the quality of institutions in improving the benefits of debt relief in developing countries. In figure 2.3 we exhibit the marginal effects based on the estimates of columns (5) and (6). The marginal impacts show that the relationship between debt relief (% of GDP) and human welfare is moderated by the changes of institutional quality. For instance, unlike other groups of countries, the effect of debt relief on human welfare in non-natural resource dependent HIPCs becomes significantly positive when the value of institutional quality is above five.

[15] Following the marginal effect equation for HIPC non-natural resource, this is computed as $-0.00016 + (0.00003 * 129.43) * 100 = 0.39$

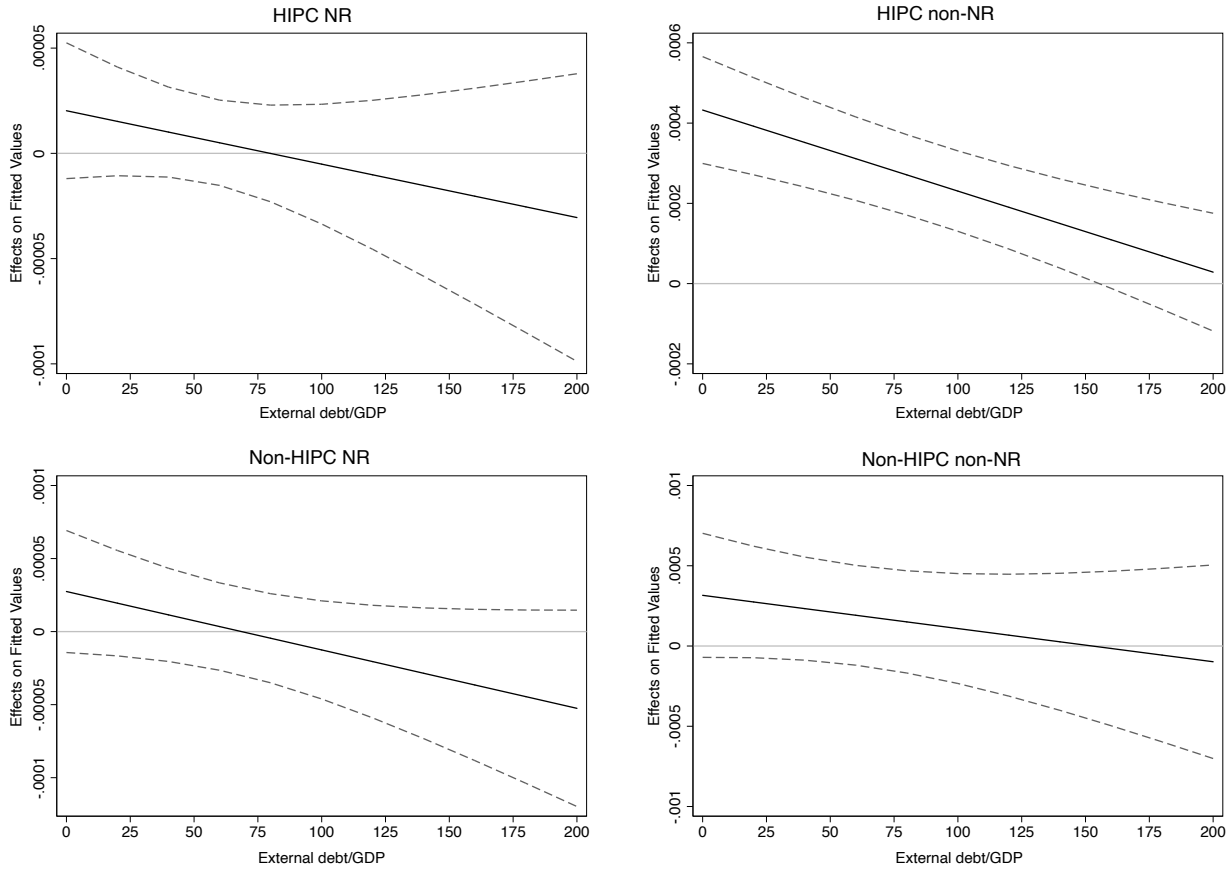
[16] For example, between 1990 and 2016 natural resource poor HIPC countries had, on average, lower inflation rates than the other group of HIPC countries. The former also had better institutional quality (see table B.3)

Table 2.3: Debt relief and human welfare – SGMM: Main results

Dependent variable	Inequality Adjusted Human Development Index (IHDI)					
	Debt relief as share of		Debt ratio*Debt relief as share of		Institutional quality*Debt relief as share of	
Debt relief indicator	GDP (I)	Exports (II)	GDP (III)	Exports (IV)	GDP (V)	Exports (VI)
Constant	0.1782***	0.158***	0.0327	0.0628***	0.0916***	0.0708***
	(0.0503)	(0.058)	(0.039)	(0.023)	(0.026)	(0.025)
PV of debt relief to GDP			–0.0002		–0.00005	
			(0.000)		(0.000)	
PV of debt relief to Exports				–0.00003		–0.00005*
				(0.000)		(0.000)
Debt relief indicator*HIPC×NR	0.0003	0.0001	0.00001	0.00001	0.00001	0.00001
	(0.0003)	(0.000)	(0.0000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*HIPC×(1–NR)	0.0008***	0.00004*	0.00003**	0.00001**	0.00001***	0.00001**
	(0.0003)	(0.000)	(0.0000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×NR	–0.0139	–0.0003	0.0000	0.000001	–0.00004	–0.0000
	(0.0167)	(0.001)	(0.0000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×(1–NR)	–0.0084	–0.00108	0.00001	–0.00000	–0.00002	–0.00001
	(0.0077)	(0.002)	(0.0000)	(0.000)	(0.000)	(0.000)
External Debt/GDP	–0.0004**		–0.0001	–0.00001	–0.0001	
	(0.000)		(0.625)	(0.000)	(0.000)	
External Debt/Exports		–0.00006		–0.00004		0.00001
		(0.000)		(0.000)		(0.000)
IHDI(–1)	0.795***	0.802***	0.978***	0.914***	0.885***	0.902***
	(0.043)	(0.068)	(0.046)	(0.037)	(0.033)	(0.037)
Observations	1,256	1,252	1,036	1,094	1,256	1,252
Countries	80	80	79	80	80	80
Instruments	69	69	70	68	78	77
Hansen J test (p-value)	0.353	0.582	0.534	0.350	0.209	0.192
AR (1) test	0.000	0.000	0.000	0.000	0.000	0.000
AR (2) test	0.370	0.395	0.375	0.372	0.415	0.394

Notes: All specifications are estimated using two-step System GMM estimator with Windmeijer finite sample correction. AR (1) and AR (2) are Arellano-Bond's 1st and 2nd autocorrelation tests. The Hansen J-statistic reports the p-values for the null of instrument validity. Time fixed effects and control variables included but not reported. HIPC = Heavily Indebted Poor Country. NR = Natural Resource. *, **, ***: significance levels of 10%, 5% and 1% respectively. Robust standard errors are in parentheses. Data source: World Bank and UNDP, 1990-2016.

Figure 2.2: Marginal effects of debt relief (% of GDP) on Human Welfare with 95% CIs (a)

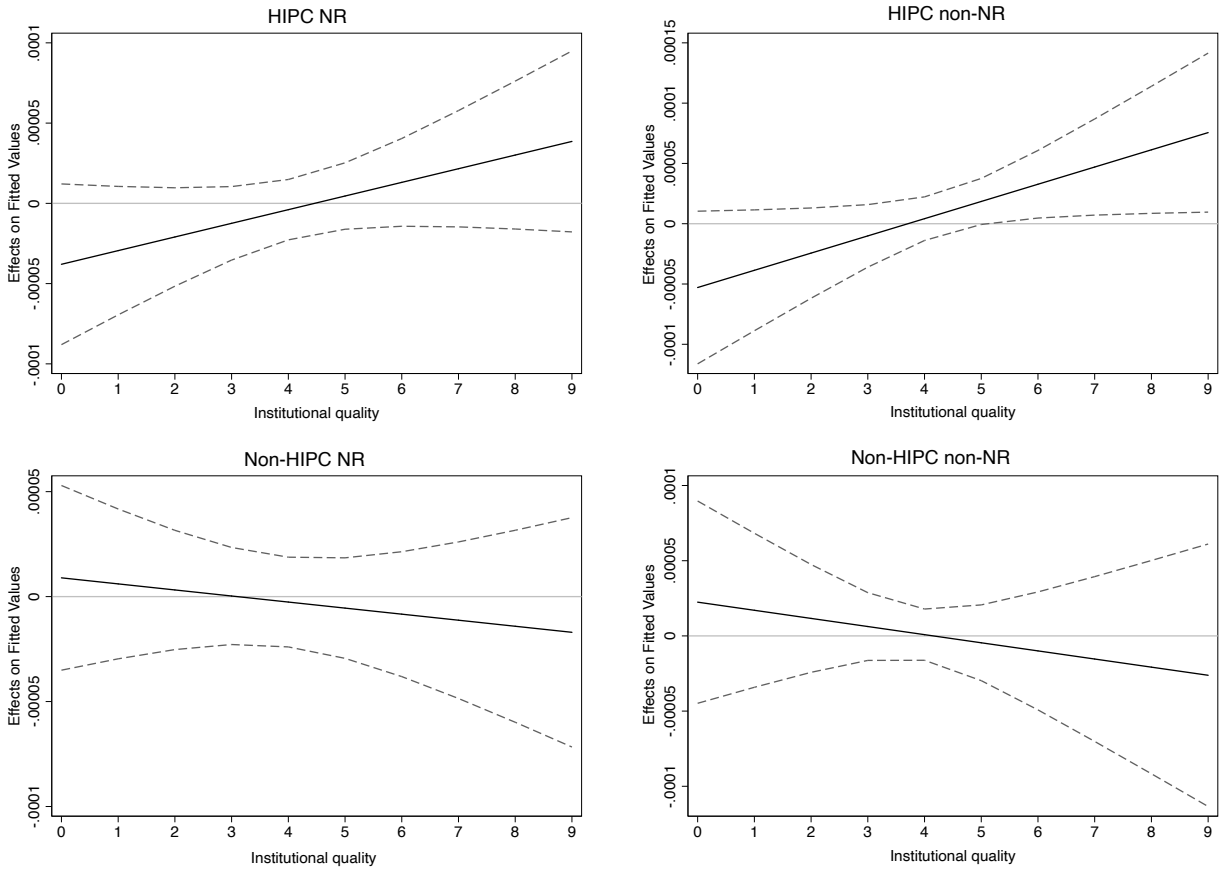


Data source: Author's computation with data from the World Bank and the UNDP

2.4.2 Transmission channels

In the previous section, we provided evidence that debt relief is conducive to human welfare in heavily indebted poor countries non-dependent on natural resource exports. Although this represents a fruitful answer for our baseline assumption, it still remains unclear which components of the Inequality Adjusted Human Development Index (IHDI) explain this association. Hence, in this section, we examine the transmission channels through which debt relief influences human welfare as we disaggregate the IHDI into its three sub-components. More specifically, we firstly begin by exploring how debt relief induces the inequality adjusted income index. This indicator is computed by using the per capita gross national income (GNI) in constant 2011 purchasing power parity (PPP) and then employing the following normalization procedure $III = \frac{ln(GNI\ per\ capita) - ln(100)}{ln(75{,}000) - ln(100)}$ in which \$100 and \$75,000 are the minimum and maximum goalposts for GNI, respectively. Secondly, we examine the impact of debt relief on the inequality adjusted education index. This indicator is given by the combination of two sub-indices – i.e., (I) expected years of

Figure 2.3: Marginal effects of debt relief (% of GDP) on Human Welfare with 95% CIs (b)



Data source: Author's computation with data from the World Bank and UNDP

schooling (EYS) for children of school entering age and (II) mean years of schooling (MYS) for adults aged 25 and older – in which 0 years is the minimum goalpost for both of them since societies can subsist without formal education. The maximum goalpost for the first and second sub-indices are 18 and 15 years, respectively.[17] Thus, the inequality adjusted education index yields from the arithmetic mean of the two sub-indices as follows: $IEI = \frac{EYS\ index\ +\ MYS\ index}{2}$. Lastly, we inspect the effect of debt relief on the inequality adjusted health index. The minimum and maximum goalposts of this indicator are set at 20 and 85 years, respectively, since it is measured by life expectancy at birth (LEB). The minimum goalpost is justified by the fact that historical empirical evidence demonstrated that in the 20$^{\text{th}}$ century every country in the world had at least a 20 years life expectancy (Maddison, 2010). On the other hand, the maximum goalpost of 85 years constitutes a realistic aspirational target for most countries during the last 3 decades.[18] As such, table

[17] 18 years of education corresponds to the achievement of a master's degree in most countries while 15 years is the projected maximum of this indicator for 2025 as designed by the United Nations Development Program (UNDP). Therefore, the normalization procedure for the first and second sub-indices would be given by $I = \frac{EYS\ -\ 0}{18\ -\ 0}$; $II = \frac{MYS\ -\ 0}{18\ -\ 0}$, respectively.

[18] Life expectancy in several economies such as Japan and Hong Kong has come close to 85 years owning to medical advances and constant improvements in living conditions.

Table 2.4: Dimensions of inequality adjusted human development index

Dimension	Indicator	Minimum	Maximum
Standard of living	Gross National Income (GNI) per capita (2011 PPP)	100	75,000
Education	Expected years of schooling (years)	0	18
	Mean years of schooling (years)	0	15
Health	Life expectancy (years)	20	85

Data source: UNDP.

2.4 summarizes the above three dimensions and the corresponding values of our measure of human welfare.

Table 2.5 depicts the estimated results on the effect of debt relief on inequality adjusted income index in our four refined groups of countries. As mentioned earlier, we consider two alternative measures of debt relief – i.e., debt relief as percentage of GDP and exports – which are presented in successive columns. As can be observed in columns (1) and (2), debt relief is significantly associated with improvements in income levels in both groups of HIPC countries – i.e., natural resource dependent and non-natural resource dependent – regardless of considering any of the two measures of debt relief. Even though this impact appears to be more pronounced in HIPC countries non-dependent on natural resources, we may infer that debt relief assistance also helps natural resource dependent HIPC states to increase their level of income. Interestingly, the debt relief indicator loses statistical significance when it interacts with the level of indebtedness in this latter group of countries (columns (3) and (4)) and therefore implies that reductions in the level of external debt do not necessarily improve the relationship between debt relief and income. This combination of findings provides some support for the conceptual premise that natural resource dependent HIPC countries do not suffer from debt overhang. In terms of economic significance, we would say that in natural resource rich and poor HIPC countries, a one percentage point reduction in external debt, as a share of exports, would therefore increase the effect of debt relief (as share of exports) on income level by about 0.09 and 0.52 percentage points, respectively.[19]

[19]Following the marginal effect equation for natural resource rich and poor HIPC countries, this is computed as $-0.000008 + (0.000002 * 448.21) * 100 = 0.09$ and $-0.000008 + (0.00001 * 519.72) * 100 = 0.52$, respectively.

Table 2.5: Debt relief and inequality on income

Dependent variable	Inequality on income Index					
	Debt relief as share of		Debt ratio*Debt relief as share of		Institutional quality*Debt relief as share of	
Debt relief indicator	GDP (I)	Exports (II)	GDP (III)	Exports (IV)	GDP (V)	Exports (VI)
Constant	0.0376*	0.0592**	0.0600**	0.0372	0.0583**	0.0711**
	(0.022)	(0.029)	(0.028)	(0.043)	(0.028)	(0.029)
PV of debt relief to GDP			0.0003*		–0.00043*	
			(0.000)		(0.000)	
PV of debt relief to Exports				–0.00008*		–0.00012***
				(0.000)		(0.000)
Debt relief indicator*HIPC×NR	0.00035*	0.00012**	0.00001	0.000002*	0.000001*	0.00001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*HIPC×(1–NR)	0.00038**	0.00013**	0.00001**	0.00001***	0.00002***	0.00001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×NR	0.0144	0.000852	0.0001	–0.000001	0.000	–0.000002
	(0.012)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×(1–NR)	0.0006	–0.00001	–0.000001	0.000001	–0.000001	0.00001
	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
External Debt/GDP	–0.00022**		–0.0005***		–0.00001	
	(0.000)		(0.000)		(0.000)	
External Debt/Exports		–0.00012***		–0.00001		0.00001
		(0.000)		(0.000)		(0.000)
Inequality on income Index (-1)	0.963***	0.957***	0.959***	0.967***	0.915***	0.898***
	(0.031)	(0.034)	(0.033)	(0.063)	(0.042)	(0.044)
Observations	1,261	1,259	1,173	1,259	1,261	1,259
Countries	80	80	80	80	80	80
Instruments	71	69	75	65	63	69
Hansen J test (p–value)	0.641	0.222	0.450	0.230	0.615	0.169
AR (1) test	0.000	0.000	0.000	0.000	0.000	0.000
AR (2) test	0.443	0.516	0.492	0.476	0.578	0.602

Notes: All specifications are estimated using two-step System GMM estimator with Windmeijer finite sample correction. AR (1) and AR (2) are Arellano-Bond's 1st and 2nd autocorrelation tests. The Hansen J-statistic reports the p-values for the null of instrument validity. Time fixed effects and control variables included but not reported. HIPC = Heavily Indebted Poor Country. NR = Natural Resource. *, **, ***: significance levels of 10%, 5% and 1% respectively. Robust standard errors are in parentheses. Data source: World Bank and UNDP, 1990-2016.

By contrast, as illustrated in columns (5) and (6) we can note that institutional quality plays an important role in determining the relationship between debt relief and national income in both groups of HIPC countries. Note that debt relief significantly influences national income level in all specifications (columns (1) – (6)) in HIPC countries non-dependent on natural resources. This result may help us to understand the importance of the inequality adjusted income index in contributing to the overall effect of debt relief on human welfare.

We now turn to the impact of debt relief on the inequality adjusted education index. As explained earlier, this indicator also represents one of the three dimensions of our measure of human welfare and its examination would shed some light on the channels through which debt relief improves the welfare of the poor in beneficiary countries. The results are displayed in table 2.6. Considering our variable of interest, we find that debt relief as a share of GDP is positive and significantly associated with improvements in the level of education in natural resource poor HIPC states (column (1)). This association is also robust to our alternative measure of debt relief – i.e., debt relief as a share of exports – as illustrated in column (2). Notably, when we control for debt overhang, the effect of debt relief on education is less pronounced but still statistically significant. An analogous situation is observed when our measures of debt relief interact with institutional quality. This result discloses that institutional quality plays a key role in explaining the relationship between debt relief and education in this group of countries.

On the other hand, we find no evidence to confirm that debt relief is significantly associated with the inequality adjusted education index in the remaining group of countries even when it interacts with external debt ratio and institutional quality. This finding may help us to explain why over the last section we only found a positive and significant effect of debt relief on human welfare in HIPC countries non-dependent on natural resources. First, this suggests that the total effect of debt relief on human welfare is transmitted by the favorable effect of the former on national income and education levels in this group of countries. Second, the unfavorable effect of debt relief on education in HIPC natural resource rich countries is not enough to significantly influence the overall effect of debt relief on human welfare, even though the former is positive and significantly associated with inequality adjusted income index.

Table 2.6: Debt relief and inequality on education

Dependent variable	Inequality on education Index					
	Debt relief as share of		Debt ratio*Debt relief as share of		Institutional quality*Debt relief as share of	
Debt relief indicator	GDP (I)	Exports (II)	GDP (III)	Exports (IV)	GDP (V)	Exports (VI)
Constant	0.414***	0.323***	0.0234*	0.0237*	0.246***	0.325***
	(0.098)	(0.089)	(0.013)	(0.013)	(0.089)	(0.094)
PV of debt relief to GDP			0.00018*		–0.00118	
			(0.000)		(0.001)	
PV of debt relief to Exports				0.00001		–0.000137
				(0.000)		(0.000)
Debt relief indicator*HIPC×NR	0.00094	0.00001	0.000001	0.00001	–0.00000	0.00001
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*HIPC×(1–NR)	0.00121**	0.000126**	0.000002*	0.000003*	0.000001**	0.0000001*
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×NR	0.0208	0.00146	0.00009	0.000001	–0.00048	0.00004
	(0.014)	(0.002)	(0.000)	(0.000)	(0.001)	(0.000)
Debt relief indicator*(1–HIPC)×(1–NR)	0.00844	0.00109	0.00001	–0.000001	–0.00004	–0.00000
	(0.007)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)
External Debt/GDP	–0.00052*		–0.0002***		0.000528	
	(0.000)		(0.000)		(0.000)	
External Debt/Exports		–0.00005		–0.00003**		0.00008
		(0.000)		(0.000)		(0.000)
Inequality on education Index (-1)	0.239***	0.198***	0.665***	0.868***	0.169***	0.212***
	(0.063)	(0.055)	(0.199)	(0.055)	(0.061)	(0.061)
Observations	1,237	1,216	1,220	1,073	1,220	1,233
Countries	80	80	80	80	80	80
Instruments	68	76	73	75	70	72
Hansen J test (p-value)	0.140	0.232	0.567	0.354	0.103	0.210
AR (1) test	0.007	0.017	0.126	0.001	0.042	0.052
AR (2) test	0.110	0.805	0.414	0.248	0.298	0.297

Notes: All specifications are estimated using two-step System GMM estimator with Windmeijer finite sample correction. AR (1) and AR (2) are Arellano-Bond's 1st and 2nd autocorrelation tests. The Hansen J-statistic reports the p-values for the null of instrument validity. Time fixed effects and control variables included but not reported. HIPC = Heavily Indebted Poor Country. NR = Natural Resource. *, **, ***: significance levels of 10%, 5% and 1% respectively. Robust standard errors are in parentheses. Data source: World Bank and UNDP, 1990-2016.

Table 2.7: Debt relief and inequality on health

Dependent variable	Debt relief and inequality on life expectancy					
	Debt relief as share of		Debt ratio*Debt relief as share of		Institutional quality*Debt relief as share of	
Debt relief indicator	GDP (I)	Exports (II)	GDP (III)	Exports (IV)	GDP (V)	Exports (VI)
Constant	0.0245	0.0446	0.0648*	0.0631**	0.0209	–0.0269
	(0.016)	(0.116)	(0.038)	(0.026)	(0.114)	(0.139)
PV of debt relief to GDP			0.000237		–0.00031	
			(0.000)		(0.001)	
PV of debt relief to Exports				0.00006*		–0.00027
				(0.000)		(0.000)
Debt relief indicator*HIPC×NR	–0.00002	–0.00005	–0.000001	–0.000001	–0.00001	0.00001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*HIPC×(1–NR)	0.00001	0.00001	–0.000001	–0.000001	0.00001	0.00001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×NR	–0.00031	0.00047	–0.00005	0.000001	–0.00026	–0.00001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×(1–NR)	0.000212	0.00041	–0.00003	–0.00001	–0.00003	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
External Debt/GDP	–0.00001		–0.000041		0.000188	
	(0.000)		(0.000)		(0.000)	
External Debt/Exports		0.00005		–0.00003		0.000101
		(0.000)		(0.000)		(0.000)
Inequality on life expectancy (-1)	0.965***	0.819***	0.682***	0.913***	0.789***	0.855***
	(0.179)	(0.119)	(0.115)	(0.030)	(0.107)	(0.116)
Observations	1,298	1,293	1,298	1,293	1,298	1,293
Countries	80	80	80	80	80	80
Instruments	78	58	56	75	59	59
Hansen J test (p-value)	0.116	0.287	0.217	0.144	0.237	0.283
AR (1) test	0.017	0.001	0.013	0.001	0.000	0.002
AR (2) test	0.347	0.161	0.523	0.224	0.101	0.182

Notes: All specifications are estimated using two-step System GMM estimator with Windmeijer finite sample correction. AR (1) and AR (2) are Arellano-Bond's 1st and 2nd autocorrelation tests. The Hansen J-statistic reports the p-values for the null of instrument validity. Time fixed effects and control variables included but not reported. HIPC = Heavily Indebted Poor Country. NR = Natural Resource. *, **, ***: significance levels of 10%, 5% and 1% respectively. Robust standard errors are in parentheses. Data source: World Bank and UNDP, 1990-2016.

Finally, we explore the interconnection between debt relief and inequality adjusted health index. Similar to the previous estimations, here we also moderate this relationship with the level of indebtedness and institutional quality. Table 2.7 exposes the results from columns (1)–(6). As the table reveals, there is no evidence to confirm that debt relief influences health in any of our selected group of countries. This lack of evidence is persistent even when we consider our moderator variables – i.e., external debt and institutional quality. We may infer from this finding that although the policies attached with debt relief initiative are development-oriented and aim to improve the socio-economic conditions in beneficiary countries, they do not seem to improve the relationship between debt relief and health. This result is contrary to that obtained by Schmid (2009) and Welander (2016) who studied the effects of debt relief on infant mortality and concluded that poor people experienced improvements in the socio-economic conditions between the decision and the completion point of the HIPC program.

2.4.3 Robustness checks

The validity of the results discussed in the last section is verified through a number of robustness tests which incorporates the following five dimensions: alternative measure of debt relief; alternative specification and cut-off points; alternative estimation technique; alternative control variables; and controlling for business cycle fluctuations.

2.4.3.1 Alternative measure of debt relief

Firstly, we use an alternative measure of debt relief developed by Cohen (2001) which is based on the market value of debt relief. While the present value of debt relief reflects the degree of concessionality by re-assessing the discount factor, the market value is the one that takes into account the risk of non-payment: rescheduling, arrears and constrained refinancing of different types. Cohen (2001) computes the data basing upon econometric evidence of middle-income debtors in the 1980s. Therefore, following his approach, our data is built on principal forgiven, interest forgiven, principal rescheduled, and interest rescheduled taken from the World Development Indicators. By considering the preceding debt situations, the market value would allow us to compute the true amount of resources released by donor countries (Cohen, 2001).

Table 2.8: Alternative measure of debt relief (a)

Dependent variable	Inequality Adjusted Human Development Index						Inequality on income Index					
	Debt relief as share of		Debt ratio*Debt relief as share of		IQ*Debt relief as share of		Debt relief as share of		Debt ratio*Debt relief as share of		IQ*Debt relief as share of	
Debt relief indicator	GDP (I)	Exports (II)	GDP (III)	Exports (IV)	GDP (V)	Exports (VI)	GDP (VII)	Exports (VIII)	GDP (IX)	Exports (X)	GDP (XI)	Exports (XII)
Constant	0.118**	0.150**	0.449***	0.463***	0.0464*	0.0504	0.0439**	0.0185	0.227***	0.0255*	0.0187	0.0517**
	(0.053)	(0.060)	(0.069)	(0.061)	(0.024)	(0.032)	(0.020)	(0.025)	(0.042)	(0.015)	(0.021)	(0.025)
Debt relief to GDP			0.00125		0.000151				0.0001		0.000251	
			(0.001)		(0.000)				(0.001)		(0.000)	
Debt relief to Exports				–0.00017		0.000167				0.00026*		0.000184
				(0.000)		(0.000)				(0.000)		(0.000)
Debt relief indicator*HIPC×NR	0.00127	0.0002	0.00001	0.000001	–0.000001	0.000001	0.000651*	0.0001	–0.00001	0.00001	–0.000001	–0.000001
	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*HIPC×(1–NR)	0.000733*	0.00019**	0.00001***	0.000001***	0.000001*	0.0000002**	0.00108**	0.00138*	0.00001**	0.000001*	0.000001***	0.000001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×NR	0.00182	–0.00285	0.00096	–0.00000	–0.00073	–0.000004	–0.00157	–0.0068	0.000548	–0.00000	0.00001	–0.00001
	(0.001)	(0.002)	(0.001)	(0.000)	(0.001)	(0.000)	(0.005)	(0.006)	(0.001)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×(1–NR)	–0.00009	–0.000034	–0.00002**	0.00000	–0.000001	–0.000000	0.00439	0.000138	0.00000	–0.000001	–0.000001	–0.000001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lagged dependent variable	0.834***	0.794***	0.244***	0.239***	0.944***	0.942***	0.943***	0.970***	0.530***	0.979***	0.980***	0.944***
	(0.073)	(0.083)	(0.067)	(0.068)	(0.035)	(0.046)	(0.024)	(0.043)	(0.050)	(0.016)	(0.033)	(0.036)
Observations	1,256	1,234	1,256	1,146	1,178	1,174	1,173	1,096	1,261	1,167	1,173	1,169
Countries	80	80	80	80	80	80	80	80	80	80	80	80
Instruments	73	75	73	74	70	70	73	71	73	74	70	67
Hansen J test (p-value)	0.549	0.334	0.105	0.264	0.286	0.253	0.300	0.302	0.105	0.309	0.156	0.772
AR(1) test	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000
AR(2) test	0.383	0.334	0.495	0.836	0.403	0.393	0.593	0.448	0.256	0.492	0.561	0.66

Notes: All specifications are estimated using two-step System GMM estimator with Windmeijer finite sample correction. AR (1) and AR (2) are Arellano-Bond's 1st and 2nd autocorrelation tests. The Hansen J-statistic reports the p-values for the null of instrument validity. Time fixed effects and control variables included but not reported. HIPC = Heavily Indebted Poor Country. NR = Natural Resource. IQ = Institutional Quality. *, **, ***: significance levels of 10%, 5% and 1% respectively. Robust standard errors are in parentheses. Data source: World Bank and UNDP, 1990-2016.

Table 2.9: Alternative measure of debt relief (b)

Dependent variable	Inequality on education						Inequality on life expectancy					
	Debt relief as share of		Debt ratio*Debt relief as share of		IQ*Debt relief as share of		Debt relief as share of		Debt ratio*Debt relief as share of		IQ*Debt relief as share of	
Debt relief indicator	GDP (I)	Exports (II)	GDP (III)	Exports (IV)	GDP (V)	Exports (VI)	GDP (VII)	Exports (VIII)	GDP (IX)	Exports (X)	GDP (XI)	Exports (XII)
Constant	0.324***	0.291***	0.342***	0.331***	0.329***	0.363***	–0.0280	0.0123	0.0950**	0.111**	0.0547**	0.0772*
	(0.073)	(0.093)	(0.069)	(0.067)	(0.085)	(0.098)	(0.023)	(0.031)	(0.044)	(0.048)	(0.022)	(0.045)
Debt relief to GDP			–0.00041		0.0001				–0.00457		0.00015	
			(0.001)		(0.001)				(0.004)		(0.001)	
Debt relief to Exports				–0.00048**		–0.00046*				–0.00043		0.0004
				(0.000)		(0.000)				(0.000)		(0.000)
Debt relief indicator*HIPC×NR	0.000771	0.000111	0.000001	0.00001	0.00001	0.000001	0.0008	–0.00007	0.00001	0.00001	–0.00002	–0.000001
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*HIPC×(1–NR)	0.000520*	0.000177*	0.00001***	0.00001*	0.00001**	0.000004***	–0.00041	0.0001	0.00001	–0.000001	–0.00003	–0.000001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×NR	0.0107	–0.00229	0.000141	0.00001	0.000755	–0.00005	0.003	–0.0021	–0.00002	0.00001	–0.00007	0.00004
	(0.015)	(0.002)	(0.000)	(0.000)	(0.001)	(0.000)	(0.004)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×(1–NR)	–0.00096***	–0.0005***	–0.00001	0.00001	–0.000003**	–0.00001	0.0010	0.000211	0.00001	0.00001	–0.000001	–0.000001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lagged dependent variable	0.308***	0.276***	0.261***	0.259***	0.238***	0.129**	0.930***	1.124***	0.866***	0.863***	0.949***	0.919***
	(0.061)	(0.074)	(0.062)	(0.067)	(0.071)	(0.052)	(0.076)	(0.339)	(0.142)	(0.053)	(0.031)	(0.053)
Observations	1,237	1,085	1,237	1,233	1,237	1,216	1,298	1,205	1,209	1,205	1,298	1,293
Countries	80	80	80	80	80	80	80	80	80	80	80	80
Instruments	79	74	77	77	74	73	63	56	64	73	74	64
Hansen J test (p-value)	0.155	0.324	0.290	0.283	0.109	0.294	0.108	0.426	0.103	0.108	0.196	0.101
AR(1) test	0.000	0.702	0.002	0.005	0.014	0.041	0.002	0.054	0.009	0.001	0.337	0.400
AR(2) test	0.484	0.245	0.452	0.121	0.184	0.813	0.278	0.272	0.285	0.508	0.486	0.506

Notes: All specifications are estimated using two-step System GMM estimator with Windmeijer finite sample correction. AR (1) and AR (2) are Arellano-Bond's 1st and 2nd autocorrelation tests. The Hansen J-statistic reports the p-values for the null of instrument validity. Time fixed effects and control variables included but not reported. HIPC = Heavily Indebted Poor Country. NR = Natural Resource. IQ = Institutional Quality. *, **, ***: significance levels of 10%, 5% and 1% respectively. Robust standard errors are in parentheses. Data source: World Bank and UNDP, 1990-2016.

The results are reported in tables 2.8 and 2.9 as they are broadly consistent with our benchmark results discussed in the previous section. More specifically, the coefficient on either measure of debt relief – i.e., debt relief as a share of GDP or exports – is positively and significantly associated with human welfare and inequality on income in HIPC countries non-dependent on natural resources. The findings remain robust even when the debt relief indicators interact with external debt and institutional quality as displayed in columns (1)–(12) of table 2.8. Although debt relief as a share of GDP carries a positive and significant sign on the inequality adjusted income index (column (6) of table 2.8) in natural resource rich HIPC countries as we reported in the previous section (column (1) of table 2.5), a notable exception is the insignificant negative impact of the interaction term between debt relief and institutional quality in this group of countries. In table 2.9 (columns (1)–(6)) we can observe that the coefficient of debt relief on education remains statistically significant and no evidence is found for life expectancy (columns (7)–(12)). Therefore, our findings are not sensitive to using alternative measures of debt relief.

2.4.3.2 Alternative specification and cut-off points

In our benchmark results, we qualitatively define 80 percent of merchandise exports as the cut-off point to classify countries as natural resource dependent. To ensure that our findings are not driven by selection bias, we define an alternative cut-off point. More specifically, we split the sample into two groups by defining the top (bottom) 50 percent most (less) dependent countries on natural resource exports of the distribution of the whole sample.[20] Although this strategy may not provide us with a precise estimation of the threshold level of natural resource dependency, it allows us to estimate the effect of debt relief on human welfare based on debt relief policies rather than in the composition of the sample. The results are summarized in tables 2.10–2.13. To save space, we only report the debt relief variables and their interactions with the level of indebtedness and institutional quality.

As the tables reveal, by considering the top 50 percent commodity-dependent countries in our sample, there is not enough evidence to confirm that debt relief improves human welfare, even though it increases national income (panel A of table 2.10). When we consider the bottom 50 percent commodity-dependent countries, we can observe a positive and significant impact of debt relief on human welfare and national income (panel B of table 2.10).

[20] Recall that we still differentiate HIPCs from non-HIPCs.

Table 2.10: Alternative specification and cut-off points–HIPC natural resource vs HIPC non-natural resource

Dependent variable	Inequality Adjusted Human Development Index						Inequality on income Index					
Panel A: Top 50 percent NRD	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)
PV of debt relief/GDP	0.0007		0.0007		0.0014							
	(0.000)		(0.001)		(0.001)							
PV of debt relief/Exports		–0.00001		–0.00001		–0.00005						
		(0.723)		(0.000)		(0.000)						
PV of debt relief/GDP*debt ratio			–0.00001									
			(0.000)									
PV of debt relief/Exports*debt ratio				–0.00001								
				(0.000)								
PV of debt relief/GDP*Institutional quality					–0.0002							
					(0.000)							
PV of debt relief/Exports*Institutional quality						0.00001						
						(0.000)						
PV of debt relief/GDP							0.0004*		0.0005		–0.0006	
							(0.000)		(0.000)		(0.000)	
PV of debt relief/Exports								0.00001*		0.000		–0.0001
								(0.000)		(0.000)		(0.000)
PV of debt relief/GDP*debt ratio									–0.00000			
									(0.000)			
PV of debt relief/Exports*debt ratio										–0.00000		
										(0.000)		
PV of debt relief/GDP*Institutional quality											0.00012*	
											(0.000)	
PV of debt relief/Exports*Institutional quality												0.00004**
												(0.000)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	18	18	18	18	18	18	18	18	18	18	18	18
Observations	290	289	290	289	290	289	290	174	290	288	290	209
R–squared	0.224	0.207	0.224	0.207	0.229	0.207	0.604	0.399	0.609	0.211	0.550	0.266

Table 2.10: Alternative specification and cut-off points–HIPC natural resource vs HIPC non-natural resource (continued)

Panel B: Bottom 50 percent NRD	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)
PV of debt relief/GDP	0.00134***		0.00145***		0.00112***							
	(0.000)		(0.000)		(0.000)							
PV of debt relief/Exports		0.0001**		0.00014*		0.0001**						
		(0.000)		(0.000)		(0.000)						
PV of debt relief/GDP*debt ratio			0.0001**									
			(0.000)									
PV of debt relief/Exports*debt ratio				0.00000**								
				(0.000)								
PV of debt relief/GDP*Institutional quality					0.0001***							
					(0.000)							
PV of debt relief/Exports*Institutional quality						0.00001***						
						(0.000)						
PV of debt relief/GDP							0.00091*		0.00087*		0.00082*	
							(0.000)		(0.000)		(0.000)	
PV of debt relief/Exports								0.0001*		0.00012		0.0001
								(0.000)		(0.000)		(0.000)
PV of debt relief/GDP*debt ratio									0.0000*			
									(0.000)			
PV of debt relief/Exports*debt ratio										0.0000***		
										(0.000)		
PV of debt relief/GDP*Institutional quality											0.0001**	
											(0.000)	
PV of debt relief/Exports*Institutional quality												0.00001***
												(0.000)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	18	18	18	18	18	18	18	18	18	18	18	18
Observations	286	286	286	272	286	286	285	285	285	271	285	285
R–squared	0.255	0.202	0.260	0.209	0.262	0.213	0.268	0.217	0.271	0.210	0.223	0.217

Notes: All specifications are estimated using OLS. Robust standard errors are in parentheses, clustered at the country level. Time fixed effects and control variables included but not reported. Dependent variables are Inequality Adjusted Human Development Index and Inequality on income index. HIPC = Heavily Indebted Poor Country. NRD = Natural Resource Dependent. *, **, ***: significance levels of 10%, 5% and 1% respectively. Data source: World Bank and UNDP, 1990-2016.

Table 2.11: Alternative specification and cut-off points–HIPC natural resource vs HIPC non-natural resource

Dependent variable	Inequality on life expectancy						Inequality on education					
Panel A: Top 50 percent NRD	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)
PV of debt relief/GDP								0.0005		0.0004		0.0005
								(0.001)		(0.001)		(0.000)
PV of debt relief/Exports									–0.00003		–0.00003	
									(0.000)		(0.000)	
PV of debt relief/GDP*debt ratio										0.0000		
										(0.000)		
PV of debt relief/Exports*debt ratio							–0.00014		–0.0000			
							(0.000)		(0.000)			
PV of debt relief/GDP*Institutional quality								–0.00001				
								(0.000)				
PV of debt relief/Exports*Institutional quality							0.00003					
							(0.000)					
PV of debt relief/GDP		0.00096		0.0008		0.0007						
		(0.001)		(0.001)		(0.000)						
PV of debt relief/Exports	0.0001		0.0000		–0.00000							
	(0.000)		(0.000)		(0.000)							
PV of debt relief/GDP*debt ratio				–0.00000								
				(0.000)								
PV of debt relief/Exports*debt ratio			–0.00000									
			(0.000)									
PV of debt relief/GDP*Institutional quality		–0.00009										
		(0.000)										
PV of debt relief/Exports*Institutional quality	–0.00002											
	(0.000)											
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	18	18	18	18	18	18	18	18	18	18	18	18
Observations	293	295	293	295	293	295	287	288	287	288	287	288
R–squared	0.381	0.33	0.319	0.563	0.319	0.563	0.148	0.148	0.180	0.148	0.139	0.148

Table: 2.11 Alternative specification and cut-off points–HIPC natural resource vs HIPC non-natural resource (continued)

Panel B: Bottom 50 percent NRD	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)
PV of debt relief/GDP										0.00153***		0.00137***
										(0.000)		(0.000)
PV of debt relief/Exports							0.00016***		0.000138**		0.00014***	
							(0.000)		(0.000)		(0.000)	
PV of debt relief/GDP*debt ratio								0.00145***		0.0000**		
								(0.000)		(0.000)		
PV of debt relief/Exports*debt ratio									0.0000***			
									(0.000)			
PV of debt relief/GDP*Institutional quality								0.00002**				
								(0.000)				
PV of debt relief/Exports*Institutional quality							0.00001*					
							(0.000)					
PV of debt relief/GDP		0.00203**		0.00093**		0.0004						
		(0.001)		(0.000)		(0.000)						
PV of debt relief/Exports	0.000133*		0.00013**		0.0001							
	(0.000)		(0.000)		(0.000)							
PV of debt relief/GDP*debt ratio				0.0001								
				(0.000)								
PV of debt relief/Exports*debt ratio			0.00001									
			(0.000)									
PV of debt relief/GDP*Institutional quality		–0.0001										
		(0.000)										
PV of debt relief/Exports*Institutional quality	0.000											
	(0.000)											
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	18	18	18	18	18	18	18	18	18	18	18	18
Observations	290	290	290	290	290	290	227	262	249	281	281	281
R–squared	0.321	0.330	0.316	0.596	0.754	0.565	0.369	0.370	0.272	0.327	0.265	0.316

Notes: All specifications are estimated using OLS. Robust standard errors are in parentheses, clustered at the country level. Time fixed effects and control variables included but not reported. Dependent variables are Inequality on life expectancy and Inequality on education. HIPC = Heavily Indebted Poor Country. NRD = Natural Resource Dependent. *, **, ***: significance levels of 10%, 5% and 1% respectively. Data source: World Bank and UNDP, 1990-2016.

Table 2.12: Alternative specification and cut-off points–Non-HIPC natural resource vs Non-HIPC non-natural resource

Dependent variable	Inequality Adjusted Human Development Index						Inequality on income Index					
Panel A: Top 50 percent NRD	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)
PV of debt relief/GDP	0.0047		0.003		0.010							
	(0.003)		(0.003)		(0.009)							
PV of debt relief/Exports		0.0005		0.0017		–0.00186*						
		(0.001)		(0.001)		(0.001)						
PV of debt relief/GDP*debt ratio			0.0001									
			(0.000)									
PV of debt relief/Exports*debt ratio				–0.00001**								
				(0.000)								
PV of debt relief/GDP*Institutional quality					–0.00111							
					(0.002)							
PV of debt relief/Exports*Institutional quality						0.0006						
						(0.000)						
PV of debt relief/GDP							0.0036		0.003		0.0022	
							(0.004)		(0.003)		(0.003)	
PV of debt relief/Exports								–0.0004		–0.0003		–0.00112
								(0.000)		(0.000)		(0.001)
PV of debt relief/GDP*debt ratio									0.000			
									(0.000)			
PV of debt relief/Exports*debt ratio										–0.00000		
										(0.000)		
PV of debt relief/GDP*Institutional quality											0.001	
											(0.001)	
PV of debt relief/Exports*Institutional quality												0.0003
												(0.000)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	22	22	22	22	22	22	22	22	22	22	22	22
Observations	316	313	316	313	316	313	328	328	328	328	328	328
R–squared	0.224	0.207	0.226	0.221	0.091	0.274	0.313	0.101	0.313	0.101	0.285	0.108

Table: 2.12 Alternative specification and cut-off points–Non-HIPC natural resource vs Non-HIPC non-natural resource (continued)

Panel B: Bottom 50 percent NRD	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)
PV of debt relief/GDP	0.0009		0.0012		0.00368							
	(0.001)		(0.001)		(0.003)							
PV of debt relief/Exports		–0.00011		–0.00013		–0.00012						
		(0.000)		(0.000)		(0.000)						
PV of debt relief/GDP*debt ratio			–0.00001									
			(0.000)									
PV of debt relief/Exports*debt ratio				0.00001								
				(0.000)								
PV of debt relief/GDP*Institutional quality					–0.00103							
					(0.001)							
PV of debt relief/Exports*Institutional quality						0.00001						
						(0.000)						
PV of debt relief/GDP							–0.00197		–0.00132		0.0001	
							(0.001)		(0.001)		(0.002)	
PV of debt relief/Exports								–0.000551		–0.00195*		–0.00165
								(0.000)		(0.001)		(0.001)
PV of debt relief/GDP*debt ratio									–0.00003			
									(0.000)			
PV of debt relief/Exports*debt ratio										0.00001		
										(0.000)		
PV of debt relief/GDP*Institutional quality											–0.00079	
											(0.001)	
PV of debt relief/Exports*Institutional quality												0.00038
												(0.000)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	22	22	22	22	22	22	22	22	22	22	22	22
Observations	375	375	375	375	375	375	365	365	361	365	365	365
R–squared	0.157	0.367	0.157	0.367	0.179	0.416	0.369	0.131	0.383	0.142	0.329	0.145

Notes: All specifications are estimated using OLS. Robust standard errors are in parentheses, clustered at the country level. Time fixed effects and control variables included but not reported. Dependent variables are Inequality Adjusted Human Development Index and Inequality on income index. HIPC = Heavily Indebted Poor Country. NRD = Natural Resource Dependent. *, **, ***: significance levels of 10%, 5% and 1% respectively. Data source: World Bank and UNDP, 1990-2016.

Table 2.13: Alternative specification and cut-off points–Non-HIPC natural resource vs Non-HIPC non-natural resource

Dependent variable	Inequality on life expectancy						Inequality on education					
Panel A: Top 50 percent NRD	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)
PV of debt relief/GDP								0.0074		0.0046		0.005
								(0.007)		(0.003)		(0.003)
PV of debt relief/Exports							–0.00057		0.00196*		0.0011	
							(0.001)		(0.001)		(0.001)	
PV of debt relief/GDP*debt ratio										0.0000		
										(0.000)		
PV of debt relief/Exports*debt ratio									0.00001			
									(0.000)			
PV of debt relief/GDP*Institutional quality								–0.00057				
								(0.001)				
PV of debt relief/Exports*Institutional quality							0.0004					
							(0.000)					
PV of debt relief/GDP		0.0031		0.0076		0.0013						
		(0.003)		(0.006)		(0.002)						
PV of debt relief/Exports	0.0005		–0.0001		–0.00001							
	(0.001)		(0.000)		(0.000)							
PV of debt relief/GDP*debt ratio				–0.0001								
				(0.000)								
PV of debt relief/Exports*debt ratio			0.00001									
			(0.000)									
PV of debt relief/GDP*Institutional quality		–0.0002										
		(0.000)										
PV of debt relief/Exports*Institutional quality	–0.000217											
	(0.000)											
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	22	22	22	22	22	22	22	22	22	22	22	22
Observations	330	333	330	333	330	333	309	312	309	312	309	312
R–squared	0.240	0.259	0.238	0.504	0.238	0.502	0.370	0.384	0.066	0.374	0.058	0.373

Table 2.13 Alternative specification and cut-off points–Non-HIPC natural resource vs Non-HIPC non-natural resource (continued)

Panel B: Bottom 50 percent NRD	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)
PV of debt relief/GDP								–0.00134		0.00158		–0.00139
								(0.003)		(0.002)		(0.001)
PV of debt relief/Exports							0.00018		–0.00061		–0.00018	
							(0.000)		(0.001)		(0.000)	
PV of debt relief/GDP*debt ratio										–0.000054		
										(0.000)		
PV of debt relief/Exports*debt ratio									0.000001			
									(0.000)			
PV of debt relief/GDP*Institutional quality								–0.00003				
								(0.001)				
PV of debt relief/Exports*Institutional quality							–0.00006					
							(0.000)					
PV of debt relief/GDP		0.000127		0.0014		0.0004						
		(0.003)		(0.001)		(0.001)						
PV of debt relief/Exports	–0.00023		0.0002		0.0001							
	(0.001)		(0.000)		(0.000)							
PV of debt relief/GDP*debt ratio				–0.00002								
				(0.000)								
PV of debt relief/Exports*debt ratio			0.00000									
			(0.000)									
PV of debt relief/GDP*Institutional quality		0.000114										
		(0.001)										
PV of debt relief/Exports*Institutional quality	0.000116											
	(0.000)											
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	22	22	22	22	22	22	22	22	22	22	22	22
Observations	380	380	380	380	380	380	372	372	372	372	372	372
R–squared	0.319	0.575	0.683	0.577	0.318	0.575	0.607	0.647	0.153	0.621	0.164	0.153

Notes: All specifications are estimated using OLS. Robust standard errors are in parentheses, clustered at the country level. Time fixed effects and control variables included but not reported. Dependent variables are Inequality on life expectancy and Inequality on education. HIPC = Heavily Indebted Poor Country. NRD = Natural Resource Dependent. *, **, ***: significance levels of 10%, 5% and 1% respectively. Data source: World Bank and UNDP, 1990-2016.

The effect remains robust and positive even when we consider inequality on education (panel B of table 2.11). Interestingly, in panel B of table 2.11, the standalone coefficient of debt relief becomes significantly positive on life expectancy (columns (1)–(4)) which suggests that both the debt burden and institutional quality help to improve the relationship between debt relief and life expectancy in HIPC countries non-dependent on natural resource. Thus, these findings broadly alleviate the concern that selection bias might be driving our results.

2.4.3.3 Alternative estimation technique

Acknowledging that our estimation technique may not fully control for the limited range of our dependent variables which theoretically fall between 0 and 1, we examine whether our results are sensitive to a different estimation methodology by employing a double-censored Tobit model. This approach has been widely applied in the literature (Kumbhakar and Lovell, 2000; Dang, 2007; Ariss, 2010); as it accounts for the possibility that the data in the observed range of values are censored at either one or both ends. In this setting, we assume for country i at time t:

$$Y_{it}^{*} = X_{it}\beta + \epsilon_{it},\ \ \epsilon_{it} \sim N\left(0, \sigma^{2}\right) \tag{2.7}$$

$$Y_{it} = Y_{it}^{*}\ if\ a \leq Y_{it}^{*} \leq b;\ Y_{it} = a\ if\ Y_{it}^{*} < a;\ Y_{it} = b\ if\ Y_{it}^{*} < b, \tag{2.8}$$

Where Y_{it}^{*} represents the underlying or the implicit value of the dependent variable, Y_{it} denotes its observed value while a and b represent the upper and lower bounds of the observation interval, respectively. For example, the distribution of the data in our main outcome variable – i.e., Inequality Adjusted Human Development Index (IHDI) – is both left-censored (at 0.198) and right-censored (at 0.796) as illustrated in figure 2.4 and therefore $a = 0.198$ and $b = 0.796$ would result in the following likelihood function:

$$\begin{aligned} \prod_{a \leq Y_{it}^{*} \leq b} \left[\frac{1}{\sigma}\Phi\left(\frac{1}{\sigma}\left(Y_{it} - X_{it}\beta\right)\right)\right] \prod_{Y_{it}^{*} < a} \left[\Phi\left(\frac{1}{\sigma}\left(a - X_{it}\beta\right)\right)\right] \\ \times \prod_{Y_{it}^{*} > b} \left[\Phi\left(-\frac{1}{\sigma}\left(b - X_{it}\beta\right)\right)\right] \end{aligned} \tag{2.9}$$

In which the first term represents the non-limit observations, the second term denotes observations at the lower limit a, and the last term corresponds to observations at the upper limit b. Hence, the Tobit model provides efficient estimates for regressions in which the range of the data is predetermined limited (Tobin, 1958).[21]

[21] For a detailed discussion of the model, see Tobin (1958) and Greene (2002).

Table 2.14: Alternative estimation technique (a)

Dependent variable	Inequality Adjusted Human Development Index						Inequality on income Index					
	Debt relief as share of		Debt ratio*Debt relief as share of		IQ*Debt relief as share of		Debt relief as share of		Debt ratio*Debt relief as share of		IQ*Debt relief as share of	
Debt relief indicator	GDP (I)	Exports (II)	GDP (III)	Exports (IV)	GDP (V)	Exports (VI)	GDP (VII)	Exports (VIII)	GDP (IX)	Exports (X)	GDP (XI)	Exports (XII)
Constant	0.6483***	0.621***	0.533***	0.563***	0.647***	0.660***	0.555***	0.582***	0.576***	0.429***	0.522***	0.622***
	(0.052)	(0.051)	(0.058)	(0.052)	(0.051)	(0.048)	(0.043)	(0.043)	(0.046)	(0.046)	(0.038)	(0.040)
PV of debt relief to GDP			–0.000872*		–0.000322				–0.00074		–0.00139***	
			(0.0005)		(0.000)				(0.000)		(0.000)	
PV of debt relief to Exports						–0.0001*				–0.00009		–0.00017***
						(0.000)				(0.000)		(0.000)
Debt relief indicator*HIPC×NR	–0.00007	–0.00001	(0.000)	0.0000	0.00001	0.00001	–0.00019	0.00001	0.00001	0.00001	0.000001**	0.000002**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*HIPC×(1–NR)	0.00094***	0.000129***	0.0006**	0.00001**	0.00001***	0.0002***	0.00069**	0.0001*	0.00001**	0.00001**	0.00001***	0.0003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×NR	0.0029	0.000648	0.00005	0.0000	0.00004*	–0.00000	0.0109	0.000864***	0.000112	0.00000	0.0001	0.0000
	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.008)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×(1–NR)	0.00013	–0.00032	–0.00002	–0.000001	–0.00004	–0.00000	–0.000651	–0.000095	–0.00001	–0.00000	–0.00001	–0.00000
	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LR Chi-Square	248.4***	422.16***	979.2***	1103.3***	304.19***	862.68***	387.72***	273.96***	499.2***	1221.28***	538.65***	598.64***
Observations	1,267	1,264	1,267	1,263	1,267	1,211	1,150	1,265	1,149	1,262	1,268	1,210
Pseudo R–squared	–0.6052	–0.6419	–0.7919	–0.7978	–0.6085	–0.8246	–0.6392	–0.5513	–0.6913	–0.8884	–0.7492	–0.9185

Notes: All specifications are estimated using double-censored Tobit regression. Robust standard errors are in parentheses, clustered at the country level. Time fixed effects and control variables included but not reported. Dependent variables are Inequality Adjusted Human Development Index and Inequality on income index. HIPC = Heavily Indebted Poor Country. NR = Natural Resource. IQ = Institutional Quality. *, **, ***: significance levels of 10%, 5% and 1% respectively. Data source: World Bank and UNDP, 1990-2016.

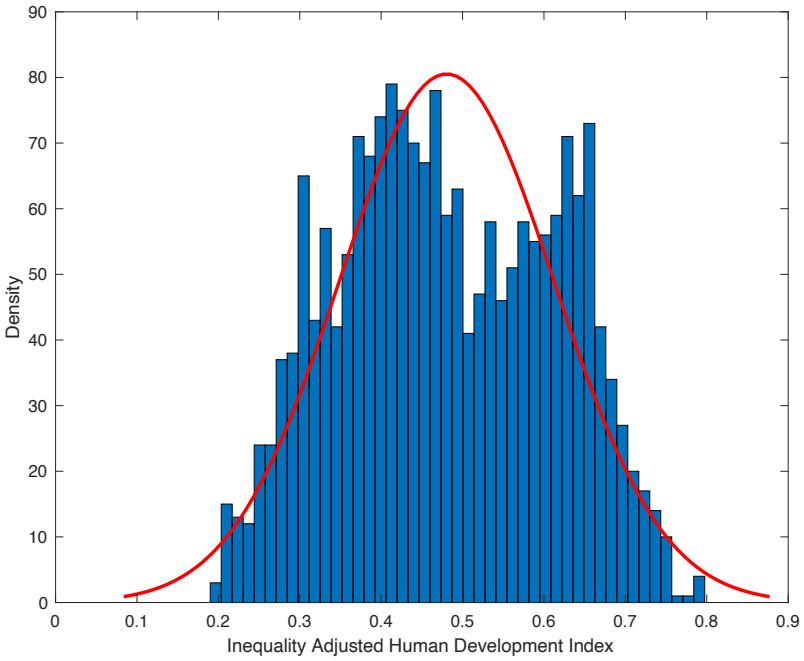
Table 2.15: Alternative estimation technique (b)

Dependent variable	Inequality on education						Inequality on life expectancy					
	Debt relief as share of		Debt ratio*Debt relief as share of		IQ*Debt relief as share of		Debt relief as share of		Debt ratio*Debt relief as share of		IQ*Debt relief as share of	
Debt relief indicator	GDP (I)	Exports (II)	GDP (III)	Exports (IV)	GDP (V)	Exports (VI)	GDP (VII)	Exports (VIII)	GDP (IX)	Exports (X)	GDP (XI)	Exports (XII)
Constant	0.526***	0.523***	0.431***	0.490***	0.522***	0.461***	0.792***	0.797***	0.715***	0.802***	0.792***	
	(0.076)	(0.077)	(0.081)	(0.081)	(0.075)	(0.086)	(0.054)	(0.051)	(0.052)	(0.053)	(0.053)	
PV of debt relief to GDP			–0.000757		–0.0009				–0.0008		–0.0005	
			(0.001)		(0.001)				(0.000)		(0.001)	0.00001
PV of debt relief to Exports				0.00003		–0.00005				0.0000		(0.000)
				(0.000)		(0.000)				(0.000)		
Debt relief indicator*HIPC×NR	0.00001	0.00004	0.00001	0.00001	0.00001	–0.000003	–0.00069	–0.00011	–0.00001	–0.00000	–0.00001*	–0.00004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*HIPC×(1–NR)	0.0007**	0.0001***	0.00001**	0.000001**	0.000001***	0.000001*	0.00064	0.0001	0.000001	0.0001	0.0000	0.00001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×NR	0.0077	0.00032	0.0001	–0.0000	0.00004	0.00001	–0.00037	0.00019	–0.00007	0.0000	0.0000	0.00001
	(0.005)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×(1–NR)	0.00091	–0.0001	0.0000	–0.00001	–0.00001	–0.00000	0.00373	0.0005	0.00001	0.00001	0.0000	0.00001
	(0.003)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LR Chi-Square	156***	494.64***	877.54***	1045.84***	760.84***	970.2***	251.85***	231.9***	1329.21***	208.78***	2018.73***	244.79***
Observations	1,253	1,250	1,253	1,249	1,253	1,250	1,179	1,302	1,298	1,292	1,298	1,290
Pseudo R–squared	–0.5852	–0.6076	–0.7016	–0.7105	–0.7024	–0.7037	–0.6304	–0.6353	–0.8591	–0.6179	–0.871	–0.6095

Notes: All specifications are estimated using double-censored Tobit regression. Robust standard errors are in parentheses, clustered at the country level. Time fixed effects and control variables included but not reported. Dependent variables are Inequality Adjusted Human Development Index and Inequality on income index. HIPC = Heavily Indebted Poor Country. NR = Natural Resource. IQ = Institutional Quality. *, **, ***: significance levels of 10%, 5% and 1% respectively. Data source: World Bank and UNDP, 1990-2016.

Results are displayed in table 2.14 and 2.15 as they are consistent with our benchmark results, even though some variables lose some of their statistical significance. This is the case for the impact of debt relief on national income in commodity-dependent HIPC countries (columns (9) and (10) of table 2.14) which is only statistically significant in the augmented model with institutional quality. Nevertheless, our findings are, in general, robust to use of an alternative estimation technique which controls for the limited range in the dependent variable.

Figure 2.4: Sample distribution of Inequality Adjusted Human Development Index



Data source: Author's computation with data from the UNDP.

2.4.3.4 Alternative control variables

Next, we explore whether our benchmark results remain unchanged when we alter the set of control variables. We first use alternative proxies of debt burden – i.e., debt service on external debt as a share of GDP and exports – instead of external debt as a share of GDP and exports. Although this latter is a good measure of the country's ability to discharge its external debt obligation, it does not accurately indicate the proportion of funds (actually paid in currency, goods and services) that is being spent on principal repayments and interest. As such, we use debt service on external debt (as a share of GDP and exports) with data collected from the world development indicators. To control for macroeconomic stability, we use an alternative measure – i.e., fiscal balance – instead of inflation.

Table 2.16: Alternative control variables – Inequality Adjusted Human Development Index

Dependent variable	Inequality Adjusted Human Development Index					
	Debt relief as share of		Debt ratio*Debt relief as share of		Polity 2*Debt relief as share of	
Debt relief indicator	GDP (I)	Exports (II)	GDP (III)	Exports (IV)	GDP (V)	Exports (VI)
Constant	0.170***	0.128***	0.0294	0.0438*	0.0425**	0.0268**
	(0.056)	(0.024)	(0.020)	(0.026)	(0.021)	(0.012)
PV of debt relief to GDP			–0.00004		–0.00008	
			(0.000)		(0.000)	
PV of debt relief to Exports				–0.00001		–0.00001
				(0.000)		(0.000)
Debt relief indicator*HIPC×NR	–0.00001	0.00001	0.000101	0.000001	0.00001	0.00001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*HIPC×(1–NR)	0.00029**	0.00002**	0.00001*	0.000004*	0.000003*	0.000002**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×NR	–0.0405	0.00472	0.00116	0.00005	0.0001	–0.00000
	(0.057)	(0.003)	(0.002)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×(1–NR)	0.000358	0.00102	–0.00098	–0.00000	–0.00003	0.0000
	(0.005)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Debt service/GDP	0.00047		–0.00238*		0.0002	
	(0.000)		(0.001)		(0.000)	
Debt service/Exports		0.0008***		–0.00026		–0.00008
		(0.000)		(0.000)		(0.000)
IHDI(-1)	0.754***	0.786***	0.992***	0.967***	0.946***	0.972***
	(0.078)	(0.028)	(0.025)	(0.032)	(0.027)	(0.018)
Log (GDP per capita)	0.000479	0.000843	–0.000298	0.000115	0.0005	0.000426
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Trade/GDP	–0.00005	–0.00001	–0.00002	–0.00006	–0.00001	–0.00003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Population growth	–0.0216***	–0.0128***	–0.00433*	–0.00519*	–0.00455*	–0.00263*
	(0.007)	(0.003)	(0.002)	(0.003)	(0.003)	(0.001)
Fiscal balance	0.00005	0.00205***	–0.00006	0.000589*	0.0000	–0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Aid/Investment	–0.00016	–0.00021**	–0.00001	–0.00001	–0.00001	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Corruption	0.016	0.0154**	0.00165	0.00487	0.00218	0.0023
	(0.011)	(0.006)	(0.002)	(0.003)	(0.003)	(0.002)
Polity 2	–0.00148**	–0.000333	–0.00015	–0.0004	–0.00039	–0.00027
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	730	1,149	1,216	1,079	1,216	1,214
Countries	73	77	77	77	77	77
Instruments	66	74	74	70	69	71
Hansen J test (p-value)	0.231	0.102	0.219	0.303	0.154	0.255
AR(1) test	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) test	0.423	0.231	0.630	0.610	0.583	0.606

Notes: All specifications are estimated using two-step System GMM estimator with Windmeijer finite sample correction. AR (1) and AR (2) are Arellano-Bond's 1st and 2nd autocorrelation tests. The Hansen J-statistic reports the p-values for the null of instrument validity. Time fixed effects included but not reported. HIPC = Heavily Indebted Poor Country. NR = Natural Resource. *, **, ***: significance levels of 10%, 5% and 1% respectively. Robust standard errors are in parentheses. Data source: World Bank and UNDP, 1990-2016.

Table 2.17: Alternative control variables – Inequality on income Index

Dependent variable	Inequality on income Index					
	Debt relief as share of		Debt ratio*Debt relief as share of		Polity 2*Debt relief as share of	
Debt relief indicator	GDP (I)	Exports (II)	GDP (III)	Exports (IV)	GDP (V)	Exports (VI)
Constant	0.170***	0.168***	0.176***	0.00998	0.0314*	0.0257
	(0.055)	(0.049)	(0.042)	(0.020)	(0.017)	(0.023)
PV of debt relief to GDP			–0.00021		–0.00013***	
			(0.000)		(0.000)	
PV of debt relief to Exports				–0.00006**		–0.00002***
				(0.000)		(0.000)
Debt relief indicator*HIPC×NR	0.000274*	0.00004*	0.00069**	0.00001**	0.000001*	0.000001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*HIPC×(1–NR)	0.000116*	0.00005**	0.00003**	0.00001**	0.000001**	0.000002*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×NR	0.0133	0.00169	0.00165	0.00008	5.66E-07	0.00001
	(0.014)	(0.001)	(0.002)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×(1–NR)	0.00193	0.000181	0.00244	0.00001	–0.00000	–0.000000
	(0.004)	(0.001)	(0.002)	(0.000)	(0.000)	(0.000)
Debt service/GDP	0.00118*		–0.00699*		–0.00002	
	(0.001)		(0.004)		(0.000)	
Debt service/Exports		0.00069*		–0.000471		–0.00016
		(0.000)		(0.000)		(0.000)
Inequality on income Index (-1)	0.806***	0.765***	0.777***	0.990***	0.945***	0.959***
	(0.039)	(0.036)	(0.035)	(0.026)	(0.025)	(0.034)
Log (GDP per capita)	–0.0004	0.00027	–0.00018	0.000582	0.00070**	0.00084**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Trade/GDP	–0.00022*	–0.00008	–0.00006	0.0000	0.000	–0.00001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Population growth	–0.00725	–0.0063	–0.0160**	–0.0015	–0.00282	–0.00349
	(0.005)	(0.005)	(0.007)	(0.002)	(0.002)	(0.003)
Fiscal balance	0.00387***	0.00544***	0.000969*	0.000636	–0.00005	–0.00024
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Aid/Investment	–0.00008	–0.000250**	–0.00015**	–0.00002	–0.00002	0.00004
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Corruption	0.0589*	0.0493	0.0242***	–0.00062	0.0014	0.0010
	(0.033)	(0.033)	(0.008)	(0.004)	(0.003)	(0.003)
Polity 2	–0.00166	–0.00167	–0.00053	0.000461*	0.000	–0.00007
	(0.001)	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)
Observations	1,155	1,137	1,231	1,227	1,231	1,154
Countries	76	75	77	77	77	77
Instruments	70	73	73	72	74	75
Hansen J test (p-value)	0.178	0.144	0.109	0.281	0.397	0.311
AR(1) test	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) test	0.775	0.834	0.452	0.778	0.886	0.891

Notes: All specifications are estimated using two-step System GMM estimator with Windmeijer finite sample correction. AR (1) and AR (2) are Arellano-Bond's 1st and 2nd autocorrelation tests. The Hansen J-statistic reports the p-values for the null of instrument validity. Time fixed effects included but not reported. HIPC = Heavily Indebted Poor Country. NR = Natural Resource. *, **, ***: significance levels of 10%, 5% and 1% respectively. Robust standard errors are in parentheses. Data source: World Bank and UNDP, 1990-2016.

Table 2.18: Alternative control variables – Inequality on education

Dependent variable	Inequality on education					
	Debt relief as share of		Debt ratio*Debt relief as share of		Polity 2*Debt relief as share of	
Debt relief indicator	GDP (I)	Exports (II)	GDP (III)	Exports (IV)	GDP (V)	Exports (VI)
Constant	0.388***	0.168***	0.0144	0.0592**	0.0423***	0.0569***
	(0.081)	(0.027)	(0.017)	(0.025)	(0.015)	(0.021)
PV of debt relief to GDP			0.00001		–0.000069	
			(0.000)		(0.000)	
PV of debt relief to Exports				0.00001		–0.00001**
				(0.000)		(0.000)
Debt relief indicator*HIPC×NR	–0.000149	0.00003	0.0001	0.00001	0.00001	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*HIPC×(1–NR)	0.000186*	0.00005*	0.000001**	0.000001**	0.00001*	0.000003**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	–0.00001
Debt relief indicator*(1–HIPC)×NR	0.00556	0.000319	0.000101	0.0000	0.00001	(0.000)
	(0.005)	(0.001)	(0.000)	(0.000)	(0.000)	–0.00002
Debt relief indicator*(1–HIPC)×(1–NR)	0.00136	0.000685	0.0001	0.0000	0.00007	0.000
	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt service/GDP	0.00466***		–0.00213*		0.00007	
	(0.002)		(0.001)		(0.000)	
Debt service/Exports		0.00097***		–0.00063**		0.00021**
		(0.000)		(0.000)		(0.0001)
Inequality on education (-1)	0.228**	0.703***	0.796***	0.879***	0.880***	0.853***
	(0.094)	(0.031)	(0.156)	(0.053)	(0.073)	(0.064)
Log (GDP per capita)	0.00175	–0.00003	–0.000024	0.0002	–0.00005	0.0004
	(0.004)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Trade/GDP	–0.00001	0.00004	–0.00001	(0.000)	–0.00005	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Population growth	–0.0573***	–0.0199***	–0.00154	–0.00772**	–0.00448**	–0.00722***
	(0.013)	(0.004)	(0.002)	(0.003)	(0.002)	(0.003)
Fiscal balance	0.000214	0.00298***	0.000	0.000	0.000913**	0.0001
	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Aid/Investment	–0.00036**	–0.00024***	–0.00004**	–0.00002	–0.00003*	–0.0001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Corruption	0.0313	0.0128	0.000	0.008	0.002	(0.000)
	(0.023)	(0.008)	(0.003)	(0.005)	(0.002)	(0.003)
Polity 2	0.00127	0.000151	0.0001	–0.00137	–0.00021	0.0003
	(0.002)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
Observations	988	1,127	1,113	1,179	1,045	1,110
Countries	76	77	77	77	77	77
Instruments	68	75	70	67	72	71
Hansen J test (p-value)	0.110	0.129	0.378	0.470	0.329	0.235
AR(1) test	0.035	0.000	0.041	0.002	0.002	0.001
AR(2) test	0.725	0.441	0.806	0.191	0.385	0.219

Notes: All specifications are estimated using two-step System GMM estimator with Windmeijer finite sample correction. AR (1) and AR (2) are Arellano-Bond's 1st and 2nd autocorrelation tests. The Hansen J-statistic reports the p-values for the null of instrument validity. Time fixed effects included but not reported. HIPC = Heavily Indebted Poor Country. NR = Natural Resource. *, **, ***: significance levels of 10%, 5% and 1% respectively. Robust standard errors are in parentheses. Data source: World Bank and UNDP, 1990-2016.

Table 2.19: Alternative control variables – Inequality on life expectancy

Dependent variable	Inequality on life expectancy					
	Debt relief as share of		Debt ratio*Debt relief as share of		Polity 2*Debt relief as share of	
Debt relief indicator	GDP (I)	Exports (II)	GDP (III)	Exports (IV)	GDP (V)	Exports (VI)
Constant	0.261***	0.843***	0.0654***	–0.0168	0.0940***	0.0339
	(0.043)	(0.148)	(0.011)	(0.053)	(0.013)	(0.035)
PV of debt relief to GDP			0.00001		–0.00001	
			(0.000)		(0.0000)	
PV of debt relief to Exports				0.00001		–0.000003
				(0.000)		(0.000)
Debt relief indicator*HIPC×NR	0.0003	0.0000	–0.00004	–0.00001	–0.00001	–0.00001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*HIPC×(1–NR)	0.0001	0.00001	–0.000002	–0.000001	0.00001	0.00001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×NR	–0.00247	0.00132	–0.00117	0.00008	–0.00002	–0.00001
	(0.010)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Debt relief indicator*(1–HIPC)×(1–NR)	0.0096	–0.00136	–0.000542	–0.00004	0.00003	0.00000
	(0.009)	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)
Debt service/GDP	0.00173**		0.0008		0.000739**	
	(0.001)		(0.000)		(0.000)	
Debt service/Exports		0.000228*		0.00112*		–0.00007
		(0.000)		(0.001)		(0.000)
Inequality on life expectancy (-1)	0.544***	0.843***	0.950***	0.948***	0.933***	0.924***
	(0.080)	(0.148)	(0.135)	(0.026)	(0.131)	(0.155)
Log (GDP per capita)	–0.00152	–0.000137	–0.000133	0.00103	–0.00039	0.00017
	(0.002)	(0.001)	(0.000)	(0.002)	(0.000)	(0.001)
Trade/GDP	–0.000180*	–0.000019	(0.000)	0.00009	–0.00005	–0.00007
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Population growth	–0.0221***	–0.00926**	–0.00514***	0.00322	–0.00764***	–0.00351
	(0.005)	(0.004)	(0.002)	(0.006)	(0.002)	(0.005)
Fiscal balance	0.00178**	0.00149**	0.000	0.000967*	–0.000143	0.0005
	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
Aid/Investment	(0.000)	–0.0001**	(0.000)	–0.00007	–0.000035	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Corruption	0.0268***	0.00793*	0.00456**	–0.0168	0.00592**	–0.00242
	(0.009)	(0.004)	(0.002)	(0.011)	(0.003)	(0.009)
Polity 2	–0.00134	–0.000044	–0.000124	0.00567**	0.0001	0.00188*
	(0.001)	(0.000)	(0.000)	(0.002)	(0.000)	(0.001)
Observations	1,035	1,035	1,189	1,189	1,188	1,262
Countries	76	76	77	77	77	77
Instruments	72	72	75	72	75	70
Hansen J test (p-value)	0.103	0.126	0.102	0.103	0.108	0.133
AR(1) test	0.002	0.011	0.006	0.001	0.006	0.014
AR(2) test	0.538	0.354	0.262	0.489	0.233	0.458

Notes: All specifications are estimated using two-step System GMM estimator with Windmeijer finite sample correction. AR (1) and AR (2) are Arellano-Bond's 1st and 2nd autocorrelation tests. The Hansen J-statistic reports the p-values for the null of instrument validity. Time fixed effects included but not reported. HIPC = Heavily Indebted Poor Country. NR = Natural Resource. *, **, ***: significance levels of 10%, 5% and 1% respectively. Robust standard errors are in parentheses. Data source: World Bank and UNDP, 1990-2016.

In a nutshell, the fiscal balance variable represents the difference between the government's revenue and expenditure as we use it to measure the effectiveness of the fiscal policy. This data is computed as a percentage of GDP and was collected from Kose et al. (2017). We also replace our aid (as a share of GDP) variable with a much narrower variable – i.e., aid as a share of investment – net of any type of debt relief.

Furthermore, we enrich our set of control variables by constructing a trade openness variable with the sum of exports and imports as a percentage of GDP in order to capture the trade policy environment. We also use an alternative proxy for corruption based on the World Bank's Governance Matters project (Kraay et al., 2010). The database provides governance scores of many countries based on six dimensions such as voice and accountability; political stability; government effectiveness; regulatory quality; rule of law; and control of corruption. These indicators range from -2.5 to 2.5, with higher values indicating 'better' governance. Nevertheless, we only use the last indicator – control of corruption – since it captures the perceived level of corruption. Lastly, as an alternative measure of institutional quality, we use the Polity 2 score gathered from the Polity IV project from the Center for Systematic Peace. The variable ranges from –10 (strongly autocratic) to +10 (strongly democratic) as it captures the quality of political institutions and regime type.

The corresponding findings are summarized in tables 2.16–2.19 as they are again similar to those in the benchmark results (tables 2.2–2.6). Hence, our results are not sensitive to using an alternative set of control variables as we continue to find a positive association of debt relief with human welfare in non-natural resource HIPC countries.

2.4.3.5 Controlling for business cycle fluctuations

The numerous specifications and methodologies described so far might already be sufficient to assess the robustness of our results. Nonetheless, one might be concerned with the fact that our results only account for long-run effects instead of reflecting business cycle factors. Consistent with the debt-growth literature (Pattillo et al., 2011; Marcelino and Hakobyan, 2014), we, therefore, calculate non-overlapping three-years average ($T = 9$) of the data to wash out any short-run cyclical fluctuations.[22] Again, the coefficients remain broadly the same, showing that debt relief improves human welfare only in non-natural resource HIPC countries. For the sake of brevity, the results are available on demand.

[22]The periods are 1990–1992, 1993–1995, 1996–1998, 1999–2001, 2002–2004, 2005–2007, 2008–2010, 2011–2013 and 2014–2016.

2.5 Conclusion

This study examines the impact of debt relief on human welfare with cross-country data from 1990 to 2016 in 80 developing countries. It also explores the potential transmission channels through which debt relief might promote the welfare of the people in beneficiary countries. We show that debt relief improves human welfare in HIPC countries non-dependent on natural resource exports. This positive and significant effect also holds when we control for the level of indebtedness and institutional quality in this group of countries. When we disaggregate our measure of human welfare, the results reveal that national income and improvements in education appear to be the transmissions channels of the effect of debt relief on human welfare. Although debt relief also improves income level in natural resource dependent HIPC states, its overall impact on human welfare reveals to be insignificant even after we control for debt burden and institutional quality. These findings support the idea that HIPC countries dependent on natural resource do not suffer from debt overhang. In addition, we find no evidence of the impact of debt relief on human welfare in non-HIPC countries.

The empirical results presented here provide an important policy implication which exhorts the relevance of debt relief to be tailored to country-specific characteristics. For example, resource dependent countries tend to suffer from low institutional quality (Mehlum et al., 2006) and evidence from this study suggests that a considerable improvement in the quality of institutions in this group of countries might be determinant to attain a significant positive effect of debt relief on human welfare. If debt relief grants are tied to a set of economic reforms and its effectiveness still differ among beneficiary countries, a one-size-fits-all policy reform does not seem to be the most suitable. More transparency in resource rich countries – i.e., minimizing corruption, rent-seeking activities and bureaucracy – especially in the resource sector should be more required.[23]

We also believe that the high and persistent swings in the primary commodity prices have been determinant for the sustainability of external debt in commodity export countries and their framework of debt sustainability should be adjusted to policy responses which support sustainable growth and development in a context of commodity price shock. For instance, although the recent DSF of IMF (2018) already evaluates the overall public debt sustainability based on certain characteristics such as dependency on primary commodity exports, specific projects in the natural resource sector should be taken into consideration cautiously in the DSF framework because very often the majority of them turn out to be unachievable in the context of lower commodity prices.

[23]For example, as we saw recently in Mozambique the unreported loan from a state-owned company with a sovereign guarantee.

Chapter 3

Debt Relief and Fiscal Response of African Heavily Indebted Poor Countries: theory and evidence

3.1 Introduction

In the late 1990s, international debt bailouts gained attention with the advent of the Heavily Indebted Poor Countries (HIPC) initiative that aimed to ensure that no poor country faced an unsustainable debt burden. The initiative was established by the Bretton Woods financial institutions, the World Bank and the International Monetary Fund (IMF), as they decided to review it in 1999 by strengthening the link between debt relief, social policies and poverty reduction (IMF, 2019*b*). In the mid-2000s, the program built momentum through the Multilateral Debt Relief Initiative (MDRI) which allowed beneficiary countries for 100 percent relief on eligible debts in order to accelerate their progress toward the Millennium Development Goals (MDGs). At present, donors have committed over $76 billion in debt service-relief for 36 countries that reached the completion point[1] of which 30 of them are in Africa (IMF, 2019*b*).

The aim of this paper is to evaluate the impact of debt relief grants stemming from HIPC and MDRI initiatives on the budget of African beneficiary countries. While overlooking the fact that debt relief is provided primarily to the recipient government and therefore any economic benefit would depend on its behavior, a large strand of the economic literature has concentrated on the effect of debt relief on economic growth (Arslanalp and Henry, 2004; Johansson, 2010; Djimeu, 2018). Although this deficiency towards the estimation of the macroeconomic benefits of such foreign capital inflows is also observed in the aid-growth literature (Hansen and Tarp, 2001; Easterly, 2003), the seminal paper of Heller (1975) addressed this shortcoming by evaluating the fiscal behavior of aid recipient countries vis-à-vis aid capital inflows. Heller recognized that any effect on the macroeconomic performance of aid beneficiary governments would be mediated by the public sector fiscal behavior. Subsequently, with contributions from Binh and McGillivray (1993); Franco-Rodriguez et al. (1998); McGillivray and Ouattara (2005); Feeny and McGillivray (2010) the aid-fiscal response literature has expanded rapidly.

It is well established these days that the main purpose of debt relief for HIPC countries is to eliminate the well-known 'debt overhang' phenomenon.[2] The premise is that the debt overhang – i.e., unsustainable public debt – minimizes the country's ability to finance fiscal incentives. As such, the additional resources from debt service relief provided by donors are expected to improve the mobilization of tax revenue so that well-targeted

[1] Under the HIPC initiative, when a country reaches the completion point it is eligible to receive a full irrevocable debt relief previously agreed at the decision point. For more details see IMF (2019*b*).

[2] Following Krugman (1988) and Sachs (1989) the debt overhang theory postulates that investors in a country with unsustainable levels of debt will anticipate higher future taxes to finance debt service payments. This may result in sub-optimal investment in the private sector which therefore negatively affects economic growth. Besides, a high debt burden might discourage the government to undertake important macroeconomic reforms which could make more funds available for debt service payments. Therefore, debt forgiveness would leave both, the debtor and the creditor, better off.

public expenditure can be sustainable. Although debt relief is an important instrument of international development assistance, hardly any research has attempted to explore the fiscal response behavior of beneficiary countries, the exception being Cassimon and Van Campenhout (2007).[3] This is rather surprising since debt relief is expected to instigate fiscal response impacts on recipient countries as advocated by the debt overhang and fiscal response theoretical frameworks. For example, Cassimon and Van Campenhout (2007) examined the fiscal impacts of debt relief, in relation to other forms of aid, on public finance of 28 HIPC countries from 1991 to 2004. They relied on a panel VAR framework and concluded that debt relief stimulates both current and capital expenditure, even though the impact on this latter is delayed.

Notwithstanding, we depart from the above-mentioned paper in four distinctive manners. First, we develop a simple theoretical model which considers an interaction among different categories of government expenditure as well as domestic and foreign revenues, while allowing for endogenous debt relief. In other words, we consider that policymakers in HIPC countries when determining the allocation of revenues and expenditures take into consideration revenues from debt relief grants. This assumption does not necessarily mean that the social planner in beneficiary countries has control over the donor's decision on debt relief allocation but rather on the allocated amount that is actually spent (Franco-Rodriguez et al., 1998). Second, to estimate the fiscal behavior of HIPC countries in relation to debt relief inflows, we use a comprehensive and more advanced panel VAR approach based on the Generalized Method of Moments (GMM) framework rather than OLS estimation. This approach allows for endogenous interaction between the variables in the system which addresses the endogeneity problem that previous studies have neglected. More specifically, this approach takes into consideration the fact that debt relief can have an impact on fiscal variables of beneficiary countries; however, at the same time, debt relief may be influenced by fiscal conditions of these countries. Third, we build and introduce a more comprehensive measure of debt relief covering a wide range of countries. While this new measure is based on reductions in debt service payments, it accounts for the market's view of the probability of default of HIPC countries after receiving debt relief grants. This measure is particularly important for the estimation of the impact of debt relief transfers because it allows us to compute the resources actually stemming from debt relief by taking into consideration previous debt situations. Lastly, we uncover, for the first time, the fiscal response of social outlays (i.e., expenditure on health and education) to debt relief programs in African HIPC countries. The fiscal responses of expenditure on health and education are of great interest to the extent that debt relief development policies are increasingly aimed at supporting social spending. As advocated by the sponsors of the HIPC initiative, the resources freed from debt relief

[3]We also acknowledge the study of Cassimon et al. (2015) who use a similar empirical setting as Cassimon and Van Campenhout (2007) and find identical results.

policies should ensure an increase in public social spending to improve the welfare of the poor (IMF and IDA, 2011).

A quick glimpse at the results of this paper shows evidence that debt relief improves domestic tax mobilization in recipient countries, which lends support to the debt overhang theory, even though it is more pronounced in HIPC fragile states. On the other hand, our analyses reveal a heterogenous fiscal response of current and capital expenditure to debt relief between fragile and non-fragile countries. The fiscal responses of public spending variables are broader and stronger in the former group of countries even when we consider social public expenditures. The findings of this study are robust to an extensive array of robustness exercises that are similar to its benchmark results. The rest of the paper is organized as follows. Section 3.2 presents and discusses the fiscal response model utilized in this study. Section 3.3 describes the data and outlines the econometric methodology. Section 3.4 presents the empirical results and discussions. Finally, section 3.5 concludes the paper.

3.2 Theoretical foundation

The fiscal response model developed by Heller (1975) is our starting point. The model postulates that among different categories of expenditure, policymakers face the problem of allocating different types of revenue to maximize their utility. For the purpose of this study, we assume that policymakers in debt relief recipient countries act as a single individual with a homothetic and well-behaved preference map, and with the following utility function:

$$U = f(r,\ ce,\ p,\ ed,\ eh,\ df,\ el,\ eg,\ dr) \tag{3.1}$$

Where r stands for total domestic revenue, ce stands for capital expenditure, p for current expenditure, ed for education expenditure, eh for health expenditure, df for the flow of public borrowing from domestic sources, el for external loans, eg for external grants and dr for debt relief. Given the fact that debt relief inflows are deemed to be spent on socio-economic development expenditures, we delineate four expenditure categories (i.e., ce, p, ed, eh)[4] to match a functional differentiation reflected in the budget of many HIPC countries. In the spirit of Binh and McGillivray (1993), we assume that policymakers set an annual target for each revenue and expenditure category in a rational and utility-

[4]In section 3.3, we explain in more detail what is incorporated in each expenditure category.

maximizing manner which consists in the following quadratic loss function:

$$U = a_0 - \frac{a_1}{2}(r - r^*)^2 - \frac{a_2}{2}(ce - ce^*)^2 - \frac{a_3}{2}(p - p^*)^2 - \frac{a_4}{2}(ed - ed^*)^2 - \frac{a_5}{2}$$
$$(eh - eh^*)^2 - \frac{a_6}{2}(df - df^*)^2 - \frac{a_7}{2}(el - el^*)^2 - \frac{a_8}{2}(eg - eg^*)^2 - \frac{a_9}{2}(dr - dr^*)^2 \tag{3.2}$$

Where $a_0 > 0$ for $i = 1, 2, ...9$ are the weight attached to each element of the utility function while the target levels which policymakers seek to attain are represented by the starred variables. It is undesirable for policymakers to deviate from these targets by either undershooting or overshooting these amounts as it may result in a loss of their utility. As previously explained, in equation 3.2 we endogenize debt relief by assuming that the amount of debt relief actually allocated and spent on different categories of expenditure is subject to a large degree of discretion of beneficiary countries, even though the relief committed is determined by the creditors. An inspection of previous debt relief reports reveals that the amount of debt relief disbursed usually differs from the amount committed (IMF and IDA, 2011; IMF, 2019*a*). This is often the case when recipient countries have limited absorptive capacity to accommodate foreign capital inflows. The same situation applies to external loans and grants. In line with Franco-Rodriguez et al. (1998), we assume that to maximize equation 3.2 public decision-makers are subjected to the following budget constraints:

$$ce + \ p = r + df + \ el + \ eg + \ dr \tag{3.3}$$

$$ed + \ eh \leq \beta_1 r + \beta_2 df + \ \beta_3 el + \ \beta_4 eg + \ \beta_5 dr \tag{3.4}$$

While equation 3.3 represents the government's overall budget which must always hold, equation 3.4 determines the maximum percentage of each government's source of funding that can be directed to expenditure on education and health. As such, the coefficients β_s are between 0 and 1. The inequality in equation 3.4 indicates the fact that usually in developing countries there exist external constraints which may limit the way in which policymakers allocate revenues to expenditures. For example, raising taxes has political costs which may cause pressures from different social groups that seek to influence the allocation of revenues. Furthermore, given the fact that funds released from debt relief are tied to social spending (e.g. education and health outlays) it also gives donors some degree of influence over the revenue setting targets. Even though revenues may satisfy equation 3.3, there is no guarantee that expenditure targets will be attained with these external constraints. To evaluate the impact of debt relief on the budget of recipient countries, we maximize equation 3.2 subject to constrains set in equations 3.3

and 3.4 to derive the structural equations. Assuming that equation 3.4 is binding, the lagrangian is applied as follows:

$$\begin{aligned} L = a_0 - \frac{a_1}{2}(r - r^*)^2 - \frac{a_2}{2}(ce - ce^*)^2 - \frac{a_3}{2}(p - p^*)^2 - \frac{a_4}{2}(ed - ed^*)^2 \\ -\frac{a_5}{2}(eh - eh^*)^2 - \frac{a_6}{2}(df - df^*)^2 - \frac{a_7}{2}(el - el^*)^2 - \frac{a_8}{2}(eg - eg^*)^2 \\ -\frac{a_9}{2}(dr - dr^*)^2 + \lambda_1 (ce + \ p - r - df - \ el - \ eg - \ dr) \\ +\lambda_2 (ed + \ eh - \beta_1 r - \beta_2 df - \ \beta_3 el - \ \beta_4 eg - \ \beta_5 dr) \end{aligned} \tag{3.5}$$

Where λ_1 and λ_2 are the lagrangian multipliers associated with constraints in equations 3.3 and 3.4. We can obtain the first-order conditions by partially differentiating equation 3.5 with respect to current policy variables:

$$\frac{\partial L}{\partial r} = -\ a_1(r - r^*) - \lambda_1 - \lambda_2\beta_1 = 0 \tag{3.6}$$

$$\frac{\partial L}{\partial ce} = -\ a_2(ce - ce^*) + \lambda_1 = 0 \tag{3.7}$$

$$\frac{\partial L}{\partial p} = -\ a_3(p - p^*) + \lambda_1 = 0 \tag{3.8}$$

$$\frac{\partial L}{\partial ed} = -\ a_4(ed - ed^*) + \lambda_2 = 0 \tag{3.9}$$

$$\frac{\partial L}{\partial eh} = -\ a_5(eh - eh^*) + \lambda_2 = 0 \tag{3.10}$$

$$\frac{\partial L}{\partial df} = -\ a_6(df - df^*) - \lambda_1 - \lambda_2\beta_2 = 0 \tag{3.11}$$

$$\frac{\partial L}{\partial el} = -\ a_7(el - el^*) - \lambda_1 - \lambda_2\beta_3 = 0 \tag{3.12}$$

$$\frac{\partial L}{\partial eg} = -\ a_8(eg - eg^*) - \lambda_1 - \lambda_2\beta_4 = 0 \tag{3.13}$$

$$\frac{\partial L}{\partial dr} = -\ a_9(dr - dr^*) - \lambda_1 - \lambda_2\beta_5 = 0 \tag{3.14}$$

$$\frac{\partial L}{\partial \lambda_1} = ce + \ p - r - df - \ el - \ eg - \ dr = 0 \tag{3.15}$$

$$\frac{\partial L}{\partial \lambda_2} = ed + \ eh - \beta_1 r - \beta_2 df - \ \beta_3 el - \ \beta_4 eg - \ \beta_5 dr = 0 \tag{3.16}$$

Following Moseley et al. (1987) and Gang and Khan (1990) we assume, *ex ant*, that in beneficiary countries of debt relief there is not a target for domestic borrowing ($df^* = 0$). This assumption entails that policymakers will only borrow from the domestic market if revenues, debt relief, and external loans and grants fail to meet all expenditures. Therefore, we generate the following system of structural equations[5] after rearranging the

[5]We provide in appendix C a detailed derivation, step-by-step, of the structural equations.

first-order conditions to substitute out λ_1 and λ_2:

$$
\begin{aligned}
r &= \varphi_1 r^* + \varphi_2(p - p^*) - \varphi_3 ce - \varphi_3 p + \varphi_3 el + \varphi_3 eg + \varphi_3 dr \\
ce &= \varphi_4 ce^* - \varphi_5 p^* + \varphi_5 r + \varphi_5 df + \varphi_5 el + \varphi_5 eg + \varphi_5 dr \\
p &= \varphi_5 p^* - \varphi_4 ce^* + \varphi_4 r + \varphi_4 df + \varphi_4 el + \varphi_4 eg + \varphi_4 dr \\
ed &= \varphi_6 ed^* - \varphi_7 eh + \varphi_7 \beta_1 r - \varphi_8 \beta_2 (p - p^*) + \varphi_7 \beta_3 el + \varphi_7 \beta_4 eg + \varphi_7 \beta_5 dr \\
eh &= \varphi_9 eh^* - \varphi_{10} ed + \varphi_{10} \beta_1 r - \varphi_{11} \beta_5 (p - p^*) + \varphi_{10} \beta_3 el + \varphi_{10} \beta_4 eg + \varphi_{10} \beta_5 dr \\
df &= \varphi_{12} r - \varphi_{12} ce + \varphi_{12} el + \varphi_{12} eg + \varphi_{12} dr - \varphi_{13} p^* - \varphi_{14} p \\
el &= \varphi_{15} el^* - \varphi_{16}(ce - ce^*)(\beta_2 + \beta_3) - \varphi_{17} \beta_4 \beta_2^{-1} ce - \varphi_{17} \beta_4 \beta_2^{-1} p + \varphi_{17} \beta_4 \beta_2^{-1} r \\
&\quad + \varphi_{17} \beta_4 \beta_2^{-1} eg \ + \varphi_{17} \beta_4 \beta_2^{-1} dr \\
eg &= \varphi_{18} eg^* - \varphi_{19}(ce - ce^*)(\beta_2 + \beta_4) - \varphi_{20} \beta_4 \beta_2^{-1} ce - \varphi_{20} \beta_4 \beta_2^{-1} p + \varphi_{20} \beta_4 \beta_2^{-1} r \\
&\quad + \varphi_{20} \beta_4 \beta_2^{-1} el + \varphi_{20} \beta_4 \beta_2^{-1} dr \\
dr &= \varphi_{21} dr^* - \varphi_{22}(ce - ce^*)(\beta_2 + \beta_5) - \varphi_{23} \beta_5 \beta_2^{-1} ce - \varphi_{23} \beta_5 \beta_2^{-1} p + \varphi_{23} \beta_5 \beta_2^{-1} r \\
&\quad + \varphi_{23} \beta_5 \beta_2^{-1} el + \varphi_{23} \beta_5 \beta_2^{-1} eg
\end{aligned}
$$

One of the drawbacks of the fiscal response literature has been the estimation of the target variables included in the model. Different techniques such as OLS and cointegration have been used by previous studies to overcome this problem. Nevertheless, because the aim of this study is to examine the influence of debt relief on fiscal variables rather than deriving the target values, in the next section we approximate our variables from economic relationships in a panel VAR system following Ouattara (2006).

3.3 Methodology

3.3.1 Data

The study is conducted using economic data for 30 African HIPC countries from 1990 to 2017. Data availability on financial operations in the public sector for low-income countries is always a constraint; however, we construct a unique dataset by using IMF country reports including article IV reports, and HIPC completion point documents as the main sources of data. Because we prefer the sample to be as homogenous as possible, our analyses are restricted to only sub-sahara African HIPCs which have reached the completion point.[6]

It is not an easy task to consider a debt relief measure that provides a straightfor-

[6]Table C.2 in appendix C presents the list of countries.

ward or direct fiscal space[7] effect on fiscal variables. Since this study aims to evaluate the impact of the enhanced HIPC and MDRI assistance on selected fiscal variables, we construct a measure of debt relief in a similar way to Cassimon and Van Campenhout (2007). They compute the debt service savings from enhanced HIPC by using the difference between the debt service due without the enhanced HIPC and the debt service due after the Enhanced HIPC. By the same token, they compute the change between the debt service due after the MDRI to the debt service due after the Enhanced HIPC to generate the debt service savings from the MDRI. Thus, we use the sum of debt service savings from both programs – i.e., enhanced HIPC and MDRI – as our main measure of debt relief. Secondly, we use an alternative measure of debt relief, based on the market value of debt, following a similar methodology as Cohen (2001). While the present value of debt relief reflects the degree of concessionality by reassessing the discount factor, the market value is the one that takes into account the risk of non-payment: rescheduling, arrears and constrained refinancing of different types. As such, we compute this variable with data built on principal forgiven, interest forgiven, principal rescheduled, and interest rescheduled taken from World Development Indicators. By considering the preceding debt situations, the market value would allow us to compute the true amount of resources released by donor countries (Cohen, 2001). For simplicity, we will refer to the first measure as *debt service relief* and the second measure as *debt relief as a share of GDP*. Hence, we posit the following hypothesis:

H_1: Debt relief improves domestic tax collection in African beneficiary countries.

Following the fiscal response model developed in section 3.2, the fiscal variables are based on a dataset from both revenue and expenditure sides[8] constructed with IMF's articles IV reports and HIPC completion point documents. On the former side, we collect data for total domestic revenue net of external grants. Since most of the African HIPCs are natural resource export-dependent countries, we disaggregate this variable into domestic revenue net of external grants and domestic revenue net of external grants and natural resource revenues.[9] This will allow us to properly capture how debt relief influences the domestic mobilization of resources in beneficiary countries. On the expenditure side, we discriminate between government primary current expenditure and government capital expenditure. The former is net from interest payments, and it encompasses, *inter alia*, expenses on consumables, wages and salaries. Government capital

[7]This term was introduced by Heller (2005). According to the author, fiscal space refers to the available budget room that enables a government to provide resources for specific services – e.g., health and education sectors – without jeopardizing the sustainability of its financial position.

[8]As a robustness check, we include other macroeconomic variables (e.g. real exchange rate, commodity price, inflation rate, and level of income) which may have a significant effect on various elements of expenditure and taxation. The results are available upon request as they are in line with the benchmark outcomes.

[9]The natural resource revenues are primarily from hydrocarbon or mining-related activities.

expenditure, on the other hand, includes infrastructure investment in roads, rail airports, public hospitals, among others. Because we are also interested in identifying how social spending responds to debt relief flows, we collect data for government expenditure on education and government expenditure on health. These latter two expenditure variables will be alternatively used with the former two expenditure variables so that we can confirm the underlying assumption of whether the impact of debt relief is stronger on social expenditure variables.

Following the fiscal response literature on debt relief and aid (Mavrotas, 2002; Gupta et al., 2003) and in line with our model in section 3.2, we also account for the budget financing variables. We collect data for domestic financing which represents funding from the central and commercial banks as well as government bonds insurances. we also gather disaggregated data for external funding based on development programs and projects such as external loans and external grants components. Both variables are net of any kind of debt relief grants. All variables described above are expressed as a percentage of GDP.[10]

3.3.2 Empirical model

In order to investigate the fiscal response effects of debt relief, this paper employs a panel-data vector autoregressive model (p-VAR). This methodology combines the traditional VAR approach, treating all the variables in the system as endogenous, with the panel dimension of the data which allows for unobserved individual heterogeneity. In line with the model developed in section 3.2, we approximate the economic relationship of our model in a panel VAR system specified as follows:

$$\begin{bmatrix} r_{i,t} \\ G_{i,t} \\ p_{i,t} \\ X_{i,t} \end{bmatrix} = \begin{bmatrix} a_r^0 \\ a_G^0 \\ a_p^0 \\ A_X^0 \end{bmatrix} + \sum_{m=1}^{n} \begin{bmatrix} c_{rm}^r & c_{rm}^G & c_{rm}^p & C_{rm}^X \\ c_{Gm}^r & c_{Gm}^G & c_{Gm}^p & C_{Gm}^X \\ c_{pm}^r & c_{pm}^G & c_{pm}^p & C_{pm}^X \\ C_{Xm}^r & C_{Xm}^G & C_{Xm}^p & C_{Xm}^X \end{bmatrix} \begin{bmatrix} r_{i,t-m} \\ G_{i,t-m} \\ p_{i,t-m} \\ X_{i,t-m} \end{bmatrix} + \mu_i + \pi_t + \begin{bmatrix} \varepsilon_{i,t}^r \\ \varepsilon_{i,t}^G \\ \varepsilon_{i,t}^p \\ E_{i,t}^X \end{bmatrix}$$

As before, $r_{i,t}$ represents the total domestic revenue for country i in year t while $G_{i,t} = (ce_{i,t}\ ed_{i,t}\ eh_{i,t})$ denotes the vector for capital expenditure, $ce_{i,t}$, expenditure on education, $ed_{i,t}$ and expenditure on health, $eh_{i,t}$. The primary current expenditure for country i in year t is represented by $p_{i,t}$, and $X_{i,t} = (df_{i,t}\ el_{i,t}\ eg_{i,t}\ dr_{i,t})$ is the vector representing the domestic and external financing variables along with the debt relief variables. As previously, $df_{i,t}$ is domestic financing, $el_{i,t}$ denotes external loans, $eg_{i,t}$ represents external grants and $dr_{i,t}$ is the vector of the two debt relief variables as described in the last section. While a^0 represents the constant for each equation, A^0 is the constant vector for

[10]Table C.1 in appendix C presents the summary statistics of all the variables.

the financing and debt relief variables in the system. All VAR parameters to be estimated in each equation of the system are given by c_m and the rest of the variables in the system are represented by C_m as the vector of VAR parameters. μ_i and π_t denote country and time fixed effects in each equation of the system, respectively, while m represents the number of lags in the VAR system.[11] Lastly, $\varepsilon_{i,t}$ represents the traditional error term and $E_{i,t}$ is the vector of standard error terms for the rest of the variables in the system. In more general terms, the panel VAR model specified above takes the following form:

$$Y_{i,t} = A^0 + \sum_{m=1}^{n} C_m Y_{i,t-m} + \mu_i + \pi_t + E_{i,t} \tag{3.17}$$

Where $Y_{i,t}$ is a vector of interdependent system variables and the remaining variables are defined as previously. In order to address concerns about the presence of unit roots, we look at the data properties by conducting panel unit root tests. Table 3.1 exhibits the results of the Fisher Augmented Dickey-Fuller (ADF) and Fisher Phillips-Perron (PP) tests of unit roots in which the null hypothesis is that all series are non-stationary while the alternative hypothesis is that at least one of the series (in the panel) is stationary. As the table reveals, the Fisher ADF tests fail to reject the null hypothesis for most variables in levels, whereas the Fisher PP tests reject the presence of unit roots for only two variables. However, after tanking first difference all the series become stationary either with the Fisher ADF tests or the Fisher PP tests.

To identify the optimal model and moment selection tests used for lag length selection, we rely on overall Coefficient of Determination (CD) and Moment and Model Selection Criteria (MMSC) developed by Andrews and Lu (2001). These criteria are based on Hansen's J statistic since they require the number of moment conditions to be superior to the number of endogenous variables in the model. Following the criteria, we use a first-order panel VAR for the main results, but as robustness checks, we consider deeper-order panel VARs.[12]

3.3.3 Estimation and identification strategy

Following Love and Zicchino (2006) and Abrigo and Love (2016) we prefer to use the Helmert procedure (forward mean-differencing) rather than the fixed-effects estimator. Since the inclusion of lags of the dependent variables induces fixed effects to be correlated with the regressors, the standard mean-differencing to eliminate fixed effects would yield biased coefficients (Holtz-Eakin et al., 1988). Therefore, the Helmert transformation

[11] In this study, we use one lag. Therefore, $m = 1$.

[12] We also consider the MMSC-Akaike's information criterion (MMSC-AIC) and it supports the use of one lag. Results are available upon request.

Table 3.1: Fisher Panel unit root tests

Variable	Augmented Dickey-Fuller	Phillips-Perron
debt service relief		
Level	–0.58	–2.68***
Difference	–10.51***	–18.71***
Debt Relief/GDP		
Level	–10.02***	–17.22***
Difference	–21.52***	–22.76***
Total Domestic Revenue		
Level	–0.52	–3.17***
Difference	–9.10***	–23.35***
Total Domestic Non-natural Resource Revenue		
Level	–1.23	–4.04***
Difference	–8.95***	–23.72***
Primary Current Expenditure		
Level	–0.91	–1.82**
Difference	–7.88***	–16.58***
Capital Expenditure		
Level	–4.2***	–4.92***
Difference	–10.02***	–19.95***
Government Expenditure on Education		
Level	–1.5*	–1.98**
Difference	–6.01***	–12.85***
Government Expenditure on Health		
Level	1.52	2.77
Difference	–8.38***	–15.38***
Domestic Financing		
Level	–5.69***	–12.12***
Difference	–12.48***	–30.52***
External Loans		
Level	–3.80***	–6.23***
Difference	–10.59***	–31.32***
External Grants		
Level	–1.69**	–4.97***
Difference	–9.68***	–29.21***

Note: This table illustrates the panel unit root tests based on the Fisher Augmented Dickey-Fuller (ADF) and the Fisher Phillips-Perron (PP) tests. the null hypothesis is that all series are non-stationary. We provide the definition of the variables in section 3.3.1. *, **, *** indicate significance levels of 10%, 5% and 1% respectively. Data source: HIPC completion point documents, 1990-2017.

removes only the mean of all future observations available for each country-year (Love and Zicchino, 2006). Moreover, with this transformation, the orthogonality between the transformed variables and lagged regressors is preserved as it allows for the use of lagged regressors as instruments and estimate the coefficients by system GMM (Arellano and Bover, 1995). Thus, we can rewrite equation 3.17 in terms of forward orthogonal deviation for every element $y_{i,t} \in Y_{i,t}$ as follows:

$$y^*_{i,t} = (y_{i,t} - \bar{y}_{i,t})\sqrt{\frac{T_{it}}{T_{it}+1}} \tag{3.18}$$

Where $\bar{y}_{i,t}$ is the average of all available future observations and T_{it} denotes the number of available future observations for panel i at time t. One of the prominent features of the panel VAR is the use of impulse-response functions (IRFs) to examine the fiscal response effects of debt relief. In this setting, this paper focuses on IRFs, derived from p-VAR models in line with equation 3.17, to evaluate the response of one variable to an orthogonal shock in another variable, while keeping the remaining variables constant. In doing so, we rely on a Cholesky decomposition structure over the variance-covariance matrix of residuals to identify orthogonal shocks in the debt relief variables and explore their impact on the remaining variables in the system. This implies that variables which appear first in the system are expected to be the most exogenous, affecting subsequent variables contemporaneously and with a lag, while the variables (less exogenous) that come later influence other variables only with a lag. Hence, we adopt the following recursive ordering:[13] **debt relief → external grants → external loans → domestic financing → domestic revenue → primary current expenditure/expenditure on health → capital expenditure/expenditure on education**.

We place debt relief at the very beginning of the ordering because we believe that it is expected to impact many, if not all, other variables in the model contemporaneously while at the same time be influenced with a lag by other variables in the system. For instance, previous studies have shown that external grants and new loans tend to fall when debt relief increases in beneficiary countries (Arslanalp and Henry, 2006; Powell and Bird, 2010). Moreover, the conditionality attached to debt relief are aimed at improving domestic revenue mobilization as well as increasing investments and social programs that are perceived as particularly meritorious (Debrun et al., 2006). Since debt relief also helps beneficiary countries to save up resources that would otherwise be spent on debt service payments, it reduces public debt and thereby alleviates excessive domestic (financing) borrowing. Fiscal variables enter the ordering after budget financing variables because capital expenditure, for example, is likely to respond more quickly to external loans while external loans respond to capital expenditure shocks with a lag because it takes time for

[13] As a robustness check we invert the recursive ordering at least three times.

the return on the investment to justify the cost of borrowing.

We also need to take into account the standard errors of the impulse response functions as their matrices are constructed from p-VARs estimated coefficients. To calculate standard errors, we generate confidence intervals for the impulse response functions using Monte Carlo simulation. More specifically, in this paper, we conduct 500 random draws of the coefficients of the model and use the estimated coefficients as well as their variance-covariance matrix to generate 5^{th} and 95^{th} percentiles of this distribution and then use as confidence intervals for the impulse-responses. In this regard, there is evidence of a statistically significant response to the shock imposed, when the zero line lies outside the confidence bands.

3.4 Empirical results

3.4.1 Baseline results

This section presents the results of the estimation in the form of impulse response functions derived from the estimated p-VAR models as shown in tables 3.2, 3.3 and 3.4.[14] In the interest of space, we only report results from total domestic revenue (and net from natural resource), public expenditure and social expenditure variables to a unity shock in debt relief. However, the models we estimate are as follows:

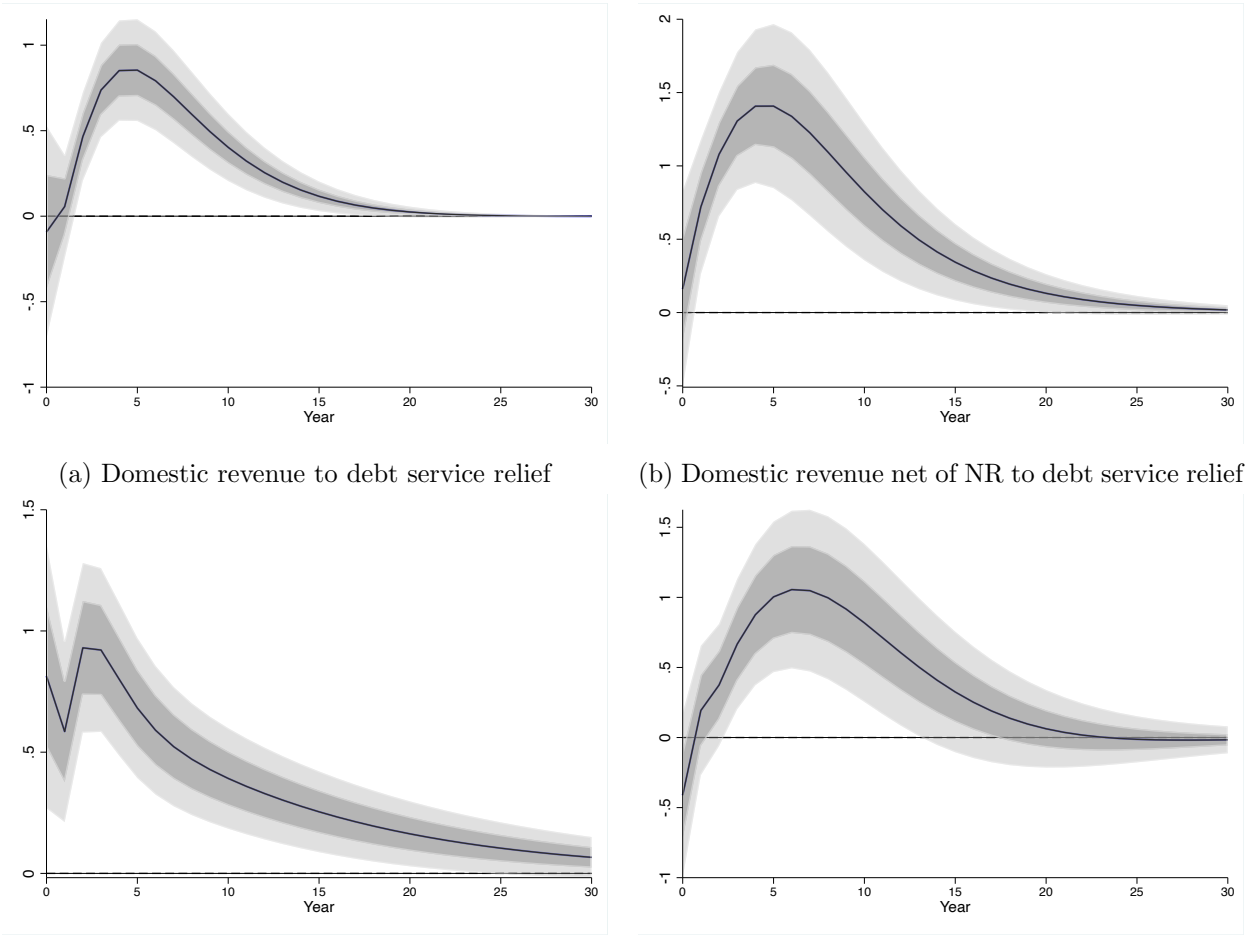
$$[\Delta dr \quad \Delta el \quad \Delta eg \quad \Delta df \quad \Delta r \quad \Delta ce \quad \Delta p]'$$

$$[\Delta dr \quad \Delta el \quad \Delta eg \quad \Delta df \quad \Delta r \quad \Delta ed \quad \Delta eh]'$$

As such, figure 3.1 displays the response of domestic revenue (or domestic revenue net of natural resource receipts) to a one-standard deviation shock in debt relief as a share of GDP (or debt service relief). All graphs illustrate the response for the first 30 years (x-axis) and the dark (light) grey areas indicate the 70 (95)% confidence intervals generated using Monte Carlo simulations with 500 repetitions. We start with the relationship between debt service relief and the measures of domestic tax mobilization (gross) and net from natural resource (top panel). Notably, the results in both figures are unanimous in implying that either domestic revenue gross or net of natural resource receipts respond positively to debt relief shocks, even though the initial impact on the former is significantly negative at 5% confidence level as illustrated by the panel VAR coefficient in table 3.2. As a result, a rise in debt service relief from HIPC and MDRI initiative is followed on impact

[14]The panel VARs satisfy the stability conditions since the moduli of eigenvalues of the fitted models are less than a unity. These results are available upon request.

by an increase in gross and net domestic resource mobilization, which reaches a maximum after 5 and 6 years, respectively before they vanish out 20 years later. Turning to the alternative proxy of debt relief (i.e., debt relief as a share of GDP), we may infer a fairly similar response of domestic tax mobilization when we consider either measure of domestic revenue (bottom panel). In both graphs, domestic tax revenue responds significantly positive to a one standard deviation shock in debt relief (being more pronounced when domestic revenue excludes natural resource receipts). This is also in accordance with the results exposed in the panel VAR (table 3.2) where a rise of 10% in debt relief as a percentage of GDP is significantly associated with an increase of about 0.41% and 0.47% in domestic revenue gross and net of natural resource, respectively.



(a) Domestic revenue to debt service relief

(b) Domestic revenue net of NR to debt service relief

(c) Domestic revenue to debt relief/GDP

(d) Domestic revenue net of NR to debt relief/GDP

Figure 3.1: Orthogonalized impulse response functions for domestic revenue (gross) and net from natural resource to a one standard-deviation innovation in debt service relief (top panel) and debt relief as a share of GDP (bottom panel), for 30 years after the shock. The dark (light) grey areas indicate the 70 (95)% confidence intervals generated using Gaussian approximation of 500 Monte Carlo draws from a fitted panel VAR. NR stands for natural resource. Data source: HIPC completion point documents, 1990-2017.

Even though there are (small) differences in magnitude across different indicators, the consistency of the results supports the fact that our model is well specified. In general, this

Table 3.2: Debt relief impacts on total domestic revenues

Dependent variable	Domestic revenue		Domestic revenue net of NR	
	(I)	(II)	(III)	(IV)
debt service relief (Δ)	–0.1984**		1.1535***	
	(0.0810)		(0.1095)	
Debt relief/GDP (Δ)		0.0412***		0.0476***
		(0.0129)		(0.0176)

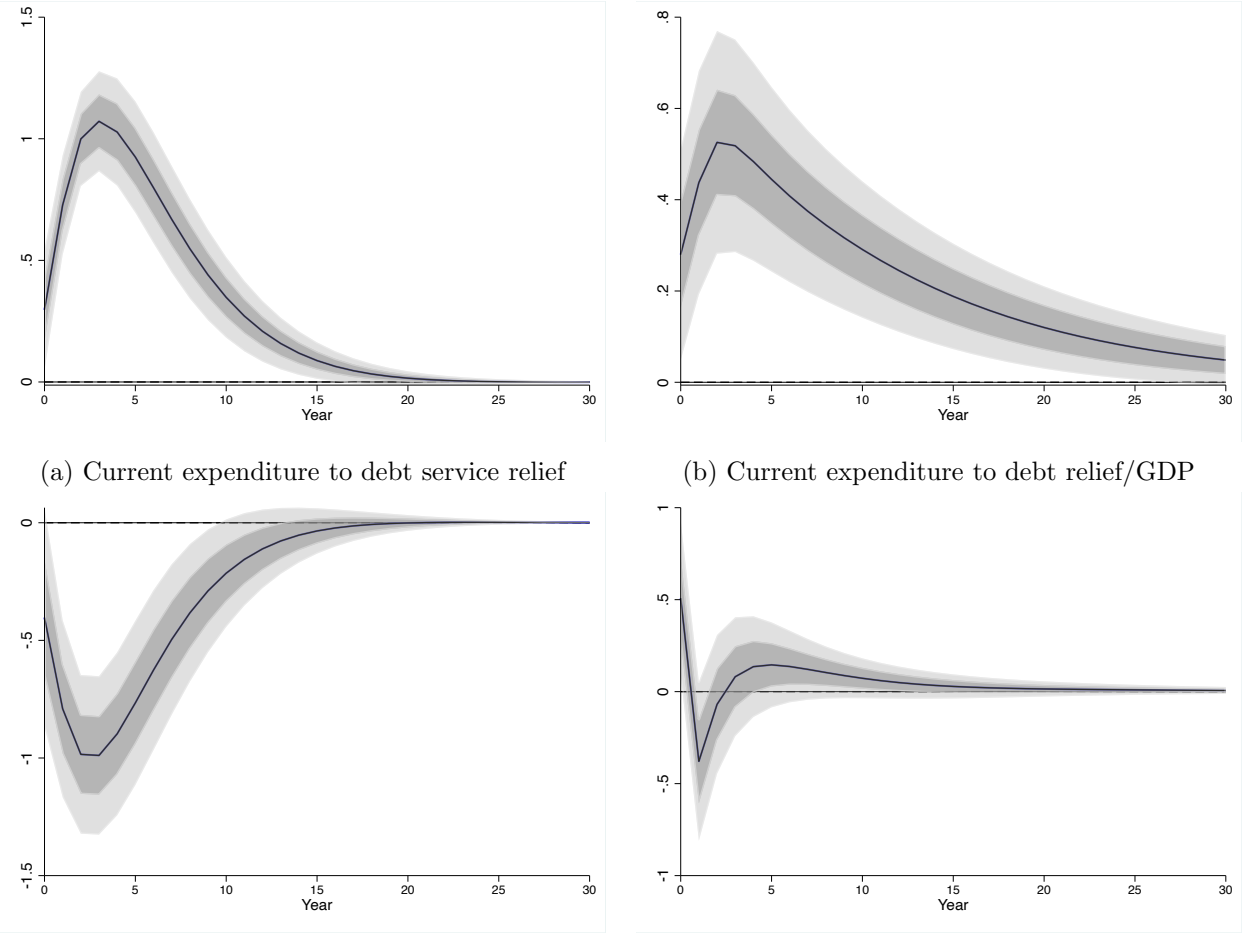
Note: This table illustrates the panel VAR estimation results via GMM. The estimates are based only on the equations of domestic revenue (gross) and net from natural resource. Fixed effects are removed prior to estimation (see section 3.3). *, **, ***: significance levels of 10%, 5% and 1% respectively. The numbers in parentheses are standard errors. NR stands for natural resource. Data source: HIPC completion point documents, 1990-2017.

novel empirical pattern that emerges from the analyses lends support to the debt overhang theory which predicts the tendency of heavily indebted poor countries to increase their tax collection effort after being granted debt relief. Moreover, the domestic tax collection as a share of GDP is higher (by 0.6 percentage points) when natural resource recipients are excluded.

We now turn our attention to the impact of debt relief on public expenditure variables since, as favoured by the donors, they are expected to react (especially social spending variables) following a debt relief assistance. Figure 3.2 exhibits the results for the impulse-response of primary current expenditure and capital expenditure to a unity shock in debt relief indicators. The results reveal that the impact of both debt service relief and debt relief as a share of GDP (top row) exert a positive and significant effect on current primary expenditure. Even though the pattern of increasing current expenditure is noticeable when we consider both measures of debt relief, the increment seems to be more pronounced with shocks in debt service relief from HIPC and MDRI initiatives. For example, the response of current primary expenditure to debt service relief attains its maximum (of 10.3%) in year 4 when compared to a maximum (of 5.3%) in year 2 when the alternative measure is considered (debt relief as a share of GDP) before they both lose their statistical significance after 2 decades. This is also in line with the coefficient of both variables in the panel VAR presented in table 3.3. For instance, a 10% increase in debt service relief and debt relief as a percentage of GDP is associated with an increase of 6.8% and 0.2% in current expenditure. This might expose the fact that debt service relief (from HIPC and MDRI) policies are particularly more oriented to create sustainable and precisely fiscal space in recurrent public expenditure since the alternative measure also captures other debt relief grants which might not be part of the HIPC and MDRI initiatives.

Insofar as the effect of debt relief on capital expenditure is concerned (bottom row), we may infer that this latter reacts negatively and significantly to a unit standard deviation

innovation in debt service relief from HIPC and MDRI assistance, although such response is not statistically significant at 95% confidence level when we consider the alternative measure of debt relief (i.e., debt relief/GDP). This negative impact is consistent even with the panel VAR presented in table 3.3 in which a 10% increase in debt service relief and debt relief is significantly associated with a decline of about 9.16% and 1.06% in capital spending, respectively. This result reveals the ineffectiveness of debt relief policies in promoting productive public investments in beneficiary countries through the macro stabilization programs attached to debt relief assistance.



(a) Current expenditure to debt service relief

(b) Current expenditure to debt relief/GDP

(c) Capital expenditure to debt service relief

(d) Capital expenditure to debt relief/GDP

Figure 3.2: Orthogonalized impulse response functions for capital and current expenditure to a one standard-deviation innovation in debt service relief and debt relief as a share of GDP, for 30 years after the shock. The dark (light) grey areas indicate the 70 (95)% confidence intervals generated using Gaussian approximation of 500 Monte Carlo draws from a fitted panel VAR. Data source: HIPC completion point documents, 1990-2017.

Finally, we also examine the impulse-response of public social expenditure (i.e., health and education) to innovation shocks in debt relief. We begin this analysis with the effect of our measures of debt relief (i.e., debt service relief and debt relief/GDP) in government expenditure on education as illustrated in figure 3.3 (top row). As the figure reveals, in both cases, debt relief shocks lead to a reduction in government expenditure on education,

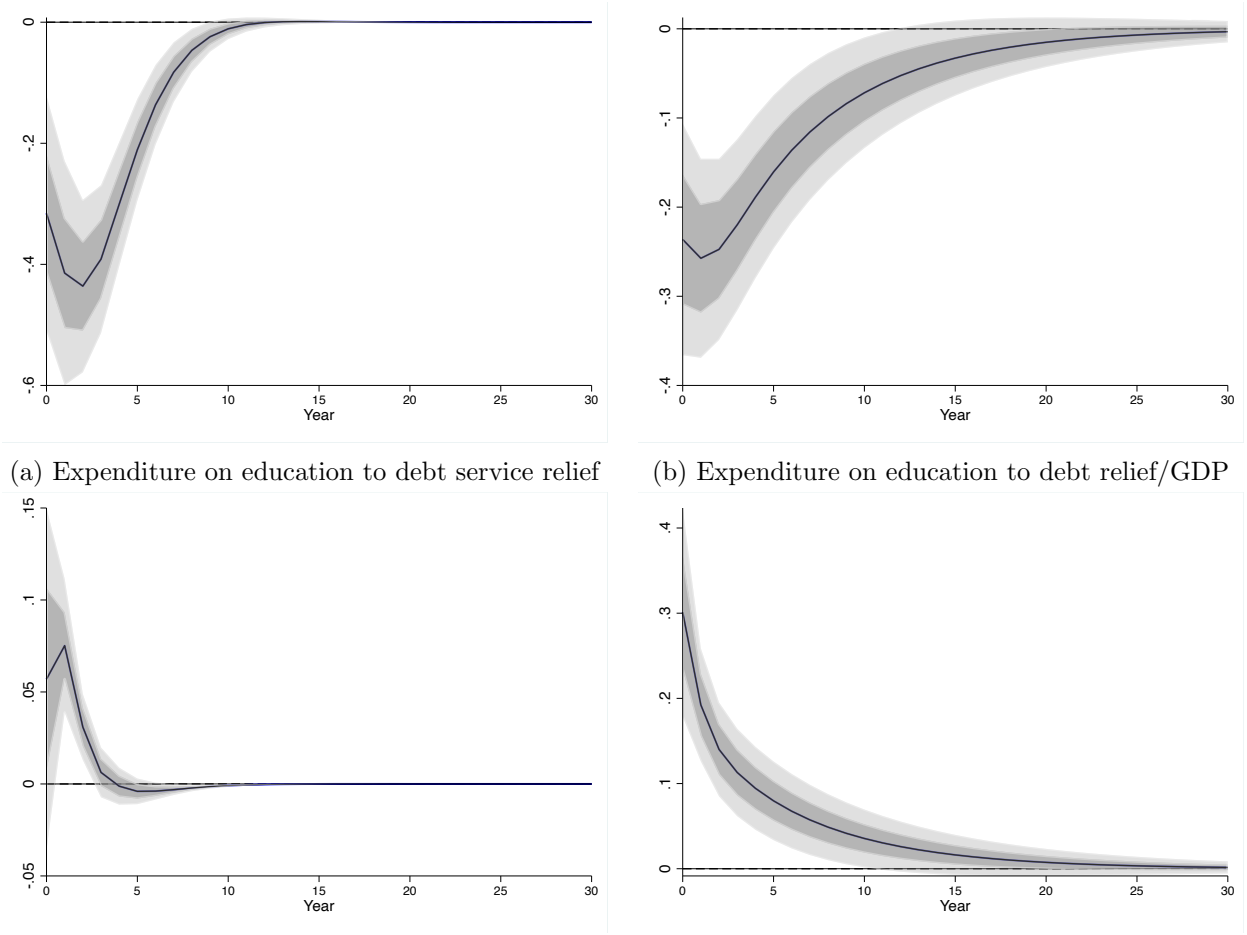
Table 3.3: Debt relief impacts on public spending

Dependent variable	Primary current expenditure		Capital expenditure	
	(I)	(II)	(III)	(IV)
Debt service relief (Δ)	0.6807***		–0.9166***	
	(0.0631)		(0.1202)	
Debt relief/GDP (Δ)		0.0250***		–0.1069***
		(0.0083)		(0.1202)

Note: This table illustrates the panel VAR estimation results via GMM. The estimates are based only on the equations of current and capital expenditure. Fixed effects are removed prior to estimation (see section 3.3). *, **, ***: significance levels of 10%, 5% and 1% respectively. The numbers in parentheses are standard errors. Data source: HIPC completion point documents, 1990-2017.

at least for the first 10 years, before the 95% confidence interval reaches the zero level. As expected, the negative response is more pronounced with debt service relief from HIPC and MDRI assistance (3.2%) than debt relief as a share of GDP (2.4%). This is also consistent with the panel VAR results exhibited in table 3.4. Regarding the impact of debt relief on government expenditure on health, we can observe from figure 3.3 (bottom row) that either measure of debt relief positively influences expenditure on health. For instance, government expenditure on health reacts significantly and positively to a unity shock in debt service relief and debt relief as a percentage of GDP by 0.57% and 3.01%, respectively. The identification and empirical simulation that generates the relationship between debt relief and social expenditure constitute a novel finding in the debt relief literature which extends not only the results put forward by Doytch et al. (2010) and Cassimon et al. (2015) but also contribute to the narrow literature on fiscal space by providing answers to the fiscal behavior of government expenditure on education and health to shocks in debt relief. What is striking about this result is the expected fiscal space on health expenditure created by debt relief as predicted by the fiscal space theory. However, Heller (2005) also stresses the need for this fiscal manoeuvre to be sustainable over the long term without jeopardizing the government's public finance.

In general, it is worth noting that our measures of debt relief show the fiscal space created on government outlays in the health sector rather than education sector, although the responses of health expenditure are shorter-lived than current and capital government outlays. Previous research has argued that the lack of absorptive capacity in the social sector has been a bottleneck for the creation of fiscal space in developing countries (Powell-Jackson et al., 2012). The allocation of more resources to the social sector turns out to be reluctant if the country's absorptive capacity in this sector is low.



(a) Expenditure on education to debt service relief

(b) Expenditure on education to debt relief/GDP

(c) Expenditure on health to debt service relief

(d) Expenditure on health to debt relief/GDP

Figure 3.3: Orthogonalized impulse response functions for expenditure on health and education to a one standard-deviation innovation in debt service relief and debt relief as a share of GDP, for 30 years after the shock. The dark (light) grey areas indicate the 70 (95)% confidence intervals generated using Gaussian approximation of 500 Monte Carlo draws from a fitted panel VAR. Data source: HIPC completion point documents, 1990-2017.

Table 3.4: Debt relief impacts on social spending

Dependent variable	Expenditure on education		Expenditure on health	
	(I)	(II)	(III)	(IV)
Debt service relief (Δ)	–0.2937***		0.2157***	
	(0.0514)		(0.0283)	
Debt relief/GDP (Δ)		–0.0059***		0.0109***
		(0.0043)		(0.0040)

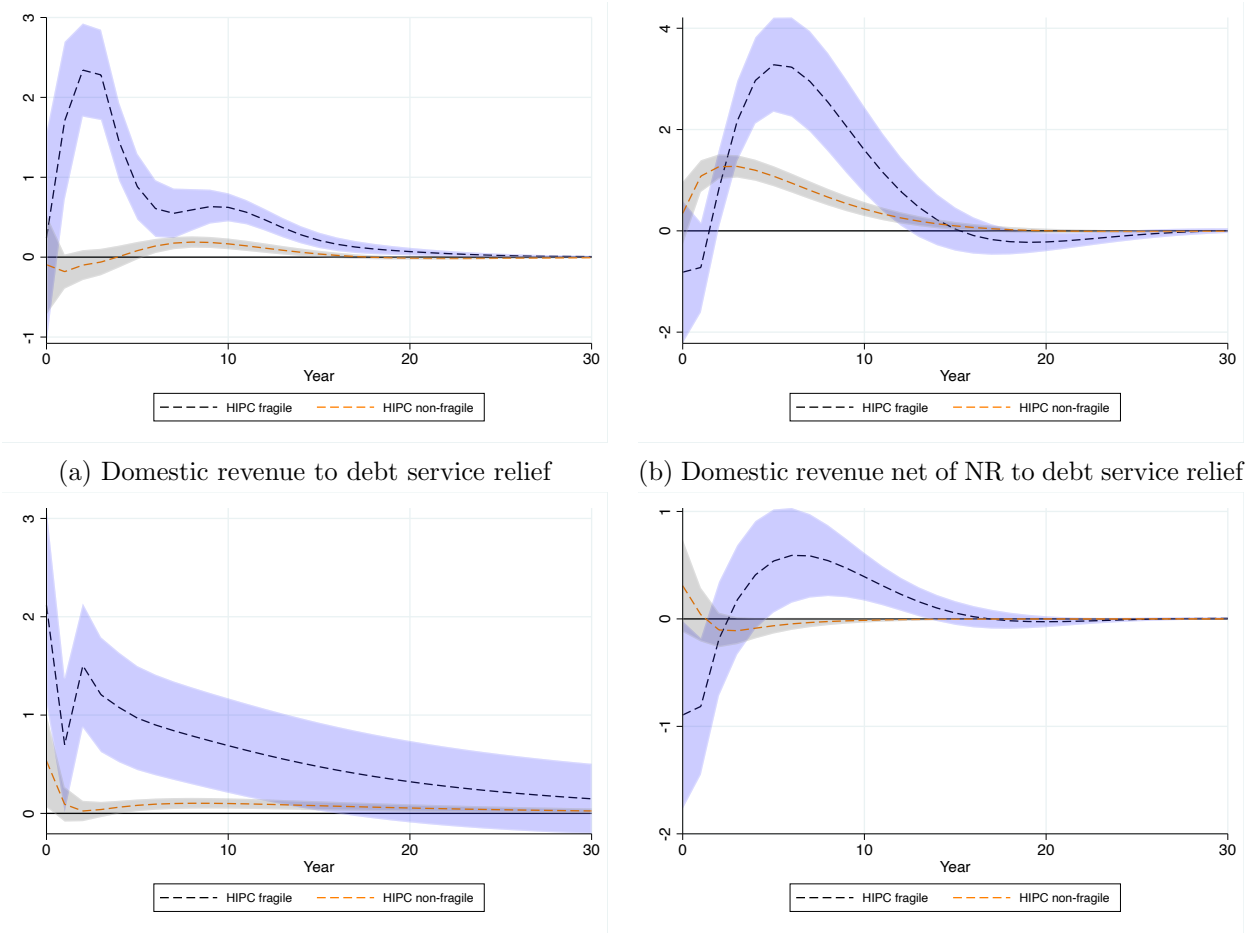
Note: This table illustrates the panel VAR estimation results via GMM. The estimates are based only on the equations of expenditure on health and education. Fixed effects are removed prior to estimation (see section 3.3). *, **, ***: significance levels of 10%, 5% and 1% respectively. The numbers in parentheses are standard errors. Data source: HIPC completion point documents, 1990-2017.

3.4.2 Controlling for fragility condition: HIPC fragile vs HIPC non-fragile

Previous research has found that the effect of debt relief on the outcome variables differs across fragile and non-fragile HIPC states (see, for example, Bandiera et al. (2009)) because the former group of countries are characterized by poor policy regimes and poorly performing institutions. Furthermore, over the last two decades, the domestic tax effort (as a share of GDP) has become higher in HIPC fragile countries (15.2% in 1996 and 20.16% in 2017) when compared to their non-HIPC counterparts (16.2% in 1996 and 18.8% in 2017). A similar situation is observed in terms of public spending (as a share of GDP) which changed from 16.3% and 17.9% in 1996 to 24% and 22.5% in 2017 in HIPC fragile and non-fragile countries, respectively.[15] For the purpose of this section, we define fragile states as HIPC countries with a score of no more than 3.2 on the World Bank Country Policy and Institutional Assessment (CPIA) rating. This exercise will allow us to test for differences in responses by two groups of countries to similar shocks – i.e., the response of domestic tax mobilization in fragile and non-fragile HIPC states to innovation shocks in debt relief. In the interest of space, we only report the impulse response functions for the main variables of interest.

Figure 3.4 depicts the impulse response functions of total domestic revenue (gross) and net of natural resource receipts to a shock to debt service relief from debt relief (top panel) in the two sub-samples described above. We can observe that there is a heterogeneous response of fragile and non-fragile HIPC countries, with the former experiencing a more pronounced (and significant) increase in total domestic tax collection over the first two decades, while in the latter we can only observe a statistically significant increase between years 6 and 12 (top-left panel). Besides, if we consider domestic revenue net of natural resource earnings, we may infer that a similar pattern is observed because a unit standard deviation innovation in debt service relief of HIPC fragile and non-fragile countries increases domestic tax collection net of natural resources by 30.3% and 12.7%, respectively. Furthermore, when debt relief as a percentage of GDP is considered, there is a significantly positive impact (at 95% confidence level) on gross domestic tax collection in both fragile and non-fragile states as this effect is much stronger in HIPC fragile states (21.1%), even though the impact in non-fragile states (5.3%) lasts longer (bottom-left panel). While domestic revenue net of natural resource earnings responds significantly and positively to debt relief as a share of GDP in fragile countries, this impact seems to be statistically equal to zero in HIPC non-fragile countries (bottom-right panel). One could argue that non-fragile HIPC countries only increase their domestic tax collection effort at the expense of debt service relief from HIPC and MDRI rather than any other

[15] See figures C.1 and C.2 in the appendix C.



(a) Domestic revenue to debt service relief

(b) Domestic revenue net of NR to debt service relief

(c) Domestic revenue to debt relief/GDP

(d) Domestic revenue net of NR to debt relief/GDP

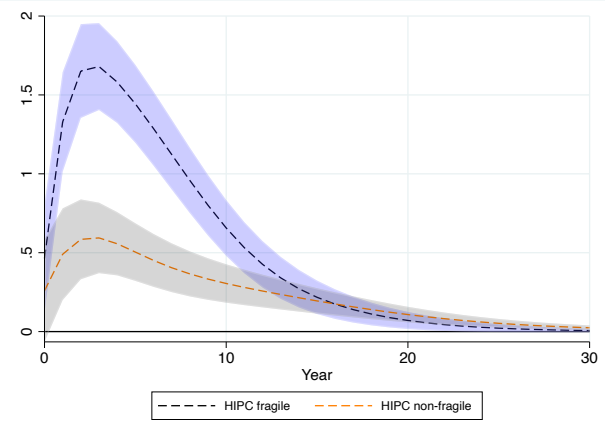
Figure 3.4: Orthogonalized impulse response functions for domestic revenue (gross) and net from natural resource to a one standard-deviation innovation in debt service relief and debt relief as a share of GDP, for 30 years after the shock. The dark grey (purple) area indicates the 95% confidence intervals for HIPC (non) fragile countries generated using Gaussian approximation of 500 Monte Carlo draws from a fitted panel VAR. NR stands for natural resource. Data source: HIPC completion point documents, 1990-2017.

type of debt relief assistance.

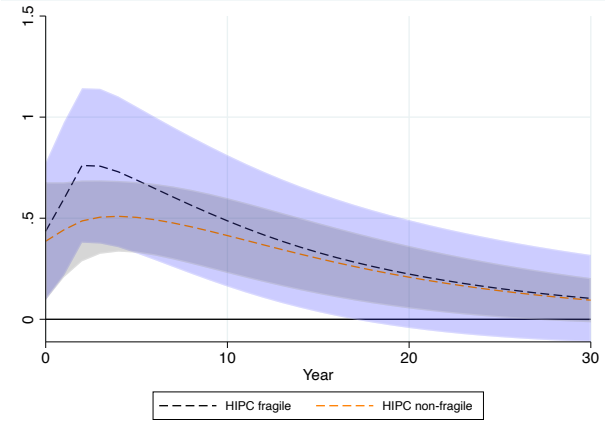
In figure 3.5, however, we present the impulse response functions of total public spending (current and capital) to a unity standard deviation shock in debt service relief in the sub-samples under analysis. Regarding primary current expenditure, we can observe that fragile HIPC countries experience a sharper increase while their non-fragile counterparts have a growth even less pronounced than the entire sample, although the impact in all regressions is positively and statistically significant at 5% significance level (top-left panel). Similarly, when we consider shocks in debt relief as a share of GDP, the behavior of each current expenditure variable is virtually the same being more pronounced in fragile HIPC states (4.4%) than non-fragile countries (3.9%).[16] This finding reveals that the overall fiscal space created in the primary current expenditure through HIPC and MDRI

[16]See top-right panel.

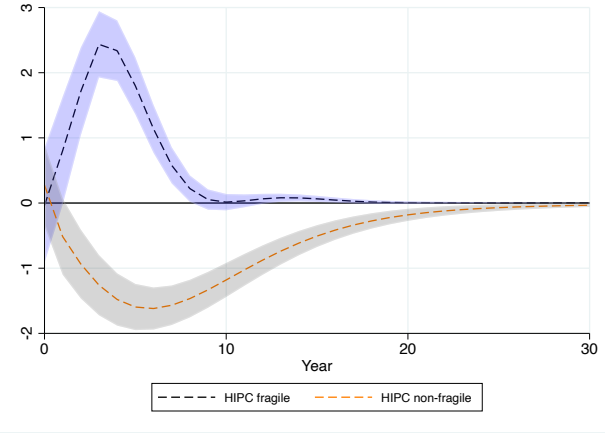
programs or any other form of debt relief is mostly owed to HIPC fragile countries. A possible explanation for this might be the reduction of unproductive outlays in this group of countries, especially those of recurrent nature.



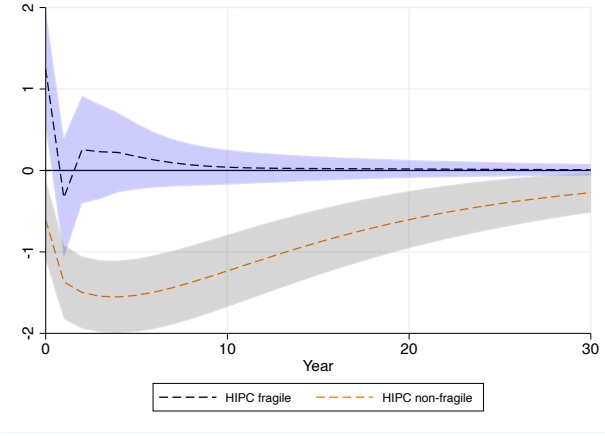
(a) Current expenditure to debt service relief



(b) Current expenditure to debt relief/GDP



(c) Capital expenditure to debt service relief



(d) Capital expenditure to debt relief/GDP

Figure 3.5: Orthogonalized impulse response functions for capital and current expenditure to a one standard-deviation innovation in debt service relief and debt relief as a share of GDP, for 30 years after the shock. The dark grey (purple) area indicates the 95% confidence intervals for HIPC (non) fragile countries generated using Gaussian approximation of 500 Monte Carlo draws from a fitted panel VAR. Data source: HIPC completion point documents, 1990-2017.

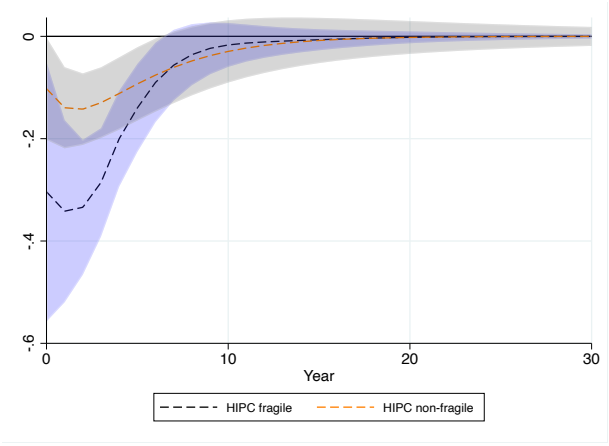
Turning to capital expenditure, we may also infer that HIPC fragile states experience a significantly positive response to a unity standard deviation shock in debt service relief from debt relief when compared to their non-fragile counterparts (bottom-left panel). For example, while government capital expenditure in the HIPC fragile group reacts significantly and positively to a one standard-deviation innovation in debt service relief, an adverse situation is observed for non-fragile HIPC countries. The negative effect is long-lived in this later as it only fades over within 2 decades. Even though when we consider shocks in debt relief as a share of GDP the response of capital expenditure in HIPC states is less precisely estimated – the zero lines lie inside the confidence bands –, the negative response in non-fragile countries is still strongly persistent (bottom-right

panel). Interestingly, one could argue that although fragile states are characterized by poor economic policies and low institutional quality, this finding discloses that the HIPC and the MDRI assistance (probably their conditionality) effectively helps these countries in creating fiscal space via higher productive public investments that are perceived as particularly meritorious.

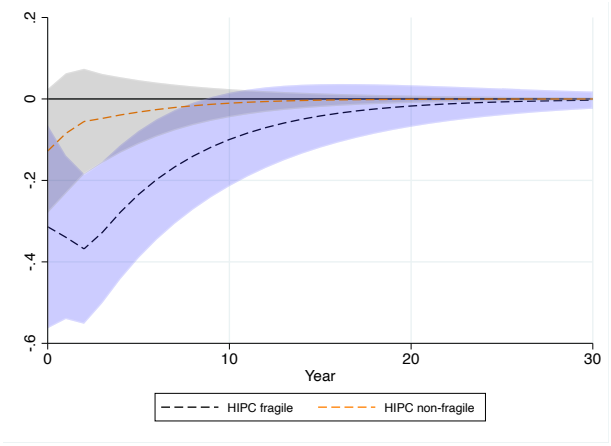
Since we are also interested in determining how social spending variables react to innovation shocks in debt relief, we now turn our attention to the responses of government expenditure on health and education. Figure 3.6 presents the impulse response functions of government expenditure on education to a one standard deviation shock in our measures of debt relief (i.e., debt service relief and debt relief as a share of GDP) over a 30-year horizon in the two sub-samples. In this setting, we observe a different behavior in the response of government expenditure on education to debt service relief shocks in fragile and non-fragile HIPC states (top-left panel). Although the response in both groups of countries is vigorously negative and statistically significant, we can note that this negative impact is worse in fragile countries (3.1%) than their non-fragile counterparts (1%). A similar pattern is observed when shocks in our alternative measure of debt relief are imposed, despite the fact that the effect turns out to be statistically insignificant in non-fragile states (top-right panel).

Notwithstanding, in the bottom panel of figure 3.6 we expose the impulse response functions of government expenditure on health to a unit standard deviation shock in debt service relief from HIPC and MDRI, and debt relief as a percentage of GDP. As such, we may infer that the response of expenditure on health to debt service relief appears to be significant and positive in HIPC fragile states (bottom-left panel). We can clearly notice the fiscal space (of 1.1%) created in government expenditure on health for this latter group of countries whereas their non-fragile counterparts appear to respond negatively to the same shocks. Akin to our alternative measure of debt relief (i.e., debt relief as a share of GDP), a fiscal space (of 4.2%) is created in HIPC fragile countries which is 1.2% higher than the one created in the entire sample whilst the negative response – albeit insignificant – in non-HIPC fragile states is still persistent (bottom-right panel). Therefore, the significant and positive effect of debt relief shocks in government expenditure on health in the entire sample seems to be mainly owed to HIPC fragile states.

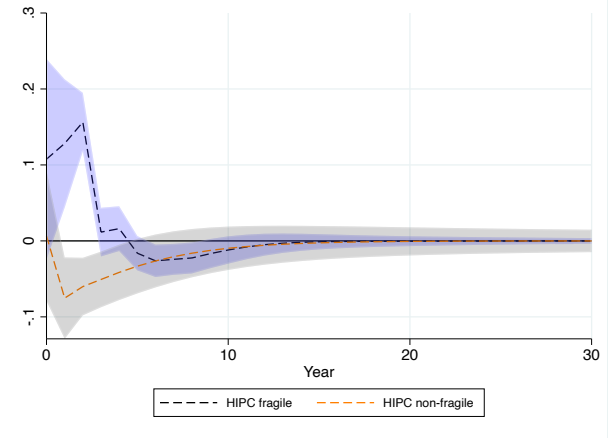
Tables 3.5 and 3.6 provide a summary of the results discussed throughout this section. In general, the findings on social expenditure seem to reinforce the results from current and capital expenditure since it happens to be evident that the fiscal space created by debt service relief from HIPC and MDRI in social spending is significant and more pronounced in HIPC fragile countries. As we saw at the beginning of this section, this group of countries have relatively increased their domestic tax effort and public expenditure when compared to their non-fragile counterparts. Following debt overhang theory, one could



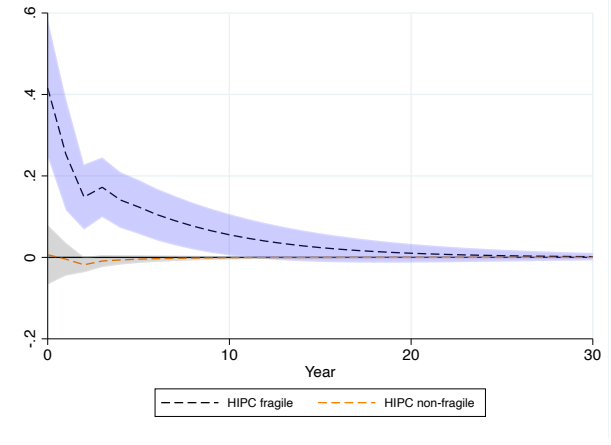
(a) Expenditure on education to debt service relief



(b) Expenditure on education to debt relief/GDP



(c) Expenditure on health to debt service relief



(d) Expenditure on health to debt relief/GDP

Figure 3.6: Orthogonalized impulse response functions for expenditure on health and education to a one standard-deviation innovation in debt service relief and debt relief as a share of GDP, for 30 years after the shock. The dark grey (purple) area indicates the 95% confidence intervals for HIPC (non) fragile countries generated using Gaussian approximation of 500 Monte Carlo draws from a fitted panel VAR. Data source: HIPC completion point documents, 1990-2017.

argue that such increases in domestic tax collection coupled with reprioritization of public expenditure and meritorious government spending seem to be responsible for the creation of fiscal manoeuvre in this group of countries. However, the persistence of debt relief shocks in expenditure on education and health seems to be shorter than current and capital expenditure.

3.4.3 Variance decomposition

Although impulse responses provide information about the impacts of various shocks on each variable in the panel VAR models, they do not explain the importance of the shocks on a single variable in explaining changes in other variables. This section complements

Table 3.5: Summary of results – debt service relief and outcome variables

	All countries	HIPC fragile	HIPC non-fragile
Domestic revenue	Positive	Positive	Positive
	19 years	19 years	6 years
Domestic revenue net of NR	Positive	Positive	Positive
	17 years	12 years	14 years
Primary current expenditure	Positive	Positive	Positive
	15 years	20 years	30 years
Capital expenditure	Negative	Positive	Negative
	9 years	9 years	21 years
Expenditure on education	Negative	Negative	Negative
	9 years	5 years	6 years
Expenditure on health	Positive	Positive	Negative
	1 year	1 year	1 year

Note: This table represents the summary of the results based on fitted panel VARs and the corresponding impulse response functions for our variables of interest to a one standard-deviation innovation in debt service relief for 30 years after the shock. The shaded area indicates the persistence of the shocks. NR stands for natural resource. Data source: HIPC completion point documents, 1990-2017.

Table 3.6: Summary of results – Debt relief (% of GDP) and outcome variables

	All countries	HIPC fragile	HIPC non-fragile
Domestic revenue	Positive	Positive	Positive
	21 years	12 years	17 years
Domestic revenue net of NR	Positive	Positive	Insignificant
	10 years	7 years	–
Primary current expenditure	Positive	Positive	Positive
	21 years	15 years	29 years
Capital expenditure	Insignificant	Positive	Negative
	–	1 year	29 years
Expenditure on education	Negative	Negative	Insignificant
	10 years	9 years	–
Expenditure on health	Positive	Positive	Insignificant
	10 years	10 years	–

Note: This table represents the summary of the results based on fitted panel VARs and the corresponding impulse response functions for our variables of interest to a one standard-deviation innovation in debt relief as a share of GDP for 30 years after the shock. The shaded area indicates the persistence of the shocks. NR stands for natural resource. Data source: HIPC completion point documents, 1990-2017.

the impulse response analysis as we illustrate the relative cumulative contribution of each variable of interest in the system through a variance decomposition. Table 3.7 reports the variance decomposition of the entire sample, fragile states and non-fragile states in panel A, B and C, respectively. Because all the responses converge to zero before the 25-year mark, and longer horizons (i.e., 30 periods) virtually yield similar results, we only present the forecast horizons of 25 years. These results shed further light on the IRFs, suggesting the importance of debt relief in explaining variations of domestic tax mobilization and public spending. More precisely, 5.5% of the fluctuations of domestic tax mobilization in the whole sample is explained by debt service relief from debt relief. This proportion is higher by 2.1 percentage points in fragile states while the lowest percentage (of 0.7%) is experienced by non-fragile countries.

Nevertheless, when we exclude natural resource revenue from domestic tax mobilization, it is observed that 18.3% of the fluctuations in domestic tax mobilizatio is explained by debt relief from HIPC and MDRI in fragile countries which is almost nine times higher than in non-fragile states. A similar situation is noted when debt relief as a share of GDP is considered in which 1.6% of variations in domestic revenue net of natural resource receipts are explained by our alternative measure of debt relief in fragile countries. This is considerably higher by 0.6% than in their non-fragile counterparts. This finding reveals that HIPC fragile states are more exposed to natural resource revenues than their non-fragile counterparts.

Turning now to the expenditure side, it is observed that the 25 period-ahead response of primary current expenditure to innovations in debt service relief is about 36.6% and 8.3% in fragile and non-fragile states, respectively. However, if we only consider innovations in debt relief as a percentage of GDP, we may infer that the contribution of this variable to explain current expenditure in fragile states is just timid of 5.9%. This proportion is higher than the one registered in the entire sample of 3.9%. By the same token, debt relief (as a share of GDP) explains fluctuations of capital expenditure in HIPC fragile states of about 1.3% which is, by a significant margin, lower than 14.6% in non-fragile states. These results provide further support to the IRFs presented in the last section since they reflect the broader response of capital expenditure – albeit negative – to one standard-deviation shocks in debt relief.

Table 3.7: Variance decomposition analysis

Panel A: All countries	s	dss	dr/gdp	r	drnnr	p	ce	ed	eh
Debt service relief (dss)	25	**0.944**		0.014	0.001	0.001	0.021	0.000	0.029
Debt relief/GDP (dr/gdp)	25		**0.851**	0.025		0.014	0.003	0.323	0.188
Domestic revenue (r)	25	**0.055**	**0.037**	0.794		0.047	0.003		
Domestic revenue net of NR (drnnr)	25	**0.107**	**0.040**		0.655				
Primary current expenditure (p)	25	**0.282**	**0.039**	0.003		0.583	0.003		
Capital expenditure (ce)	25	**0.081**	**0.005**	0.007		0.018	0.845		
Expenditure on education (ed)	25	**0.099**	**0.058**					0.311	0.177
Expenditure on health (eh)	25	**0.013**	**0.068**					0.010	0.962
Panel B: HIPC Fragile	s	dss	dr/gdp	r	drnnr	p	ce	ed	eh
Debt service relief (dss)	25	**0.870**		0.014	0.014	0.015	0.002	0.003	0.094
Debt relief/GDP (dr/gdp)	25		**0.745**	0.032		0.003	0.013	0.458	0.003
Domestic revenue (r)	25	**0.076**	**0.059**	0.519		0.067	0.112		
Domestic revenue net of NR (drnnr)	25	**0.183**	**0.016**		0.444				
Primary current expenditure (p)	25	**0.366**	**0.059**	0.012		0.518	0.006		
Capital expenditure (ce)	25	**0.126**	**0.013**	0.110		0.025	0.435		
Expenditure on education (ed)	25	**0.047**	**0.046**					0.860	0.004
Expenditure on health (eh)	25	**0.037**	**0.066**					0.002	0.833
Panel C: HIPC non-Fragile	s	dss	dr/gdp	r	drnnr	p	ce	ed	eh
Debt service relief (dss)	25	**0.914**		0.016	0.002	0.017	0.022	0.026	0.004
Debt relief/GDP (dr/gdp)	25		**0.550**	0.004		0.000	0.056	0.048	0.044
Domestic revenue (r)	25	**0.007**	**0.020**	0.731		0.078	0.073		
Domestic revenue net of NR (drnnr)	25	**0.221**	**0.006**		0.660				
Primary current expenditure (p)	25	**0.083**	**0.098**	0.006		0.584	0.061		
Capital expenditure (ce)	25	**0.180**	**0.146**	0.005		0.128	0.571		
Expenditure on education (ed)	25	**0.122**	**0.011**					0.689	0.030
Expenditure on health (eh)	25	**0.045**	**0.002**					0.052	0.830

Note: Percent of variation in the row variable explained by column variable for s 25 periods ahead. Data source: HIPC completion point documents, 1990-2017.

In terms of social expenditure, it is noticed that, by far, the significant majority of the dynamics displayed by expenditure on education and health to innovations in debt relief are observed in fragile states. More specifically, about 4.6% and 6.6% of changes in expenditure on education and health, respectively, are explained by debt relief (as a share of GDP) in fragile countries whereas in non-fragile states these proportions are shy and fixed at 1.1% and 0.2%, following the same sequence.

3.4.4 A word on Granger Causality

To gauge additional perspective into the effect of debt relief on fiscal variables in African HIPC countries, we further apply the Granger causality tests for the full sample as well as the two sub-samples under consideration. The results are summarized in table 3.8. The top and middle panels report Granger causality tests for the full and fragile HIPC samples, respectively, while the bottom panel presents Granger causality tests for non-fragile HIPC countries. As previously, we consider both measures of debt relief – i.e., debt service relief from HIPC and debt relief as a share of GDP. First, we find a bidirectional Granger causality running from debt relief to our fiscal variables with the exception of expenditure on education. More specifically, while expenditure on education Granger causes debt relief in African HIPC countries, a reverse Granger causality relation is not found. This finding gives further support to our impulse response functions discussed in the baseline results in section 3.4.1. Debt relief assistance does not seem to be associated with increments in education outlays.

Second, there is a bidirectional Granger causality running from debt relief to our fiscal variables in HIPC fragile countries, even though the level of significance becomes lower in the causality running from domestic revenues (gross and net) to debt relief as a share of GDP. This result confirms our argument on section 3.4.1 that this measure also captures other debt relief grants which might not be part of the HIPC and MDRI assistance. Lastly, debt relief is the Granger cause for our fiscal variables and vice-versa in non-fragile HIPC countries, although the same causality fails to hold for domestic revenue net of natural resource and debt relief as a share of GDP. Not surprisingly, this consonance in the results between IRFs and Granger causality tests demonstrates the robustness of our model and results. Overall, the present results are novel on at least two major fronts. Firstly, they uncover the actual causality effect of debt relief assistance on public spending in African HIPC countries. Secondly, they highlight the causal heterogeneity impact of debt relief across HIPC countries by distinguishing between fragile and non-fragile states.

Table 3.8: Granger causality test

All Countries	dss → fv	fv → dss	dr → fv	fv → dr
Domestic revenue	27.54***	0.524	302.76***	10.04***
Domestic revenue net of NR	0.098	111.0***	133.25***	7.33***
Primary current expenditure	13.72***	91.22***	67.58***	9.01***
Capital expenditure	24.87***	12.92***	2.83*	28.73***
Expenditure on education	0.066	32.59***	576.56***	1.851
Expenditure on health	293.21***	58.06***	390.84***	7.392***
HIPC Fragile	dss → fv	fv → dss	dr → fv	fv → dr
Domestic revenue	78.46***	183.43***	63.77***	3.81*
Domestic revenue net of NR	69.54***	35.73***	783.99***	0.641
Primary current expenditure	488.76***	2003.87***	2.17***	5.61**
Capital expenditure	0.166	279.61***	0.438***	24.31***
Expenditure on education	9.77***	133.94***	1005.04***	7.698***
Expenditure on health	461.69***	132.68***	78.46***	48.636***
HIPC Non-fragile	dss → fv	fv → dss	dr → fv	fv → dr
Domestic revenue	5.35**	2.97*	151.81***	1.738
Domestic revenue net of NR	2.79*	700.42***	1.054	0.085
Primary current expenditure	8.25***	150.42***	2.95*	0.386
Capital expenditure	0.003	1120.34***	557.89***	94.85***
Expenditure on education	0.949	15.28***	19.44***	0.005
Expenditure on health	0.249***	2.88*	84.08***	1.513

Note: The null hypothesis is that the excluded variable(s), on the left, does not Granger-cause the dependent variable(s), on the right. dss stands for debt service relief, fv stands for fiscal variable and dr stands for debt relief. Numbers in the table report the VAR-Granger causality Wald tests for the coefficients of all lags of non-excluded variables being jointly equal to zero. *, **, *** indicate significance levels at 10%, 5% and 1% respectively. Data source: HIPC completion point documents, 1990-2017.

3.4.5 Robustness checks

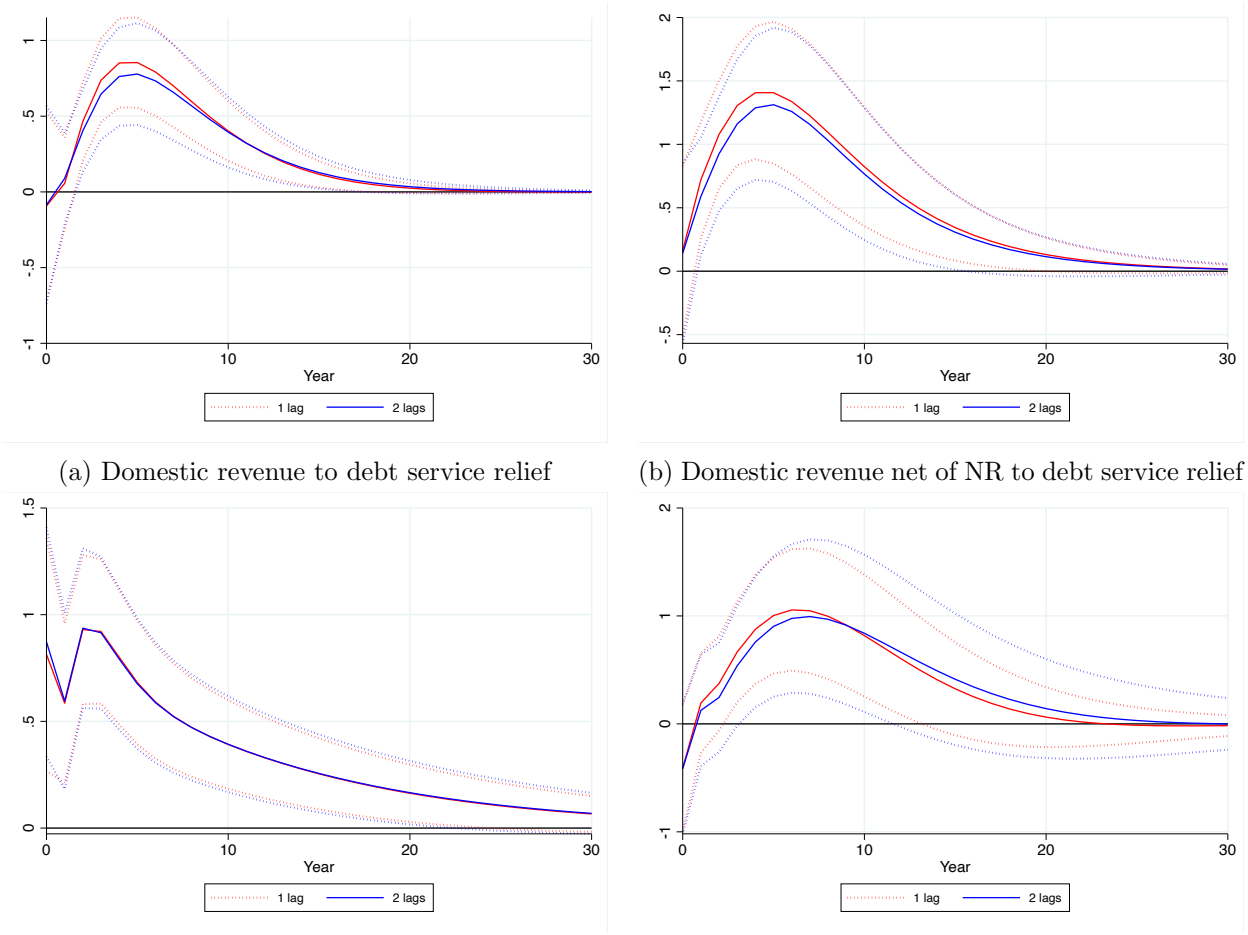
In order to confirm the validity of the results discussed in the last section, we conduct a series of robustness tests as the panel VARs models are re-estimated based on four assessment checks. Firstly, we re-estimate the model with two lags to see if the results remain unchanged, even though the model-selection criteria by Andrews and Lu (2001) suggests the model being fitted with one lag. Secondly, we exclude from the model the budget financing variables (i.e., domestic financing, external loans and external grants) so that we can inspect whether the response of fiscal variables to debt relief shocks is contingent to restrictions in the number of variables in the p-VAR system. Thirdly, we alter the identification strategy to ensure that the results are not driven by the imposed recursive ordering. Lastly, we use alternative social indicators to examine the effectiveness of poverty reduction expenditures.

3.4.5.1 Sensitivity of the results to changes in the number of lags

Although in section 3.3 the lag information criteria developed by Andrews and Lu (2001) suggested that the panel VAR model should be fitted with one lag, we re-estimate the model in equation 3.17 with two lags so that we can compare the impulse response function obtained to the model with one lag as discussed in our baseline results. Figures 3.7, 3.8 and 3.9 illustrate the impulse response function of all the variables in the system to a one standard deviation shock in both measures of debt relief. In the case of domestic revenue (gross) and net of natural resource, it seems that the models with two lags exhibit a fairly smaller and faster recovery when compared to the baseline model (one lag), even though the sign, significance and co-movement of the responses remain unchanged (figure 3.7). The largest difference is noticed in the case of domestic revenue net of natural resource to shocks in both measures of debt relief in which the response of the models with two lags are fairly less pronounced and persistent mainly between the periods 2 and 8 (top panel). An analogous situation also occurs for expenditure on education and health as shown in figure 3.9 which suggests that the variables do not respond as strongly as they do when more historical information is included in the model. Nevertheless, the results remain very similar and we consider these results as a validation exercise for the original model.

3.4.5.2 Sensitivity of the outcomes to a more restricted panel VAR model

Following the debate on the fungibility of debt relief and aid (Arslanalp and Henry, 2006; Powell and Bird, 2010) one could argue that our results are influenced by the inclusion of budget financing variables – i.e., external grants, external loans and domestic financing



(a) Domestic revenue to debt service relief

(b) Domestic revenue net of NR to debt service relief

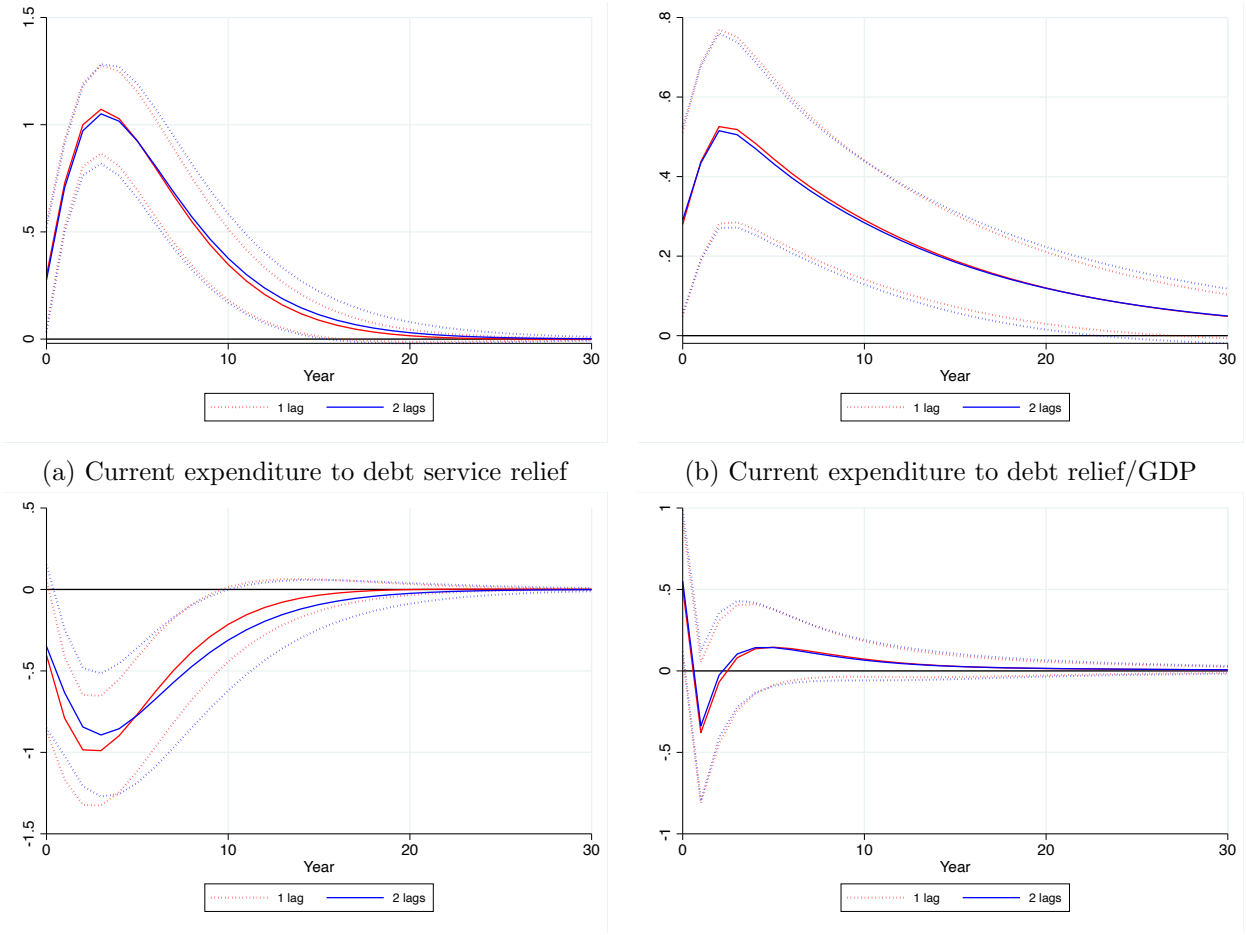
(c) Domestic revenue to debt relief/GDP

(d) Domestic revenue net of NR to debt relief/GDP

Figure 3.7: Orthogonalized impulse response functions for domestic revenue (gross) and net from natural resource to a one standard-deviation innovation in debt service relief and debt relief as a share of GDP, for 30 years after the shock. The dotted lines indicate the 95% confidence intervals generated using Gaussian approximation of 500 Monte Carlo draws from a fitted panel VAR. NR stands for natural resource. Data source: HIPC completion point documents, 1990-2017.

– in the panel VAR system. Therefore, we here focus only on the main relationship of interest – debt relief and fiscal variables – and see if the results remain unchanged. Figures 3.10, 3.11 and 3.12 present the impulse response of the fiscal variables to a unity shock in either debt service relief from HIPC and MDRI assistance or debt relief as a share of GDP in our sample. Insofar as domestic tax collection is concerned, we can observe that all the responses are very similar (in terms of significance) to the ones obtained when we considered the original model. One exception that can be noted is that the response of domestic revenue to shocks in debt service relief becomes significantly positive and long-lived when the budget financing variables are excluded from the model. Moreover, we can observe that the response of fiscal variables in the original model tend to weaken as the budged financing variables are excluded from the panel VAR system.

An identical situation is also noted when we re-estimate the baseline model for current



(a) Current expenditure to debt service relief

(b) Current expenditure to debt relief/GDP

(c) Capital expenditure to debt service relief

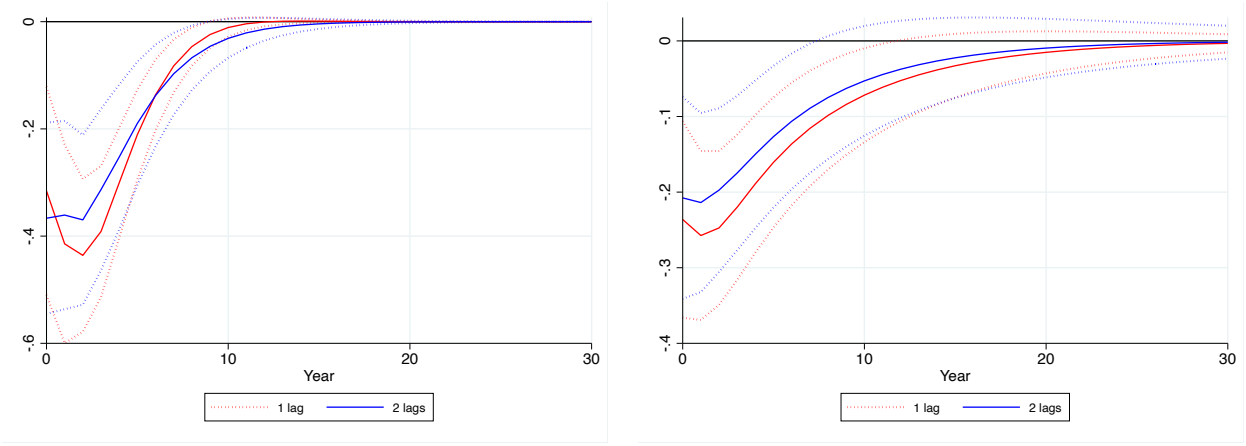
(d) Capital expenditure to debt relief/GDP

Figure 3.8: Orthogonalized impulse response functions for capital and current expenditure to a one standard-deviation innovation in debt service relief and debt relief as a share of GDP, for 30 years after the shock. The dotted lines indicate the 95% confidence intervals generated using Gaussian approximation of 500 Monte Carlo draws from a fitted panel VAR. Data source: HIPC completion point documents, 1990-2017.

and capital expenditures. Interestingly, the most notable difference between the original and the more restricted panel VAR model is the fact that capital expenditure becomes positive and statistically significant to shocks in debt service relief (bottom-left of figure 3.11). In general, the outcomes of these robustness tests reveal that our findings are not sensitive to restrictions in the number of variables in the p-VAR system.

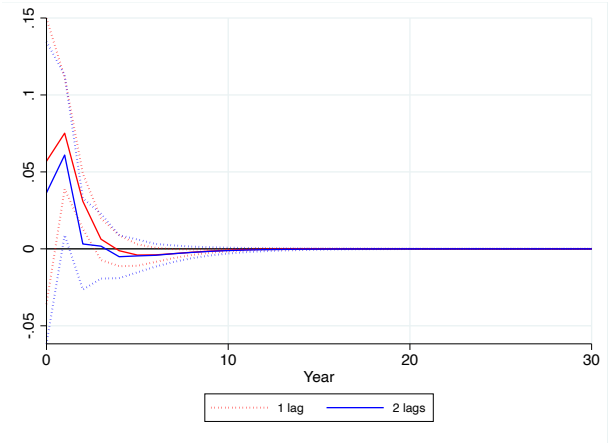
3.4.5.3 Sensitivity of the results to alternative Cholesky orderings

As we discussed in section 3.3, the Cholesky decomposition assumes that variables listed earlier in the VAR order affect other series contemporaneously, whilst variables listed later in the VAR order affect the remaining series only with a lag. In this setting, we alter the inside of the Cholesky ordering used in the model by rerunning the basic model based on the following three alternatives:

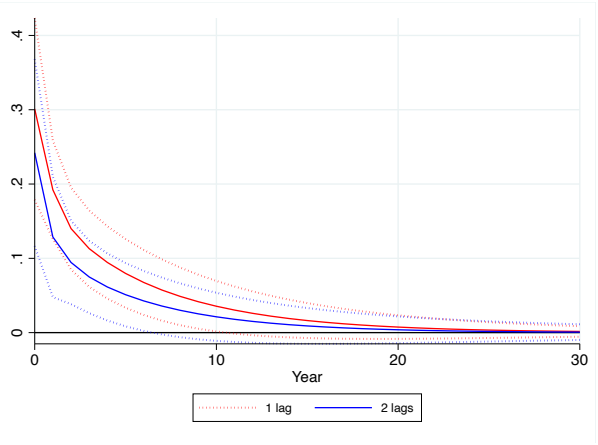


(a) Expenditure on education to debt service relief

(b) Expenditure on education to debt relief/GDP



(c) Expenditure on health to debt service relief

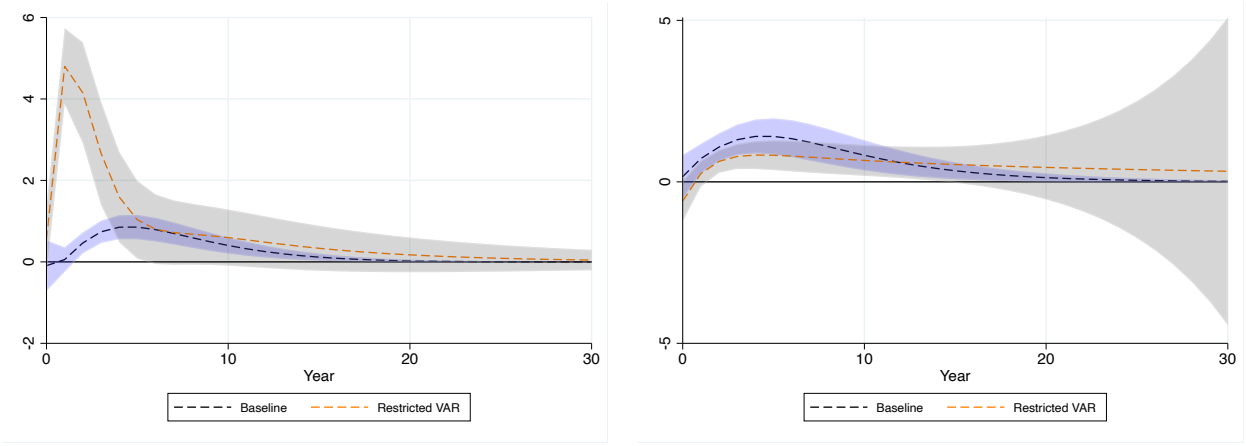


(d) Expenditure on health to debt relief/GDP

Figure 3.9: Orthogonalized impulse response functions for expenditure on health and education to a one standard-deviation innovation in debt service relief and debt relief as a share of GDP, for 30 years after the shock. The dotted lines indicate the 95% confidence intervals generated using Gaussian approximation of 500 Monte Carlo draws from a fitted panel VAR. Data source: HIPC completion point documents, 1990-2017.

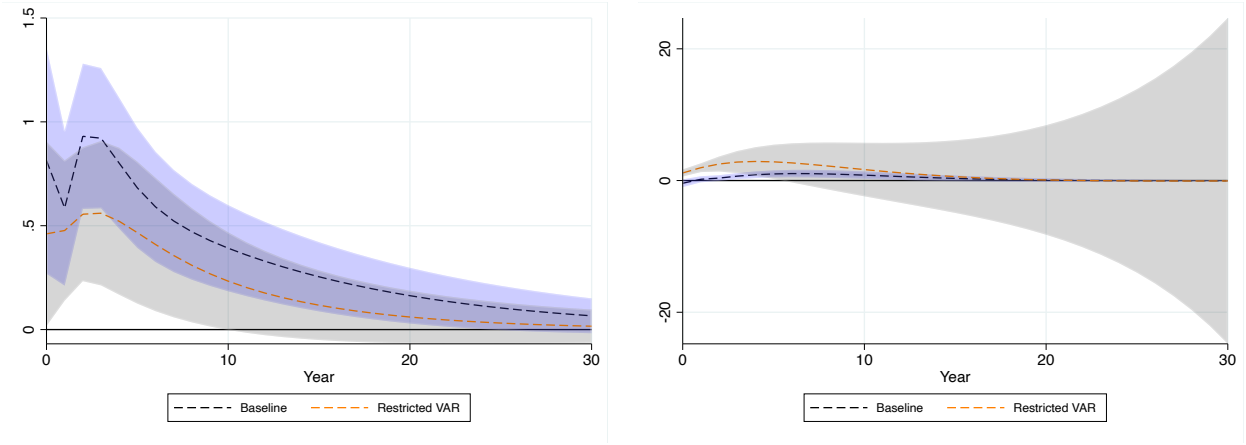
1. [Δ*Budget financing variables* Δ*Debt relief variable* Δ*Fiscal variables*]'
2. [Δ*Budget financing variables* Δ*Fiscal variables* Δ*Debt relief variable*]'
3. [Δ*Debt relief variable* Δ*Fiscal variables* Δ*Budget financing variables*]'

In the first and second case, we place budget financing variables (i.e., external loans and external grants) at the very beginning of the model because they represent foreign aid variables and they might also be expected to influence all other series in the model contemporaneously. For example, some strand of the literature advocates that debt relief is less effective than foreign aid as they argue that the former is not equivalent to the latter because money is not fungible (Arslanalp and Henry, 2004; Cordella and Missale, 2013). These avenues of research believe that foreign aid would help poorest countries to build an economic infrastructure that best suits their development needs since most of



(a) Domestic revenue to debt service relief

(b) Domestic revenue net of NR to debt service relief



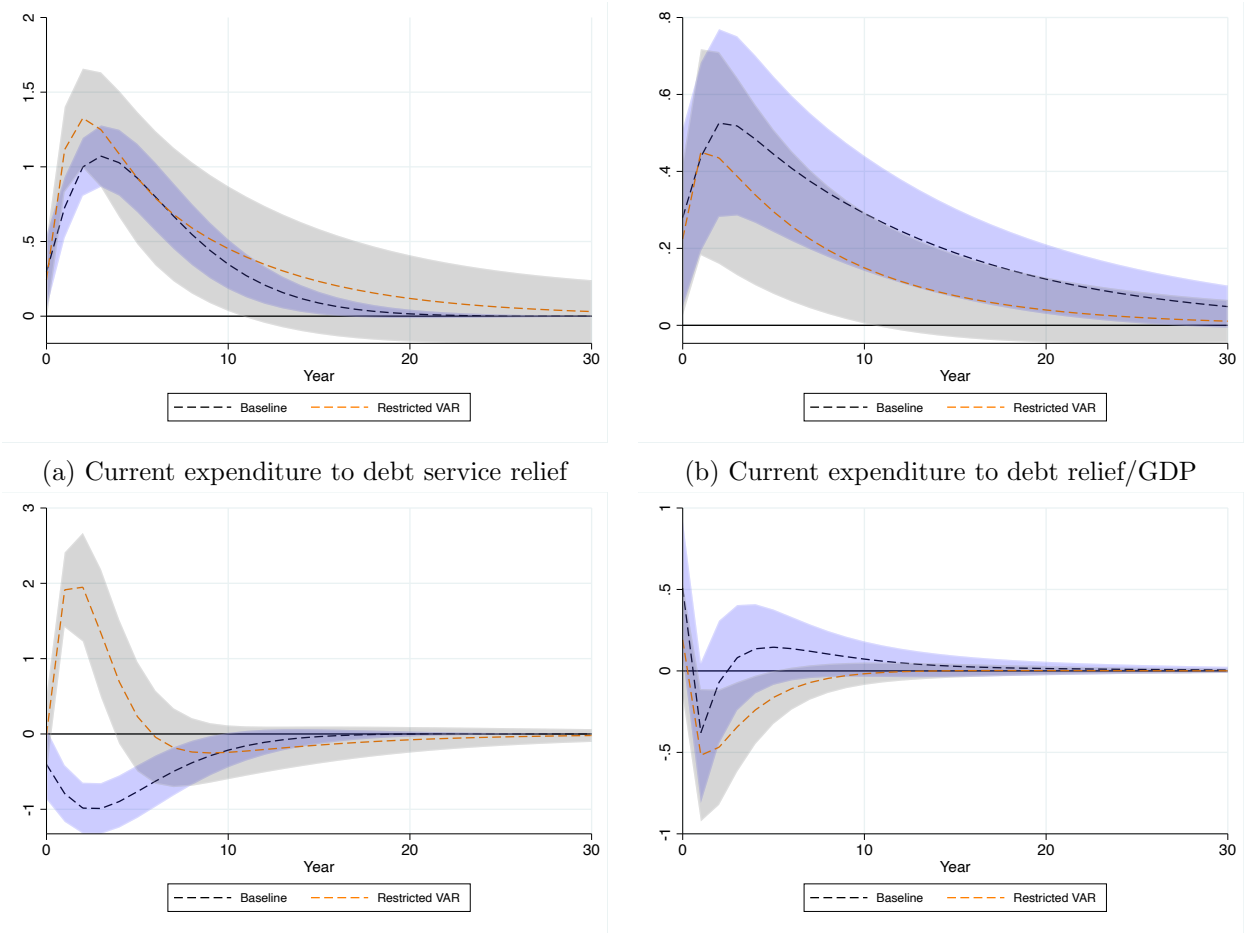
(c) Domestic revenue to debt relief/GDP

(d) Domestic revenue net of NR to debt relief/GDP

Figure 3.10: Orthogonalized impulse response functions for domestic revenue (gross) and net from natural resource to a one standard-deviation innovation in debt service relief and debt relief as a share of GDP, for 30 years after the shock. The dark grey (purple) areas indicate the 95% confidence intervals for the baseline (restricted) model generated using Gaussian approximation of 500 Monte Carlo draws from a fitted panel VAR. NR stands for natural resource. Data source: HIPC completion point documents, 1990-2017.

them do not suffer from debt overhang. Moreover, foreign aid tends to increase domestic tax collection, total and social public expenditure (Gomanee et al., 2005; Cassimon and Van Campenhout, 2007). In the third case, debt relief is placed at the beginning of the model in line with the motivations discussed in section 3.3; however, we order fiscal variables before budget financing variables to inspect if the results still hold.

After we re-estimate the panel VAR models we note that the results are qualitatively similar to the ones obtained in section 3.4.1 and changing the order of the variables does not influence the feedback of the measures of debt relief to a unity standard deviation shock in the remaining variables in the model. In the interest of space, the results are available upon request.



(a) Current expenditure to debt service relief

(b) Current expenditure to debt relief/GDP

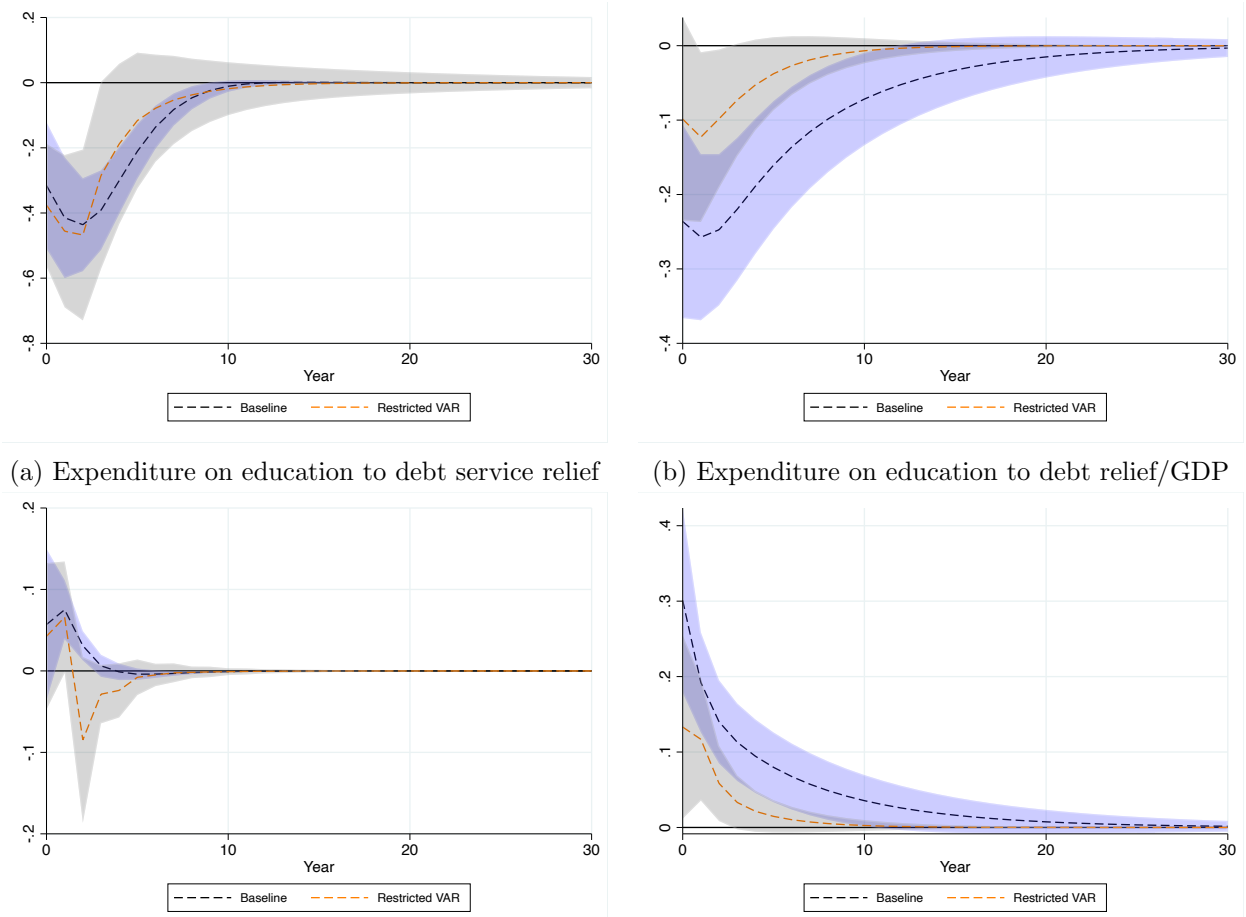
(c) Capital expenditure to debt service relief

(d) Capital expenditure to debt relief/GDP

Figure 3.11: Orthogonalized impulse response functions for capital and current expenditure to a one standard-deviation innovation in debt service relief and debt relief as a share of GDP, for 30 years after the shock. The dark grey (purple) areas indicate the 95% confidence intervals for the baseline (restricted) model generated using Gaussian approximation of 500 Monte Carlo draws from a fitted panel VAR. Data source: HIPC completion point documents, 1990-2017.

3.4.5.4 Additional robustness check

We understand that changes in government expenditure on health and education may not, *per se*, reflect improvements in the social sector because of the absorptive capacity of HIPCs in properly allocating inflows from debt relief assistance. In this section, we inspect how other social indicators respond to one-standard deviation shocks in debt relief. First, we look at Infant Mortality (per 1000 live births) as reported by the World Development Indicators (WDI). As such, from figure 3.13 it is observed that infant mortality in the original sample responds positively and significantly to shocks in debt service relief from HIPC and MDRI by 2% (top-left panel). A similar situation is observed even when we consider the alternative measure of debt relief (i.e., debt relief as a share of GDP) as illustrated in the top-right panel of the same figure. These findings reinforce our baseline results discussed in section 3.4.1 in which we documented a fiscal space created by debt



(a) Expenditure on education to debt service relief

(b) Expenditure on education to debt relief/GDP

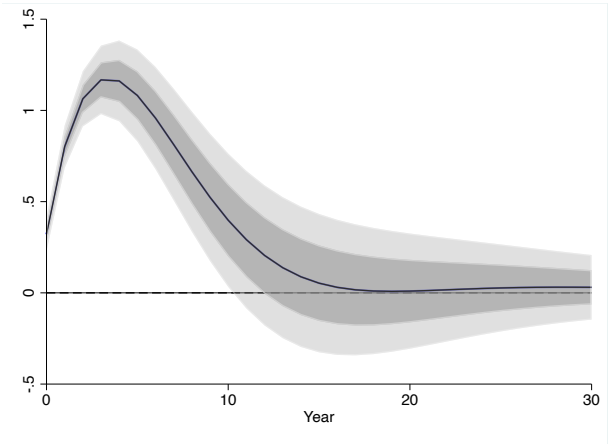
(c) Expenditure on health to debt service relief

(d) Expenditure on health to debt relief/GDP

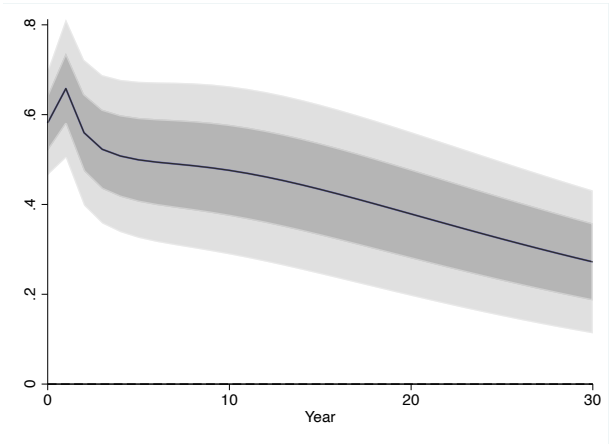
Figure 3.12: Orthogonalized impulse response functions for expenditure on health and education to a one standard-deviation innovation in debt service relief and debt relief as a share of GDP, for 30 years after the shock. The dark grey (purple) areas indicate the 95% confidence intervals for the baseline (restricted) model generated using Gaussian approximation of 500 Monte Carlo draws from a fitted panel VAR. Data source: HIPC completion point documents, 1990-2017.

relief innovations in government expenditure on health.

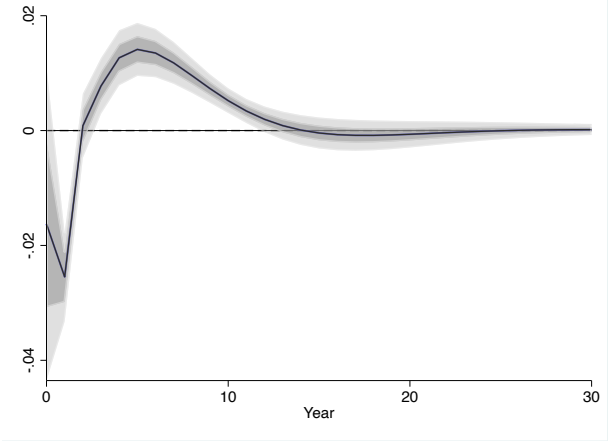
Second, we examine whether a unity standard deviation shock in our measure of debt relief affects the behavior of the Expected Years of Schooling (EYS) for children of school-entering age as defined by the WDI. As shown in figure 3.13 (bottom panel), EYS responds negatively to innovation shocks in debt service relief from HIPC and MDRI assistance in our original sample, even though it becomes significantly positive in period 2 before vanishing out after 12 years. When the alternative measure of debt relief is taken into consideration, the response of EYS is significantly negative which is therefore in line with our baseline results. In figure 3.14, we also re-estimate our baseline model for the two sub-samples, HIPC fragile and non-fragile countries, and the results continue to be in line with those discussed in section 3.4.1. In general, even when we consider alternative indicators for social spending variables, our results remain broadly the same.



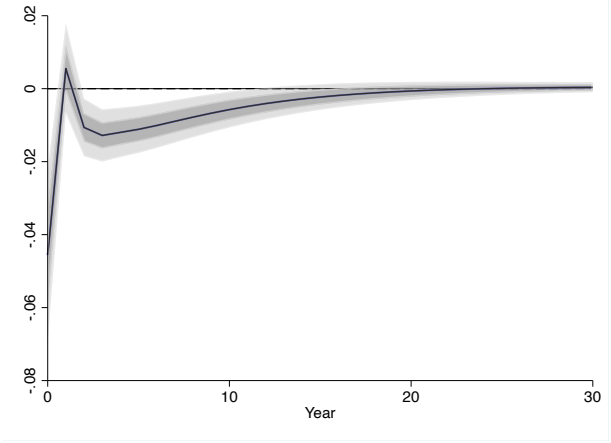
(a) Infant Mortality to debt service relief



(b) Infant Mortality to debt relief/GDP

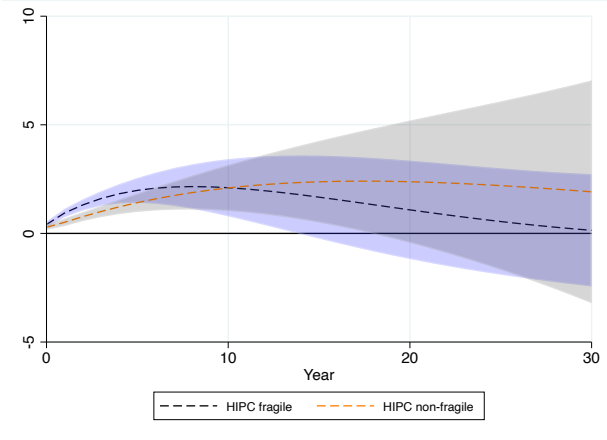


(c) Expected Years of Schooling to debt service relief

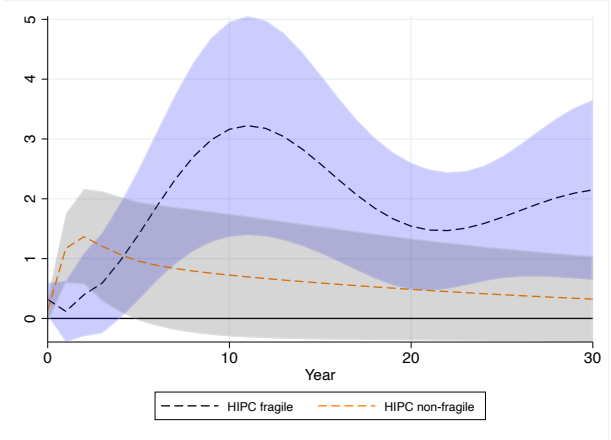


(d) Expected Years of Schooling to debt relief/GDP

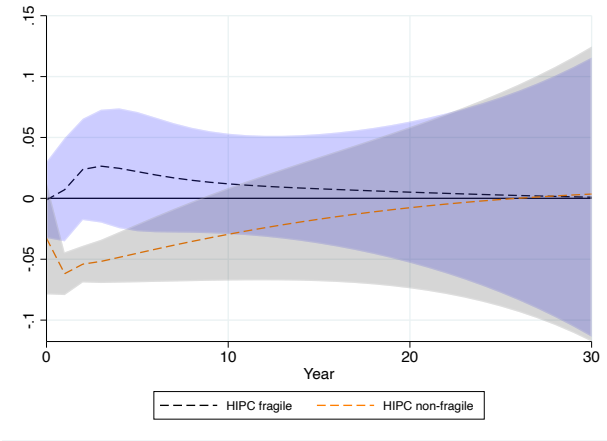
Figure 3.13: Orthogonalized impulse response functions for expenditure on health and education to a one standard-deviation innovation in debt service relief and debt relief as a share of GDP, for 30 years after the shock. The dark (light) grey areas indicate the 70 (95)% confidence intervals generated using Gaussian approximation of 500 Monte Carlo draws from a fitted panel VAR. Data source: HIPC completion point documents, 1990-2017.



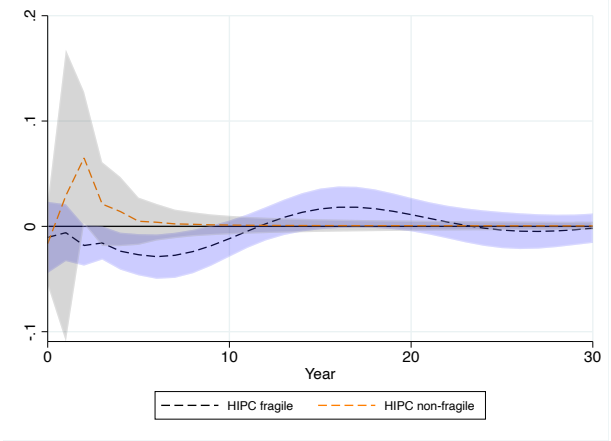
(a) Infant Mortality to debt service relief



(b) Infant Mortality to debt relief/GDP



(c) Expected Years of Schooling to debt service relief



(d) Expected Years of Schooling to debt relief/GDP

Figure 3.14: Orthogonalized impulse response functions for expenditure on health and education to a one standard-deviation innovation in debt service relief and debt relief as a share of GDP, for 30 years after the shock. The dark grey (purple) areas indicate the 95% confidence intervals for HIPC (non) fragile countries generated using Gaussian approximation of 500 Monte Carlo draws from a fitted panel VAR. Data source: HIPC completion point documents, 1990-2017.

3.5 Conclusion

This study presents a simple model of fiscal response behavior of debt relief recipient countries which allows for endogenous debt relief and different categories of government expenditure. To obtain empirical evidence, we use a panel VAR approach based on GMM framework for 30 African Heavily Indebted Poor Countries over the period 1990–2017. To enrich our examination, several analyses such as impulse response functions, variance decomposition and Granger causality tests were carried out. Our findings are robust to a number of robustness exercises.

We document evidence that debt service relief from HIPC and MDRI assistance or debt relief as a share of GDP significantly help African Heavily Indebted Poor Countries to increase domestic tax collection. The mobilization of domestic revenue is more pronounced when natural resource revenues are excluded. Furthermore, although capital expenditure seems to fall with innovation shocks in debt relief, we compute a shred of strong evidence that debt service relief and debt relief as a share of GDP create (a maximum of) fiscal space of about 10.2% and 5.3%, respectively, in primary current expenditure. Government outlays on health appears to react better (and significantly positive) to debt relief assistance than government outlays on education and the positive impact on the former is also in line with improvements in infant mortality.

We then differentiate the sample between HIPC fragile and non-fragile countries. The results reveal that domestic tax mobilization responds positively much stronger in the former group of countries to shocks in debt relief assistance. For example, 7.6% of the variations in domestic tax collection in fragile HIPC states is explained by debt relief from HIPC and MDRI assistance when compared to a timid 0.7% in their non-fragile counterparts. Moreover, we find a significantly positive response of both current and capital expenditure to a unity shock in debt service relief in HIPC fragile countries while capital expenditure seems to decline with the same shocks in HIPC non-fragile countries. In terms of social expenditure, health outlays seem to be effective in HIPC fragile states whereas there is not enough evidence to confirm the same pattern in non-fragile states.

Noticeably, HIPC fragile countries seem to be more successful in creating fiscal space than non-fragile countries as the former group of countries also have higher levels of revenue and government expenditure as a share of GDP. From a prudential point of view, a policy could be designed on the enhancement of efficiency of tax effort and productive public expenditure (for example, allowing a larger proportion of public investment anchoring towards merit goods and reducing unproductive recurrent expenditure) in non-fragile HIPC countries. Moreover, although debt relief might be an attractive source of fiscal space, there is still a need to identify and improve the determinants of absorptive

capacity in both fragile and non-fragile HIPC countries. We leave such an endeavour to future research.

Chapter 4

Fiscal Consolidation and Debt Reduction in Developing Countries: evidence from firm-level data

4.1 Introduction

After more than one decade since the global financial crisis took place, many developed and developing countries worldwide are still suffering from its aftermath as economic growth remains distant from its pre-crisis trend (Fatás and Summers, 2018). The strong loosening of fiscal adjustment policies as a response to the financial and economic turmoil in 2008 coincided with sharp rises in sovereign debt levels and public deficits. Although the fiscal stance was sound before 2008, the persistent impact of fiscal imbalances after the credit crunch has increasingly challenged the sustainability of public finances in many countries around the world.

Even though this persistence is now recognized by policymakers and scholars alike, it was not evident at the outset of the crisis. In the post-crisis era, however, many countries have simultaneously engaged in expansionary policies at the same time and in the same direction, and this period has been characterized by a natural policy experiment (Correa-Caro et al., 2018). Nevertheless, in early 2011, when the economic recovery in developed countries began to materialize, the necessity to bring government debt to a downward trajectory had precipitated many policymakers to shift their measures from fiscal stimulus to austerity. As one would expect, fiscal consolidation programs based upon austerity packages were rapidly designed and started to come into action. Regardless of the overall consensus that these measures were of pressing need, the economic literature still casts doubt on the real effectiveness of these fiscal retrenchments in terms of narrowing the gap in public finance as well as bringing government debt into a sustainable path (Jordà and Taylor, 2016; Arellano and Bai, 2017). As a result, there has been an intense debate about the need for flexible adjustment periods so that economies do not fall back into recessions (Agnello et al., 2012).

From this angle, a remarkable number of studies have extensively explored the macroeconomic effects of fiscal consolidation policies in both advanced and developing countries (e.g., Gemmell et al., 2011; Lin and Chu, 2013; Alesina et al., 2017; Correa-Caro et al., 2018). While Gemmell et al. (2011) examine the timing and persistence of fiscal policy impacts on aggregate short-run and long-run growth in OECD countries, Lin and Chu (2013) explore the nexus between fiscal consolidation and inflation in emerging and developed economies. Some scholars have also stressed that successful consolidations are primarily based on spending cuts in contrast to tax hikes (e.g., Alesina and Ardagna, 2010; Forni et al., 2010; Guajardo et al., 2014; Ağca and Igan, 2019). Notwithstanding, among the number of studies that focus on developing countries, those that concentrate on the economic implications of fiscal consolidation at the firm and industry level are still scant. This paper aims at filling this gap by shedding light on the effects of fiscal consolidation policies – implemented to bring back public debt to sustainable levels – on

firm performance. It contributes to the existing literature in three distinct ways. Firstly, while many scholars (e.g., Claessens et al., 2012; Correa-Caro et al., 2018) use statistical approaches (e.g., changes in the structural deficits) as a proxy for fiscal adjustments, I construct a unique dataset of more than 544 fiscal consolidation actions – motivated by the desire to reduce government debt levels – for 98 developing countries following the narrative concept suggested by Romer and Romer (2010), and Devries et al. (2011). As put forward by Devries et al. (2011), such statistical approaches of fiscal adjustments suffer from measurement errors that are likely to be correlated with economic developments. Therefore, fiscal policy actions not motivated by current or projected economic conditions, are more likely to yield appropriate and unbiased estimates of the effects of fiscal consolidation (Romer and Romer, 2010). Secondly, I provide a novel perspective on the effects of fiscal consolidation packages on firm performance. More specifically, I disaggregate the fiscal consolidation measure into adjustment episodes based on tax hikes and spending cuts. To the best of my knowledge, no previous study has examined the effects of these consolidation packages on economic activity in developing countries taking a micro approach from the perspective of firm growth. Lastly, I combine the new narrative dataset of fiscal policy actions with the World Bank Enterprise Survey (WBES) covering a large database of more than 118,279 firms in 98 developing countries. Therefore, with this firm-level variation within countries, I exploit the heterogeneous effects of fiscal retrenchments on companies with different features. I generate a fresher insight on the existing firm-level evidence which may also complement the current and extensive country-level evidence.

I show that firm performance decreases with fiscal consolidation actions in developing countries. This negative association is more pronounced in large and non-exporting firms. However, consistent with the literature, the decline in firm performance is considerably mitigated with large fiscal consolidations (e.g., higher than 1.5 percent of GDP). When I allow the state of the debt-cycle to differ, I observe that fiscal adjustments in low-debt-risk developing countries are no longer important compared to their high-debt-risk counterparts. In the high-debt-risk countries, large fiscal adjustments are significantly positive for firm performance, and this positive association helps this group of countries to rebuild credibility due to expectation of better economic performance in the future. Furthermore, I document evidence that debt-driven consolidation efforts based on tax hikes are more contractionary than those based on spending cuts, and therefore corroborating the existing empirical evidence. The remainder of this paper proceeds as follows. Section 4.2 highlights the existing literature on fiscal consolidation. Section 4.3 describes the dataset and the methodology applied in this study. Section 4.4 presents the empirical results, discussions, and robustness checks. Finally, section 4.5 draws conclusion and policy implications.

4.2 Related literature

The literature on fiscal consolidation is broad and has typically focused on developed and emerging countries. Early contributions from Perotti (1999); Alesina et al. (2008); Tagkalakis (2008); Corsetti et al. (2012*b*) have explored the aspects (i.e., macroeconomic environment and political economy settings) that are likely to induce fiscal consolidation programs, while Agnello et al. (2013); Foremny et al. (2017); Andrés et al. (2020) have highlighted factors (i.e., inflation rate, fiscal decentralisation and per capita GDP) that are associated with the length of fiscal adjustment periods. Yet, there is a growing body of literature on the composition of consolidation efforts which upholds that adjustments based on spending cuts are more successful than those based on tax hikes (Buti et al., 1998; Alesina and Ardagna, 2010; Ağca and Igan, 2019; Alesina et al., 2019).

To date, however, there has been little agreement on what is considered to be a successful fiscal consolidation effort. For example, to examine the factors that motivate a well-conceived consolidation plan, some studies have employed binary dependent variables in probit and logit empirical settings (McDermott and Wescott, 1996; Mierau et al., 2007; Jordà and Taylor, 2016). In contrast, Alesina and Ardagna (2013) define a successful fiscal consolidation as those adjustment efforts which assure a sound reduction of public debt as a share of GDP accompanied by positive economic output. As such, the consolidation effort is more likely to be successful, if the cyclically adjusted primary balance (CAPB)-to-GDP ratio increases by at least 1.5 percentage points (Alesina and Ardagna, 2010). Even so, there is a consensus among several studies that large fiscal adjustments illustrate a commitment for attaining long-term government debt sustainability (Von Hagen and Strauch, 2001; Ağca and Igan, 2019; Agnello et al., 2019). Along these lines, the composition, duration and size of a consolidation effort represent important factors for its likelihood of success.

As previously emphasized, limited empirical evidence is available on the effects of fiscal consolidation policies in developing countries at the firm and industry level. A few exceptions are the studies conducted by Claessens et al. (2012) and Correa-Caro et al. (2018). For instance, Claessens et al. (2012) used a sample of 42 developed and emerging countries to investigate how firms' performance responded to fiscal impulses over the 2007-2009 financial crisis. They employed changes in the structural deficits scaled by sectoral sensitivity to the business cycle as a proxy for discretionary fiscal impulse for 7,722 non-financial manufacturing firms. The authors concluded that firms' profit responded positively to the degree that fiscal expansion occurred at the early stage of the crisis. In the same vein, Correa-Caro et al. (2018) examined the impact of fiscal stimulus on firms' profitability over the global financial crisis. They used a similar methodology as Claessens et al. (2012) but in a larger sample of 52 developed and emerging economies

with financial statement data from 22,333 firms. The authors took advantage of the Thomson Reuters Worldscope database and concluded that an increment of one percent of potential GDP in structural deficit (i.e., fiscal stimulus) leads to an increase of 0.3 percentage points in corporate profitability. This improvement is more pronounced in industries more sensitive to the business cycle.

However, such studies remain narrow in focus dealing only with statistical concepts as a proxy for fiscal adjustment changes. As is now well established from a number of studies, such statistical concepts suffer from measurement errors that may potentially be correlated with the economic activity (Romer and Romer, 2010; Devries et al., 2011, see section 4.3.1). Hence, to examine the effects of fiscal consolidation policies a more comprehensive measure which is strictly exogenous is required. The present study, therefore, uses a narrative approach which disentangles fiscal policy changes – motivated by reductions in government debt – from other developments affecting the economy in the short term. Moreover, unlike the narrative approach employed in this paper, the statistical concept is unable to provide information on the composition of fiscal retrenchments which is an important element to identify the success of fiscal consolidation plans.

4.3 Data and methodology

4.3.1 Data

The most time-consuming part of my analyses was certainly the construction of a new dataset of debt-driven fiscal consolidation episodes in 98 developing countries. The data is mostly retrieved from IMF staff reports – i.e., Article IV consultations, IMF Program documents, and Recent Economic Development reports. On the other hand, all the firm-level variables are computed with data from the World Bank Enterprise Survey (WBES). The remaining country-level variables are mainly collected from the World Development Indicators and Governance Matters project (Kraay et al., 2010). In what follows, the data collection process is discussed in more detail.

4.3.1.1 Fiscal consolidation measure

To construct the fiscal consolidation measure, I use a narrative approach in line with Romer and Romer (2010); Devries et al. (2011); Ramey (2011). This narrative approach is based on policymakers' actions and intentions that are primarily motivated by reductions in government debt as described in contemporaneous policy documents. These actions could be tax hikes or spending cuts as they are expressed as a percentage of GDP. For the

purpose of this paper, I compile historical information gathered from IMF staff reports as the primary source and, in some cases, I complement the dataset with regional bank reports and national budget reports.[1] In the database, I only document fiscal stances primarily motivated by the purpose of lowering government debt. For example, if the fiscal adjustment is driven primarily by restraining domestic demand or in response to economic contractions, I do not include it in the dataset. The case of Gabon in the second half of 2014 provides a real-world example of fiscal policy actions in response to current economic conditions. In particular, the authorities started a modest fiscal stance in response to the slump of the oil price in the international market. For instance, the government reduced wage bill growth, and eliminated some tax exemptions as well as subsidies to diesel and petrol as per *2015 Article IV consultation staff report*.[2] Since these adjustments were not implemented explicitly to reduce government debt, I do not include them in the dataset.

In addition, following Devries et al. (2011), I focus on implemented fiscal consolidation actions which means that if policies were announced but the historical reports indicate that they were not implemented, they are not included in the dataset. The case of Egypt in 2012 demonstrates an example of fiscal adjustment that was announced but not fully implemented. More specifically, the government announced ambitious austerity plans mostly based on cutting energy subsidies, introducing taxes on dividend and capital gains as well as raising property tax with the intent of setting the government's debt on a downward path. However, given the political turmoil, fiscal consolidation did not resume until 2015. As a result, I do not include these consolidation episodes in the dataset.

Indeed, the historical documents and successive editions of the IMF staff reports on each country provide us with reasonable enough information to assess whether policies previously announced were implemented or not. Since this measure is based on policy-makers' actions rather than a traditional statistical concept such as the increase in the cyclically-adjusted primary budget balance (CAPB), I avoid two major caveats of this latter that have been previously identified in the fiscal consolidation literature. Firstly, there is a potential correlation between cyclical adjustment methods and economic developments. For example, the CAPB normally is unable to remove the effect of sharp fluctuations in economic activity and asset prices from fiscal data. As a result, changes in CAPB may not necessarily be linked to fiscal consolidation actions, even though they are correlated with economic activity (Devries et al., 2011). Secondly, the CAPB raises concerns about reverse causality which may bias the results towards finding evidence of

[1] I use countries' specific reports from the African Development Bank, Asian Development Bank and Inter-America Development Bank.

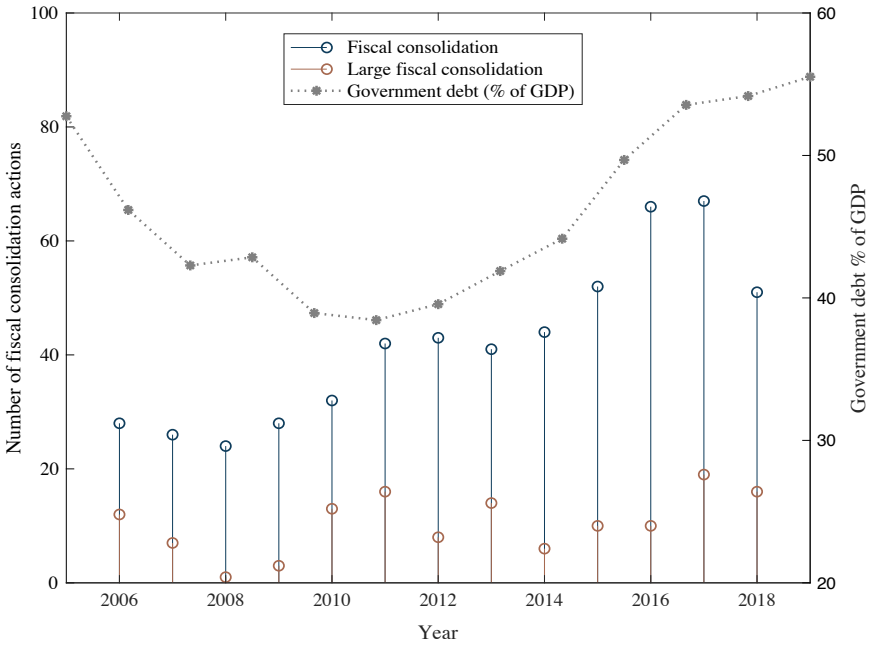
[2] For more information see https://www.imf.org/en/Publications/CR/Issues/2016/12/31/Gabon-2015-Article-IV-Consultation-Press-Release-Staff-Report-and-Statement-by-the-Executive-43802.

expansionary effects. In particular, an increase in the CAPB (e.g., resulting from tax hikes or spending cuts) may be motivated by a government's desire to restrain domestic demand and reduce the risk of overheating (Guajardo et al., 2014).

4.3.1.2 Stylized facts

I identify 544 fiscal consolidation episodes for all policy actions that aim at reducing government debt in 98 developing countries between 2006 and 2018. The list of countries and corresponding fiscal consolidation years can be found in table D.1 in appendix D. In terms of fiscal consolidation efforts, some countries such as Afghanistan, Albania, Republic of Congo, Pakistan and The Gambia were more active than others (e.g., East Timor, Egypt, Nicaragua and Liberia). Following the literature on fiscal consolidation (Pappa et al., 2015; Ağca and Igan, 2019; Guajardo et al., 2014; Agnello et al., 2019), I define large fiscal consolidation as those consolidation actions which exceed 1.5 percent of GDP. From the total of 544 consolidation actions, 135 are large according to this cut-off point. These records are illustrated in figure 4.1. For instance, I observe that the episodes of fiscal consolidation appear most frequently between 2016 and 2017 following the upward pattern in the average government debt as a share of GDP.

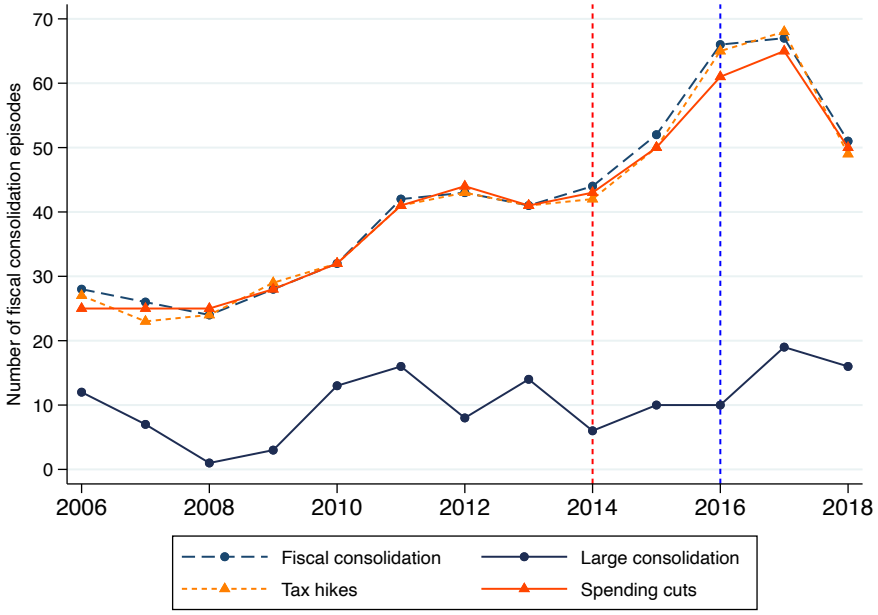
Figure 4.1: Fiscal consolidation episodes and government debt



Note: This figure plots fiscal consolidation actions (left axis) and government debt (right axis) in 98 developing countries between 2006 and 2018. The list of countries and corresponding fiscal consolidation years can be found in table D.1 in appendix D . The construction of the three variables is discussed in section 4.3. Data source: Author's calculation with data from IMF Article IV reports.

In addition, Table 4.1 shows that the average fiscal consolidation is about 0.1 percent of GDP, while large fiscal consolidation is approximately 3.2 percent of GDP. In order

Figure 4.2: Composition of fiscal consolidation episodes



Note: This figure plots the composition of fiscal consolidation episodes constructed as described in section 4.3. The area between the vertical red and blue lines represents the period in which there was more fiscal consolidation episodes. The definition and construction of the variable are discussed in section 4.3. Data source: Author's calculation with data from IMF Article IV reports.

to have a deeper insight into the fiscal consolidation packages, I distinguish between tax hikes and spending cuts taken to reduce government debt levels. In line with figure 4.2, I identify 534 and 530 fiscal consolidation actions based on tax hikes and spending cuts, respectively, between 2006 and 2018. These consolidation episodes are illustrated as a percentage of GDP in figure D.3 in appendix D. In addition, I disaggregate into current and capital spending cuts all the consolidation actions related to spending cuts (see figure D.1). More specifically, I record 475 consolidation episodes related to current spending cuts and 469 related to capital spending cuts. Tax hikes represent around 0.09 percent of GDP, on average, and spending cuts are much lower with an average of 0.01 percent of GDP as illustrated in Table 4.1.

4.3.1.3 Firm-level data

To examine the effect of fiscal consolidation actions on firm performance in developing countries, I match the new narrative dataset with the World Bank Enterprise Survey (WBES). This latter is firm-level survey data collected by the World Bank between 2006 and 2019 in more than one hundred countries. The survey covers a representative sample of firms in both the manufacturing and service sectors for each country. In all countries, respondents (i.e., business owners and senior managers) are invited to provide information on sales, labor, taxation, technology, financing, corruption and infrastructure. To allow

comparison across countries, the questions in the survey are standardized.

Since I am interested in analyzing firms' performance in relation to fiscal consolidation policies, I construct the dependent variable with data on the growth of firms' sales. The WBES contains information on companies' sales one year and three years before the survey. Hence, I compute, for each firm, the growth rate of sales by using the differential in log sales over three years for each available survey as follows:

$$Growth_t = \frac{log(sales_t) - log(sales_{t-3})}{3} \tag{4.1}$$

I use the GDP deflator with the same base year ($100 = 2005$) to deflate all sales that are provided in local currencies. Thereafter, I convert them into US dollars with exchange rate data for each country. Data on both GDP deflator and exchange rate are retrieved from the World Development Indicators. Figure D.4 in appendix D presents the distribution of the final variable. In tandem with the recent firm growth literature (Chauvet and Ehrhart, 2018; Bai et al., 2019), I drop the one percent of firms with the largest growth rates to avoid outliers driving the results. I also use a set of variables to control for firm-level characteristics. In particular, I control for the size of the firm, *Size*, by assigning discrete values for each firm in the sample. The value of one is assigned for firms with less than 20 employees, the value of two for firms with between 20 and 100 employees and the value of 3 for firms with more than 100 employees. I also use the available information in the WBES to account for the firm's ownership structure. I construct two variables, *State share*, which equals one if part (or all) of the firm's shares are owned by the government and zero otherwise, and *Foreign share*, which equals one if part (or all) of the firm's shares are owned by a foreign company. I include a dummy variable, *Export*, which equals one if the firm exports part of its sales to the foreign market. I also control for *Age*, defined as the number of years since the firm began its operations. In particular, I assign three (i.e., 1, 2 and 3) discrete values for Young (1–5 years old), mature (6–15 years old) and old (more than 15 years old) firms, respectively. Finally, I control for the catch-up effect by including the lagged value of sales, $Sales(-3)$.

Table 4.1 displays summary statistics. The annual average sales growth is about 9.66 percent, much lower than the 16.85 percent registered three years before. While 22 percent of the firms export part of their production to the foreign market, 12 percent of them are owned, in part or all, by foreign entities. The sample of firms is mostly composed of large and mature companies.

4.3.1.4 Country-level data

At the country level, I include a set of macroeconomic variables which represent an important dimension of the effects of fiscal policy actions on firm performance. Following previous studies on fiscal consolidation (Agnello et al., 2013; Ilzetzki et al., 2013; Guajardo et al., 2014), I control for the country's level of development by using the logarithm form of GDP per capita in constant 2005 US dollars. In order to control for the macroeconomic buoyancy of the country's economy, I include the real GDP growth rate. I also include the logarithm form of the country's population to account for the size of the country. All these three variables are collected from the World Development Indicators. To control for the size of the government bond market and sovereign debt levels, I use the ratio of general government debt to GDP with data collected from the World Economic Outlook database. I also use this latter database to gather data on the percentage change of inflation so that I can account for monetary conditions. To account for the trade policy environment at the country level, I construct a trade openness variable, $Trade$, defined as the sum of exports and imports as a percentage of GDP.

To control for quality of governance and economic institutions, I include a set of variables collected from the World Bank's Governance Matters project (Kraay et al., 2010). First, I include government effectiveness to account for the government's commitment to pursue its declared programs and policies. Second, I include regulatory quality to control for the government's ability to formulate and implement sound policies and regulations that stimulate and enable the development of the private sector. Last, I use corruption to control for the quality of economic institutions. These three indicators range from -2.5 to 2.5, with higher values indicating 'better' governance. All these country-level variables are averaged over three years for which firm growth is computed. Finally, in line with the fiscal consolidation (Gnangnon, 2014) and firm growth (Kouamé and Tapsoba, 2019) literature, it is believed that firm performance in developing countries might be influenced by the IMF balance of payment assistances and conditionalities. To control for this, I generate a dummy variable, IMF, which takes the value of one if the country is under one of the following IMF stabilization programs: Extended Credit Facility (ECF), Poverty Reduction and Growth Facility (PRGF), Standby Credit Facility (SCF), and Structural Adjustment Facility (SAF).

Table 4.1 suggests a fair degree of variation in terms of country-level variables. In particular, while the perceived level of government effectiveness and regulatory quality is low, the real GDP growth and inflation are relatively high at 4.82 and 7.2 percent, on average, respectively. Given that the sample is composed of developing countries, the overall perceived level of corruption is high, whereas 67.62 percent of GDP represents exports and imports. Between 2006 and 2018, 36 percent of the countries in the sample

were under the IMF's balance of payment assistance or stabilization programs.

Table 4.1: Summary statistics

	Mean	Std.Dev.	Min.	Max.	Obs.
Main variables of interest					
Fiscal Consolidation	0.10	1.655	–12.9	7.20	51,364
Large fiscal consolidation	3.20	1.145	0.00	7.20	9,625
Tax hikes	0.09	1.117	–15.4	3.10	51,149
Spending cuts	0.01	1.358	–6.7	5.90	47,611
Current spending cuts	0.02	0.990	–5.0	4.80	47,611
Capital spending cuts	–0.04	0.780	–7.3	3.40	46,111
Growth	9.66	35.529	–128.11	424.65	88,804
Firm characteristics					
Sales (–3)	16.85	3.363	0.00	37.243	89,936
Age	2.76	0.481	1	3	118,279
Foreign share	0.12	0.328	0	1	118,279
State share	0.03	0.172	0	1	118,279
Export	0.22	0.415	0	1	118,279
Size	1.72	0.767	1	3	118,269
Country characteristics					
Corruption	–0.54	0.547	–1.587	1.457	118,279
Government effectiveness	–0.41	0.524	–1.694	1.248	118,279
Regulatory quality	–0.35	0.562	–2.071	1.474	118,279
GDP per capita (log)	3.39	0.407	2.353	4.150	118,269
Population (log)	7.53	0.788	5.498	9.128	118,269
Real GDP growth	4.82	3.426	–7.652	19.683	118,269
Inflation	7.20	6.269	–2.41	59.218	118,625
Government debt (% GDP)	44.49	24.052	0.000	204.041	118,279
Trade (% GDP)	67.62	30.843	23.729	179.121	116,122
IMF	0.36	0.480	0	1	118,279

Notes: This table reports summary statistics for 98 developing countries over 2006–2018. Fiscal consolidation variables are from authors' calculations based on IMF, regional and national reports. Firm-level variables are from the World Bank Enterprise Survey (WBES). Country-level variables are from the World Development Indicators and Governance Matters project. Data source: WBES and IMF Article IV reports.

4.3.2 Methodology

To evaluate the impact of fiscal consolidation policies in the performance of firms in developing countries, this paper takes the following specification form:

$$Growth_{i,k,j(t,t-3)} = \alpha + \beta_1 Fiscal_{j(t,t-3)} + \beta_2 Country_{j(t,t-3)} + \beta_3 Firm_{i,k,j,t} + u_j + \tau_{k,t} + \varepsilon_{i,k,j,t} \tag{4.2}$$

Where $Growth_{i,k,j(t,t-3)}$ is the annual average growth rate of sales for firm i in industry k, and country j. As explained in the last section, the average annual growth rate is calculated over three years, between year t and $t-3$. $Fiscal_{j(t,t-3)}$ denotes the amount

of fiscal consolidation as a share of GDP averaged for three years. This variable can also represent the alternative and more specific measures of fiscal consolidation actions including tax hikes, spending cuts, current and capital spending cuts all expressed as a percentage of GDP. While $Country_{j(t,t-3)}$ is a set of country-level control variables, $Firm_{i,k,j,t}$ is a set of time varying firm-level characteristics. I also include u_j to account for unobservable time-invariant country characteristics. Lastly, $\tau_{k,t}$ is industry x year dummies to control for industry-level business cycles.

A number of statistical pitfalls may arise when measuring the impact of aggregate policy variables on the economic behavior of micro-units (Moulton, 1990; Wooldridge, 2003). The fact that $Fiscal_{j(t,t-3)}$ is measured at the country-year level, while $Growth_{i,k,j(t,t-3)}$ is measured at the firm level largely allies downward bias in the usual ordinary least-squares (OLS) standard errors and results on the inflation of test statistics. I, therefore, cluster the robust standard errors at the country-year level since the aggregate policy variable, $Fiscal_{j(t,t-3)}$, is measured at the same level. Moreover, potential endogeneity problems may occur from the inclusion of discretionary fiscal policy variables which might not be orthogonal to developments of the business cycle. For example, there might be some fiscal consolidation efforts resulting from current economic conditions affecting firm performance which again would be reflected in fiscal policy actions and therefore causing problems of reverse causality. However, as was seen in section 4.3.1.1, the action-based fiscal consolidation measure suggested by Romer and Romer (2010) and Devries et al. (2011) addresses these limitations because it is designed to exclusively capture exogenous fiscal adjustment efforts unrelated to cyclical conditions. Furthermore, this study focuses on fiscal consolidation efforts – i.e., policymakers' actions primarily motivated by reductions in government debt – not systematically associated to current economic conditions.[3] Hence, the following hypothesis is highlighted:

H_1: Debt-driven fiscal consolidation policies decrease firm performance in developing countries.

[3]Romer and Romer (2010) distinguish between legislated tax changes that are implemented to attain or maintain normal growth which they call endogenous, and those changes not primarily due to current or projected economic conditions which they call exogenous. The former approach includes (1) purely countercyclical legislated tax changes and (2) legislated changes undertaken because of changes in government spending; The latter approach includes (1) legislated tax changes motivated by the desire to reduce fiscal deficits and (2) changes undertaken to promote long-run growth. The measure of fiscal consolidation in the present study, therefore, follows the first path of this latter approach as I concentrate on changes primarily motivated by the desire to reduce government debt.

4.4 Empirical evidence

4.4.1 Baseline results

As discussed in equation 4.2, I begin my analysis by exploring how fiscal consolidation actions – motivated by reductions in government debt – affect firm performance in developing countries. Before discussing the baseline results, I first examine the specification by using an OLS estimator where country dummies and sector-year dummies are employed without considering firm fixed effects. Since the main variable of interest – i.e., fiscal consolidation – is measured at the country-year level, I clustered the standard errors at the same level. The results are presented in column (1) of Table 4.2 for the full sample of 98 developing countries. In column (2), results are exposed for the same sample when firm fixed effects are accounted for. Across all samples, the coefficient of $Sales(-3)$ suggests evidence of the catching-up effect, meaning that firms with lower performance in year $(t-3)$ tend to have better growth prospects in year t. Fiscal consolidation efforts implemented to reduce government debt in developing countries are negatively and significantly associated with firm performance at 5 percent significance level (Table 4.2, column 2). This result suggests that fiscal consolidation has contractionary effects on the growth of firms in developing countries. In column (3), I consider an indicator variable which equals one when the measure of fiscal consolidation exceeds 1.5 percent of GDP. This indicator variable is interacted with the measure of fiscal consolidation and its purpose is to provide an additional answer on the effect of large fiscal consolidations on firm performance.

Interestingly, with the large fiscal adjustment variable introduced in the specification, the magnitude and significance of the (negative) coefficient on fiscal consolidation rise. Moreover, firm performance is stimulated by large fiscal consolidations at 1 percent significance level. This is a novel finding which is consistent with the expansionary effects of large fiscal consolidations. As put forward by Giavazzi and Pagano (1990), severe or large fiscal adjustments anticipate forward-looking expectations about future economic output.

These results are not only statistically, but also economically meaningful. Specifically, a one percentage point increase in fiscal consolidation as a share of GDP may result in a reduction of firms' sales growth of about 3.97 percentage points. However, the growth of firms' sales may increase at the same proportion (i.e., 3.97 percentage points) if changes in fiscal consolidation are above 1.5 percent of GDP (Table 4.2, column 3). Thereafter, following Leigh et al. (2010), I explore whether expansionary fiscal adjustments are more likely to happen in economies with high perceived sovereign default risks. In doing so, I split the sample into two groups of high (above-median) and low (below-median)

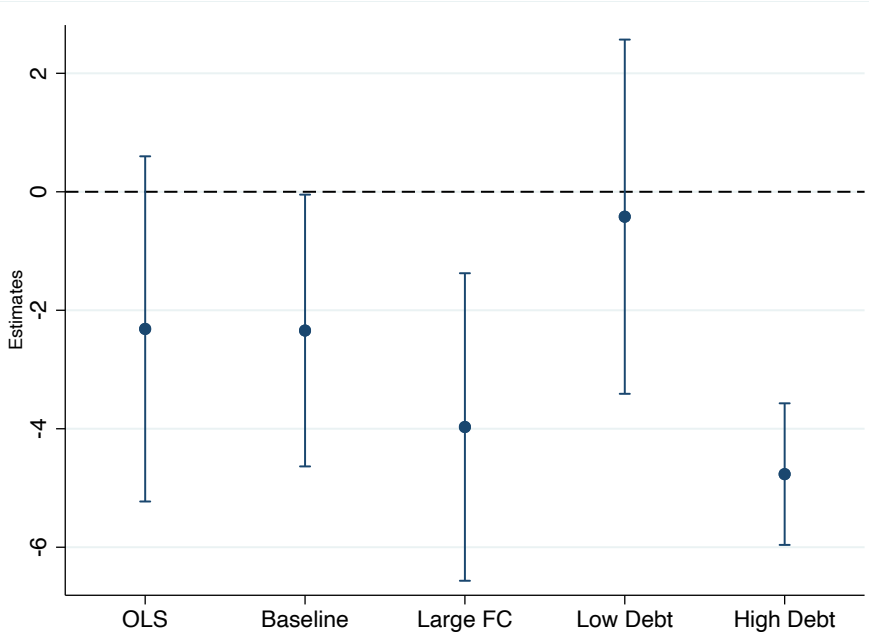
Table 4.2: Baseline results

Dependent variable:	(1)	(2)	(3)	(4)	(5)
Firm growth	OLS	Baseline (Within)	Large consolidation	Low public debt	High public debt
Sales (–3)	–4.4299***	–4.3505***	–4.3346***	–6.6357***	–3.4703***
	(1.6484)	(1.2885)	(1.2879)	(1.8221)	(0.3322)
Fiscal consolidation	–2.3145	–2.3419**	–3.9704***	–0.4203	–4.7659***
	(1.4770)	(1.1631)	(1.3160)	(1.5078)	(0.6012)
Fiscal consolidation >1.5% GDP			3.9710***	2.308	5.4356***
			(1.4879)	(2.3572)	(0.7929)
Country–level variables					
Corruption	1.254	2.108	2.390	7.667	–4.0497
	(3.5239)	(3.1870)	(3.2076)	(5.1553)	(2.7848)
Government effectiveness	–3.4688	–3.3886	–3.0664	1.227	–3.7264
	(5.1676)	(4.2658)	(4.3879)	(7.3642)	(3.7335)
Regulatory quality	1.474	0.492	0.254	0.812	–0.5712
	(4.0573)	(3.3138)	(3.3337)	(5.9811)	(2.8123)
GDP per capita (log)	–0.320	0.475	0.395	–3.5531	10.9281***
	(3.5053)	(3.1884)	(3.1525)	(5.2734)	(2.9473)
Population (log)	1.115	1.530	1.724	13.2617***	–0.1162
	(2.2184)	(1.7947)	(1.7994)	(4.3677)	(1.4887)
Real GDP growth	0.541	0.6181*	0.5820*	0.863	1.6143***
	(0.3717)	(0.3408)	(0.3226)	(0.6412)	(0.2622)
Inflation	0.9477***	1.0087***	0.9630***	0.9826***	0.7276***
	(0.2075)	(0.1816)	(0.1793)	(0.2559)	(0.1272)
Government debt (% GDP)	–0.0503	–0.0299	–0.0365	–0.0853	0.2276***
	(0.0668)	(0.0557)	(0.0559)	(0.1131)	(0.0314)
Trade (% GDP)	0.048	0.049	0.026	–0.1372	0.049
	(0.0454)	(0.0393)	(0.0367)	(0.0837)	(0.0357)
IMF	1.410	1.830	1.041	–2.6658	3.4016*
	(2.2131)	(1.9558)	(1.8675)	(2.9805)	(1.9501)
Firm–level variables					
Age	–2.0096***	–1.7229***	–1.5975***	0.064	–1.9498***
	(0.5527)	(0.5348)	(0.5221)	(0.9839)	(0.4614)
Foreign share	2.9281***	3.0192***	2.8339***	5.3158***	2.3487***
	(0.9586)	(0.7485)	(0.7435)	(1.5085)	(0.4711)
State share	2.4173	2.6684**	2.6534**	3.3511**	0.043
	(1.6795)	(1.2423)	(1.2408)	(1.5808)	(1.2313)
Export	2.5687*	2.4793**	2.6054**	3.3050**	1.5969***
	(1.3164)	(1.1834)	(1.1607)	(1.4326)	(0.4574)
Size	7.8684***	7.6993***	7.7222***	12.7388***	6.7587***
	(2.5963)	(1.9608)	(1.9618)	(2.9896)	(0.5576)
Observations	85,879	85,879	85,879	41,397	44,482
R–squared	0.174	0.178	0.182	0.241	0.246
Number of countries	98	98	98	45	53
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Sector–Year fixed effects	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	No	Yes	Yes	Yes	Yes

Notes: Dependent variable is firm growth proxied by the annual average growth rate in sales. Top one percent of companies with the highest growth rates have been dropped from the sample. Tax hikes, spending cuts, current spending cuts and capital spending cuts are expressed as a percentage of GDP. Large consolidation is a dummy variable which equals 1 if fiscal consolidation is higher than 1.5% of GDP and 0 otherwise. The definitions of the variables are in line with section 4.3. To save space, I omit the control variables as their coefficients are in line with those reported in Table 4.2. Country, sector–year and firm fixed effects are included. The numbers in parentheses are robust standard errors clustered at the country–year level. *, **, ***: significance levels of 10%, 5% and 1% respectively. Data source: WBES and IMF Article IV reports.

sovereign debt levels as illustrated in columns (4) and (5). The estimation results suggest that for the sample that has relatively low sovereign debt, fiscal tightening does not necessarily influence firm performance. Nevertheless, firm performance falls significantly following fiscal consolidation for the sample that has relatively high sovereign debt and this negative effect is mitigated for large fiscal consolidations. This finding is in line with the perception that large fiscal adjustments in favor of bringing sovereign debt to sustainable levels actually help high-debt-risk countries to rebuild their credibility because of the expectation of better economic performance in the future. Figures 4.3 and 4.4 summarise the main results of table 4.2.

Figure 4.3: Impact of fiscal consolidation on firm performance (baseline)

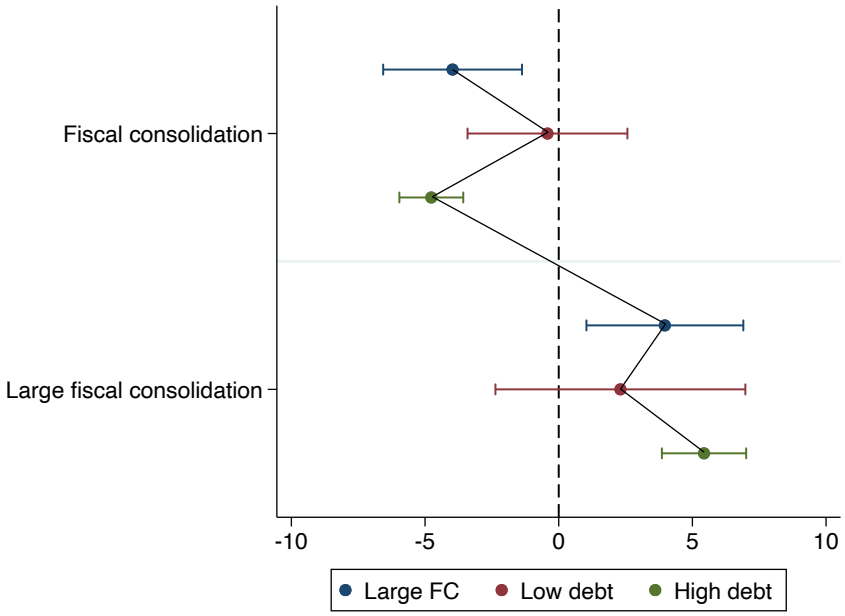


Note: This figure plots the impact of fiscal consolidation on firm performance. Dependent variable is firm growth proxied by the annual average growth rate in sales. Top one percent of companies with the highest growth rates have been dropped from the sample. All regressions are estimated using the narrative approach of fiscal consolidation as a share of GDP. The definition and construction of the variable are discussed in section 4.3. Data source: WBES and IMF Article IV reports.

Turning to the control variables, Table 4.2 illustrates that the estimated coefficients on country-level variables are mostly in line with those reported in the literature. Firm performance increases with real GDP growth and GDP per capita (albeit insignificant) implying that in rapidly growing economies and with higher income per capita, firms enjoy higher sales growth. In developing countries, firms are also growing with higher inflation meaning that they tend to increase the price of goods and services more than the rise in their costs of production. IMF programs seem to improve firms' sales growth in developing countries with relatively high sovereign debt. The inclusion of country and year fixed effects may explain the absence of a statistically significant association for the remaining country variables.

Turning to the correlation between firm performance and the firm-level variables, I may infer that firm's age is inversely correlated with sales growth. This means that younger firms tend to have higher sales growth than older firms. On the other hand, foreign-owned firms tend to have higher sales growth than state-owned ones and being an outward-looking (exporting) firm also helps to increase the firm's performance. Lastly, larger firms normally have higher performance as it is confirmed by the positive coefficient on *Size* in all regressions.

Figure 4.4: Impact of fiscal (large) consolidation on firm performance (baseline)



Note: This figure plots the impact of fiscal (and large) consolidation on firm performance. Large fiscal consolidation is identified with an indicator that equals one if a consolidation action is above 1.5% of GDP. Dependent variable is firm growth proxied by the annual average growth rate in sales. Top one percent of companies with the highest growth rates have been dropped from the sample. All regressions are estimated using the narrative approach of fiscal consolidation as a share of GDP. The definition of the variables is discussed in section 4.3. Data source: WBES and IMF Article IV reports.

4.4.2 Tax hikes *versus* spending cuts

A large strand of the literature suggests that fiscal adjustments based on spending cuts are less likely to have contractionary effects on output than those based on tax hikes (Alesina and Ardagna, 2010; Guajardo et al., 2014; Ağca and Igan, 2019). In this section, I, therefore, examine how the composition of fiscal consolidation packages affects firm performance in developing countries. The results are summarized in Table 4.3. As a preliminary exercise, in columns (1) and (2), I start with specifications that only include tax hikes as a percentage of GDP while in columns (3) and (4) I only include spending cuts as a percentage of GDP. Further, in columns (5) and (6), I include in the regression both tax hikes and spending cuts. They are all debt-driven fiscal consolidation packages.

The results suggest that debt-driven consolidation efforts based on tax hikes are more contractionary than those based on spending cuts, even though this latter is not statistically significant (Table 4.3, column 5). In column (6), I add tax hikes and spending cuts above 1.5 percent of GDP to evaluate the response of the variables of interest. It is observed that a one percentage point increase in tax hikes and spending cuts reduces firm performance by about 4.45 and 2.73 percentage points in developing countries (Table 4.3, column 6). This negative impact is alleviated by large tax hikes (although insignificant) and spending cuts.

Consistent with previous findings, these are novel results confirming that spending-based adjustments are less likely to have contractionary effects on firm performance than tax-based adjustments. There may be several reasons behind these findings and the literature has identified at least three. Firstly, consolidations based on spending cuts usually tend to be affiliated with monetary easing than consolidations based on tax hikes (Leigh et al., 2010; Guajardo et al., 2014). Secondly, in the short-run, government spending reversals alter the impact of spending cuts (Corsetti et al., 2012*a*). Thirdly, consolidation actions based on spending cuts are less costly, in terms of short-run output losses, than those based on tax hikes (Alesina et al., 2018).

I next further the analyses by decomposing the spending-based consolidation variable into current and capital spending cuts.[4] This exercise would allow us to figure out which components of spending cuts are more prone to cause expansionary effects on firm performance. Both measures are computed as a share of GDP and the results are summarized in Table 4.3 between columns (7)-(10). While in column (7) I include current and capital spending cuts, in column (8) I add both current and capital spending cuts when they exceed 1.5 percent of GDP. In columns (9) and (10), on the other hand, I include all these latter spending cuts variables as well as tax hikes simultaneously. It is found that capital spending cuts are more likely to have contractionary impacts on firms' sales growth than current spending cuts, although this latter being statistically insignificant. To gauge economic importance, I would infer that a one percentage point increase in capital spending cuts, would reduce firm performance by about 3.32 percentage points which are mitigated when capital spending cuts are higher than 1.5 percent of GDP (Table 4.3, column (10)). This finding is consistent with that of Arizala et al. (2017) who find that a drop in public investment has a more contractionary effect on output than a reduction in public consumption in African countries. Indeed, reductions in capital spending are likely to lead to a deterioration of public capital and therefore risking the long-term growth. In developing countries, this adverse impact can be mitigated by reducing unproductive current and capital outlays.

[4]Due to the high heterogeneity on how developing countries report their typologies of taxation, the effort to decompose tax-based consolidations has proven to be unsuccessful.

Table 4.3: Tax hikes *versus* spending cuts

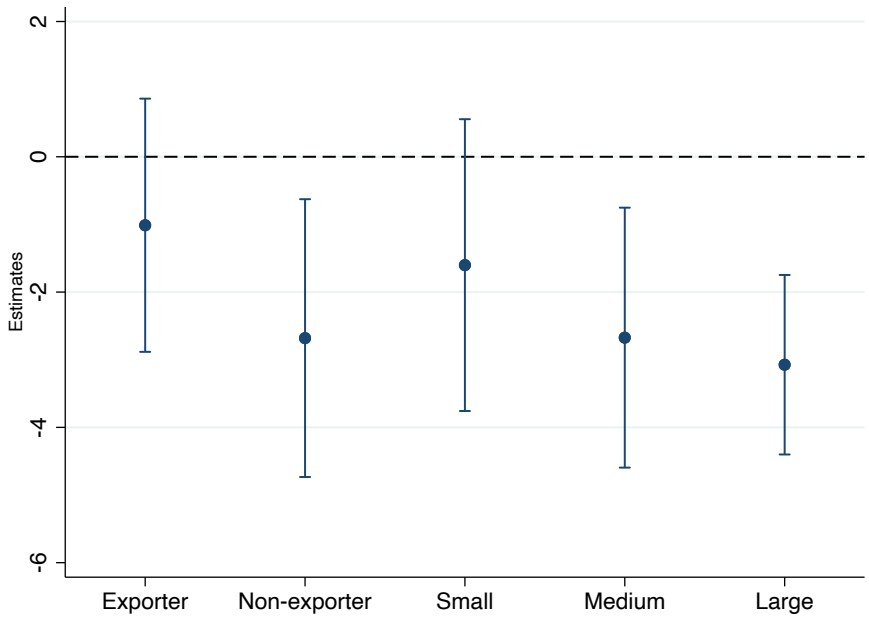
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Tax hikes	–3.5045***	–3.6271***			–3.6701***	–4.4540***			–3.5170***	–4.1428***
	(1.2238)	(1.3039)			(1.2138)	(1.2090)			(1.2602)	(1.2948)
Tax hikes >1.5% GDP		1.1297				1.1321				1.3419
		(2.3077)				(2.3705)				(2.4395)
Spending cuts			0.1504	–0.2289	–0.7617	–2.7293**				
			(0.8760)	(1.4233)	(0.8640)	(1.3093)				
Spending cuts >1.5% GDP				0.9356		4.1459**				
				(2.0285)		(1.8990)				
Current spending cuts							0.6383	0.6091	0.1626	–1.1568
							(1.2570)	(1.6978)	(1.3456)	(1.6934)
Current spending cuts >1.5% GDP								–0.5382		2.4951
								(2.1526)		(2.3221)
Capital spending cuts							1.3895	–0.5578	–0.139	–3.3245*
							(1.4658)	(2.1907)	(1.3294)	(1.8090)
Capital spending cuts >1.5% GDP								3.9497		6.0246**
								(2.7826)		(2.3619)
Sales (–3)	–4.3674***	–3.6271***	–4.4538***	–4.4647***	–4.3490***	–4.3665***	–4.4906***	–4.5289***	–4.3643***	–4.4143***
	(1.2831)	(1.3035)	(1.2818)	(1.2875)	(1.2895)	(1.3045)	(1.2944)	(1.3101)	(1.3055)	(1.3248)
Observations	85,879	85,879	85,879	85,879	85,879	85,879	85,879	85,879	85,879	85,879
R–squared	0.182	0.182	0.172	0.172	0.182	0.184	0.173	0.174	0.182	0.185
Number of countries	98	98	98	98	98	98	98	98	98	98
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector–Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Dependent variable is firm growth proxied by the annual average growth rate in sales. Top one percent of companies with the highest growth rates have been dropped from the sample. Tax hikes, spending cuts, current spending cuts and capital spending cuts are expressed as a percentage of GDP. Large consolidation is a dummy variable which equals 1 if fiscal consolidation is higher than 1.5% of GDP and 0 otherwise. The definitions of the variables are in line with section 4.3. To save space, I omit the control variables as their coefficients are in line with those reported in Table 4.2. Country, sector–year and firm fixed effects are included. The numbers in parentheses are robust standard errors clustered at the country–year level. *, **, ***: significance levels of 10%, 5% and 1% respectively. Data source: WBES and IMF Article IV reports.

4.4.3 Does fiscal consolidation harm some firms more than others?

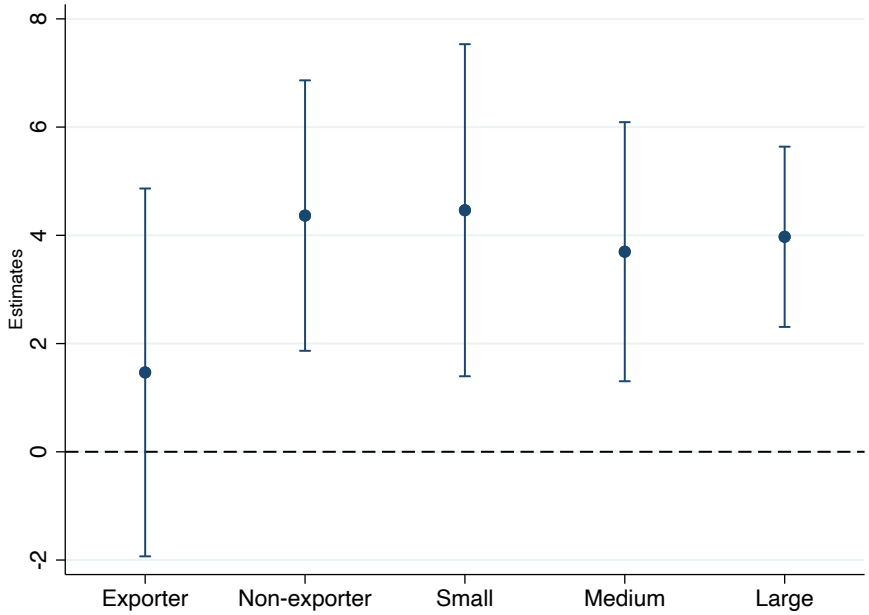
So far, the present findings show that debt-driven fiscal consolidation policies are negatively correlated with firm performance in developing countries. This negative impact is mitigated for large fiscal adjustments. In this section, I investigate whether the effect of fiscal consolidation is contingent on some firms' characteristics. I distinguish between small, medium and large firms, and firms that are deemed to be exporters and domestics. The definitions of these characteristics are in line with what is discussed in section 4.3. The results are summarized in Table 4.4. Column (4) in panel A suggests that the adverse impact of fiscal tightening on firm performance loses its statistical significance if I consider only small firms. However, after I include large fiscal consolidation, the results are very similar to those reported in the baseline regressions as illustrated in column (2) of the same panel.

Figure 4.5: Impact of fiscal consolidation on different firm sub-samples



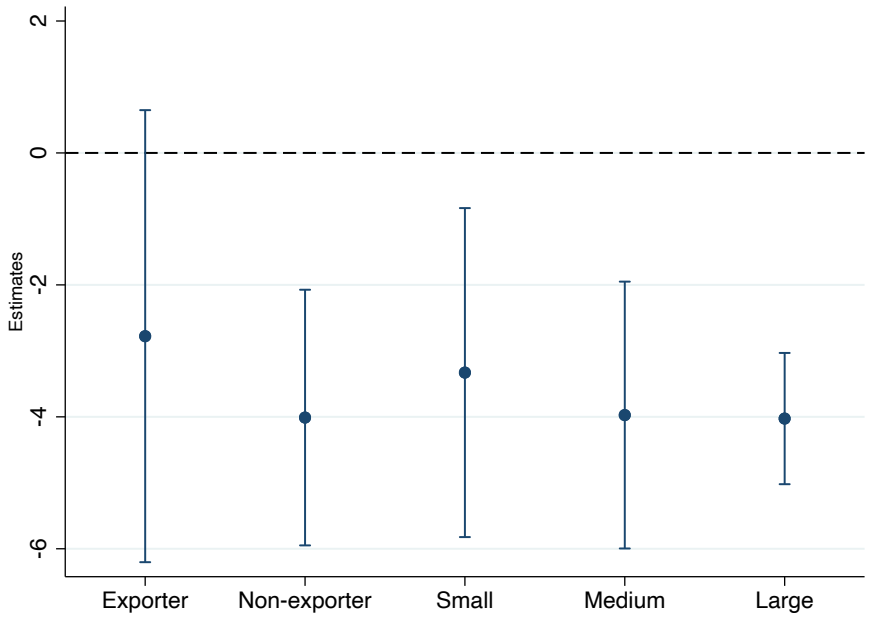
Note: This figure plots the impact of fiscal consolidation on firm performance in different firm sub-samples. Exporter (domestic) firms are those which export part (none) proportion of its sales. Small, medium and large firms are those with less than 20, between 20 and 100, and more than 100 employees, respectively. The definition and construction of the variable are discussed in section 4.3. Data source: WBES and IMF Article IV reports.

Figure 4.6: Impact of large fiscal consolidation on different firm sub-samples



Note: This figure plots the impact of large fiscal consolidation on firm performance in different firm sub-samples. Exporter (domestic) firms are those which export part (none) proportion of its sales. Small, medium and large firms are those with less than 20, between 20 and 100, and more than 100 employees, respectively. The definition and construction of the variable are discussed in section 4.3. Data source: WBES and IMF Article IV reports.

Figure 4.7: Impact of tax hikes on different firm sub-samples



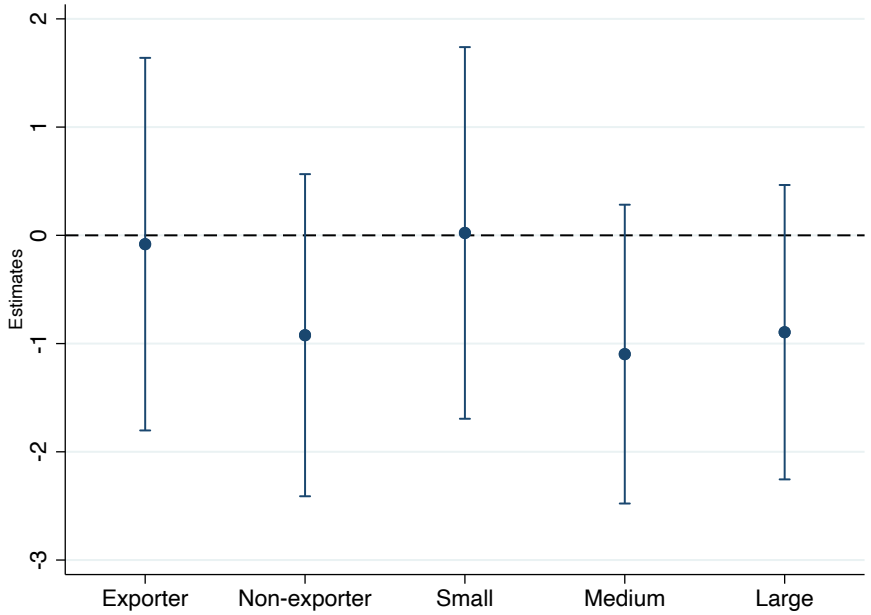
Note: This figure plots the impact of tax hikes on firm performance in different firm sub-samples. Exporter (domestic) firms are those which export part (none) proportion of its sales. Small, medium and large firms are those with less than 20, between 20 and 100, and more than 100 employees, respectively. The definition and construction of the variable are discussed in section 4.3. Data source: WBES and IMF Article IV reports.

Table 4.4: Impact of fiscal consolidation on different firms

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Variables	Baseline			Small			Medium		
Fiscal consolidation	–2.3419**	–3.9704***		–1.6013	–3.6246**		–2.6735***	–4.1619***	
	(1.1631)	(1.3160)		(1.0935)	(1.3939)		(0.9740)	(1.1391)	
Fiscal consolidation >1.5% GDP		3.9710***			4.4639***			3.6976***	
		(1.4879)	–3.6701***		(1.5552)			(1.2136)	
Taxhikes			(1.2138)			–3.3295***			–3.9732***
			–0.7617			(1.2641)			(1.0254)
Spendingcuts			(0.8640)			0.0222			–1.0973
						(0.8704)			(0.6998)
Sales (–3)	–4.3505***	–4.3346***	–4.3490***	–5.1486***	–5.1554***	–5.1870***	–4.1201***	–4.0922***	–4.0976***
	(1.2885)	(1.2879)	(1.2895)	(1.4663)	(1.4636)	(1.4693)	(0.8985)	(0.8970)	(0.9009)
Observations	85,879	85,879	85,879	38,824	38,824	38,824	29,372	29,372	29,372
R–squared	0.178	0.182	0.182	0.197	0.201	0.201	0.184	0.188	0.188
Number of countries	98	98	98	44	44	44	33	33	33
Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Large			Exporter			Domestic		
Fiscal consolidation	–3.0738***	–4.3466***		–1.0121	–1.5961		–2.6803**	–4.4728***	
	(0.6727)	(0.6112)		(0.9488)	(1.4715)		(1.0410)	(1.0766)	
Fiscal consolidation >1.5% GDP		3.9730***			1.4668			4.3652***	
		(0.8445)			(1.7229)			(1.2668)	
Taxhikes			–4.0263***			–2.7774			–4.0112***
			(0.5043)			(1.7369)			(0.9823)
Spendingcuts			–0.8949			–0.0814			–0.9226
			(0.6894)			(0.8725)			(0.7544)
Sales (–3)	–3.6953***	–3.6648***	–3.6576***	–6.1496***	–6.1321***	–6.1471***	–4.0024***	–4.0029***	–4.0036***
	(0.5557)	(0.5539)	(0.5571)	(1.6123)	(1.6221)	(1.6144)	(1.0316)	(1.0303)	(1.0332)
Observations	17,683	17,683	17,683	19,563	19,563	19,563	66,316	66,316	66,316
R–squared	0.207	0.212	0.212	0.258	0.259	0.260	0.175	0.181	0.180
Number of countries	21	21	21	23	23	23	75	75	75
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector–Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

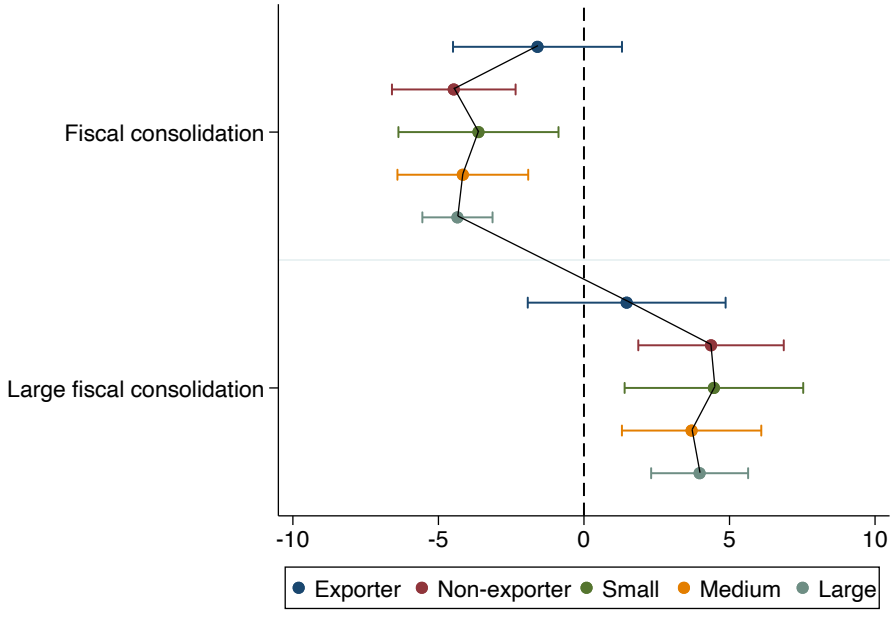
Notes: Dependent variable is firm growth proxied by the annual average growth rate in sales. Top one percent of companies with the highest growth rates have been dropped from the sample. Tax hikes and spending cuts are expressed as a percentage of GDP. Large consolidation is a dummy variable which equals 1 if fiscal consolidation is higher than 1.5% of GDP and 0 otherwise. Small, medium and large firms are those with less than 20, between 20 and 100, and more than 100 employees, respectively. Exporter (domestic) firms are those which export part (none) proportion of its sales. The definitions of the variables are in line with section 4.3. To save space, I omit the control variables as their coefficients are in line with those reported in table 4.2. Country, sector–year and firm fixed effects are included. The numbers in parentheses are robust standard errors clustered at the country–year level. *, **, ***: significance levels of 10%, 5% and 1% respectively. Data source: WBES and IMF Article IV reports.

Figure 4.8: Impact of spending cuts on different firm sub-samples



Note: This figure plots the impact of spending cuts on firm performance in different firm sub-samples. Exporter (domestic) firms are those which export part (none) proportion of its sales. Small, medium and large firms are those with less than 20, between 20 and 100, and more than 100 employees, respectively. The definition and construction of the variable are discussed in section 4.3. Data source: WBES and IMF Article IV reports.

Figure 4.9: Impact of fiscal (large) consolidation episodes on different firm sub-samples



Note: This figure plots the impact of fiscal (and large) consolidation on firm performance in different firm sub-samples. Exporter (domestic) firms are those which export part (none) proportion of its sales. Small, medium and large firms are those with less than 20, between 20 and 100, and more than 100 employees, respectively. The definition and construction of the variable are discussed in section 4.3. Data source: WBES and IMF Article IV reports.

Compared to medium firms, small firms appear to be less affected by the adverse

impact of fiscal consolidation (Table 4.4, columns (5) and (8)). The same pattern holds true when it is compared with the effect of fiscal policy actions on medium and large firms (Table 4.4, column (8) in panel A and column (2) in panel B). In terms of fiscal consolidation packages, tax hikes also have more contractionary effects than spending cuts and this impact becomes more harmful as it is moved from small to large firms. This outcome is contrary to that of Ağca and Igan (2019) who found a more contractionary effect of fiscal consolidation on loan spreads in small firms rather than large firms. Nevertheless, because I concentrate the sample on firms in developing countries, it is reasonably expected that tax authorities in these countries face several challenges with tax hikes because of many unregistered small businesses working in the shadow economy. Therefore, medium and large firms may be the most affected by fiscal consolidation actions because they tend to operate within the official sector as they represent an important source of government revenues in developing countries.

Turning to the effect of fiscal consolidation on exporting and domestic firms, I observe that fiscal tightening is more detrimental for the latter group of firms than the former. This result suggests that for a one percentage point increase in fiscal consolidation, sales growth drops by around 1.60 (not significant) and 4.47 percentage points in exporter and domestic firms, respectively (Table 4.4, columns (5) and (8) of panel B). Both effects are mitigated for large consolidations. These results further support the idea of exporting (or multinational) firms enjoying a foreign tax advantage since they have the resources to move profits to low-tax jurisdictions. As put forward by Rego (2003), because of profit shifting opportunities of exporting firms, they benefit from economies of scale in international fiscal policy planning. Figures 4.5, 4.6, 4.7, 4.8 and 4.9 exhibit the main results of table 4.4.

4.4.4 Robustness

In this section, I discuss further the baseline results presented in Table 4.2 as I perform several robustness checks. Because fiscal consolidation is measured at the country level and the sample comprises 98 developing countries, one may suspect that the findings are sensitive to sample dependence and potential bias due to outliers. As such, I start by inspecting whether the baseline findings are driven by one specific region within the sample. More specifically, columns (2) and (3) of Table 4.2 are re-estimated with each regional sub-sample excluded one at a time. Table 4.5 summarizes the results. In panel A, I exclude 3 regions at a time such as Sub-Saharan Africa countries (SSA), Middle East and North Africa (MENA), and Latin America and Caribbean (LAC) countries.

Column (1) shows that after I dropped SSA countries the coefficient of fiscal consolidation is still negative and significant, even though its magnitude is smaller than those

reported in the baseline results. In column (2), I observe that the coefficient on large fiscal consolidation also remains positive and significant. Moving forward to MENA and LAC regions between columns (3) and (6), it is noted that the results remain very similar to those reported in Table 4.2. In panel B of the same Table, I sequentially drop 3 other regions at a time such as East-Asia and Pacific (EAP), Europe and Central Asia (ECA), and South Asia (SA). Again, results remain unaltered by these sample changes and show that baseline estimates are not driven by one specific region. It is worth mentioning that firms in the Africa region appear to be the most affected by fiscal consolidation actions as when this region is dropped from the sample, the negative effect of fiscal tightening on firm performance is the lowest at about 0.58 percentage points (Table 4.5, column (1)) compared to when the remaining regions are dropped from the sample. This effect is also considerably lower compared to the 2.34 percentage points found in the baseline results (Table 4.2, column (2)). This implies that the effect of fiscal consolidation on firm performance is more contractionary in the Africa region (see figure 4.10). Indeed, in terms of commitment to the announced fiscal policy actions, between 2006 and 2018, this region had an average negative value of fiscal consolidation of about 0.28 percent of GDP when compared to the overall positive mean of 0.1 percent of GDP in the whole sample.

Although I control for sector-year fixed effects in the baseline estimates, I next check the robustness of the results for specific sector characteristics. In doing so, I identify 12 different sectors across all firms in the sample. The outcomes are illustrated in Table 4.6 where I drop each specific sector one at a time. The results are again comparable to those in the baseline estimates (Table 4.2, columns (2) and (3)) as the coefficient on fiscal consolidation continues to be negative and statistically significant. These results alleviate the concern that the findings may be sensitive to specific sector characteristics. To gauge some economic sensitivity, I plot the results of Table 4.6 in figures 4.11 and 4.12. Next, I further ascertain whether the results are not driven by one specific country, although I control for country fixed effects. In fact, given the large sample of 98 developing countries, one may be concerned with the fact that the findings are sensitive to potential outliers. In Table 4.7, therefore, I present several panels (from A to N) where I re-estimate the baseline regressions by dropping one country at a time. All estimations show that the coefficients on fiscal consolidation and large consolidations remain broadly the same, suggesting that the results are not driven by a single country.

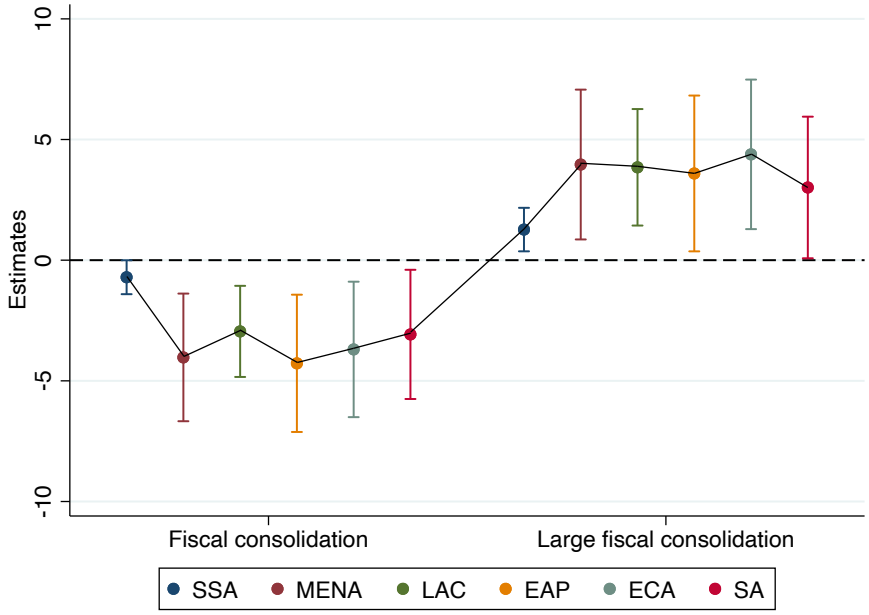
In Table 4.4, it was seen how fiscal consolidation affects firm performance in different groups of firms. While those estimates are useful in determining the extent to which fiscal tightening influences firms with specific characteristics, they do not confirm the validity of the baseline results when firms with certain features are excluded from the sample. Moreover, the inclusion of firm-level covariates in the regression to control for firm time-

Table 4.5: Dropping regional sub-samples

Panel A	(1)	(2)	(3)	(4)	(5)	(6)
Dropped region	SSA		MENA		LAC	
Fiscal consolidation	–0.5846***	–0.7064**	–2.4070**	–4.0289***	–1.7424*	–2.9516***
	(0.1766)	(0.3543)	(1.1886)	(1.3405)	(0.9278)	(0.9553)
Fiscal consolidation >1.5% GDP		1.2683***		3.9631**		3.8482***
		(0.4547)		(1.5733)		(1.2215)
Observations	63,532	63,532	78,879	78,879	64,722	64,721
R–squared	0.1218	0.1134	0.182	0.186	0.301	0.223
Number of countries	48	48	90	90	79	79
Panel B	(1)	(2)	(3)	(4)	(5)	(6)
Dropped region	EAP		ECA		SA	
Fiscal consolidation	–3.0685**	–4.2749***	–2.2916*	–3.6981**	–1.7289*	–3.0757**
	(1.2429)	(1.4412)	(1.3589)	(1.4208)	(1.0033)	(1.3566)
Large fiscal consolidation		3.5933**		4.3849***		3.0126**
		(1.6356)		(1.5684)		(1.4867)
Observations	73,674	73,674	76,925	76,925	71,664	71,664
R–squared	0.209	0.212	0.198	0.203	0.191	0.193
Number of countries	88	88	84	84	91	91
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sector–Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Dependent variable is firm growth proxied by the annual average growth rate in sales. Top one percent of companies with the highest growth rates have been dropped from the sample. Large consolidation is a dummy variable which equals 1 if fiscal consolidation is higher than 1.5% of GDP and 0 otherwise. SSA stands for Sub–Saharan Africa, MENA is Middle–East and North Africa, LAC is Latin America and Caribbean, EAP is East–Asia and Pacific, ECA stands for Europe and Central Asia, and SA is South Asia. The definition of the variables is in line with section 4.3. To save space, I omit the control variables as their coefficients are in line with those reported in table 4.2. Country, sector–year and firm fixed effects are included. The numbers in parentheses are robust standard errors clustered at the country–year level. *, **, ***: significance levels of 10%, 5% and 1% respectively. Data source: WBES and IMF Article IV reports.

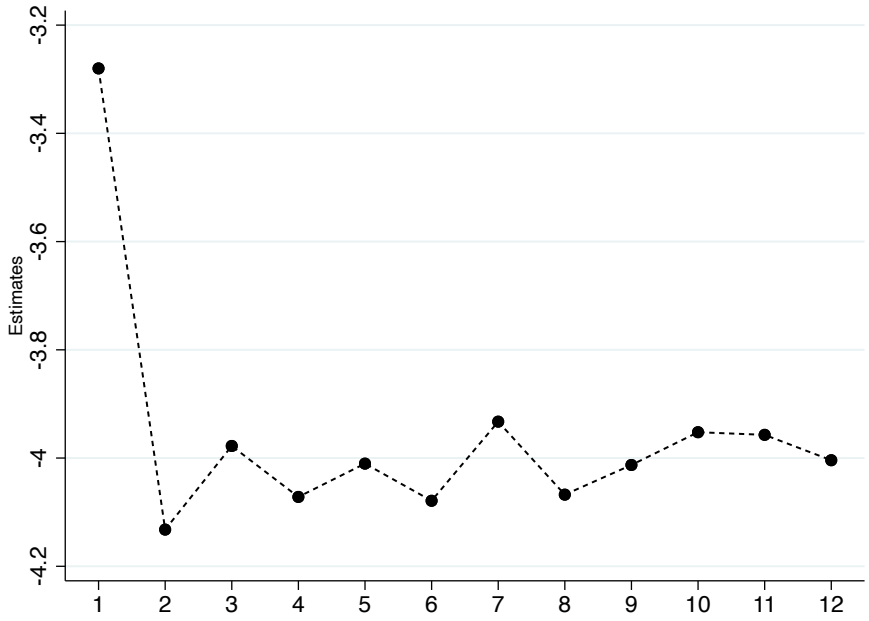
Figure 4.10: Impact of fiscal (large) consolidation episodes on dropped regional sub-samples



Note: This figure plots the impact of fiscal (and large) consolidation on firm performance in dropped regional sub-samples. Estimation in each point represents the dropped region. The dependent variable is firm growth proxied by the annual average growth rate in sales. Top one percent of companies with the highest growth rates have been dropped from the sample. Large consolidation is a dummy variable which equals 1 if fiscal consolidation is higher than 1.5% of GDP and 0 otherwise. SSA stands for Sub-Saharan Africa, MENA is Middle East and North Africa, LAC is Latin America and Caribbean, EAP is East-Asia and Pacific, ECA stands for Europe and Central Asia, and SA is South Asia. The definition and construction of the variable is discussed in section 4.3. Data source: WBES and IMF Article IV reports.

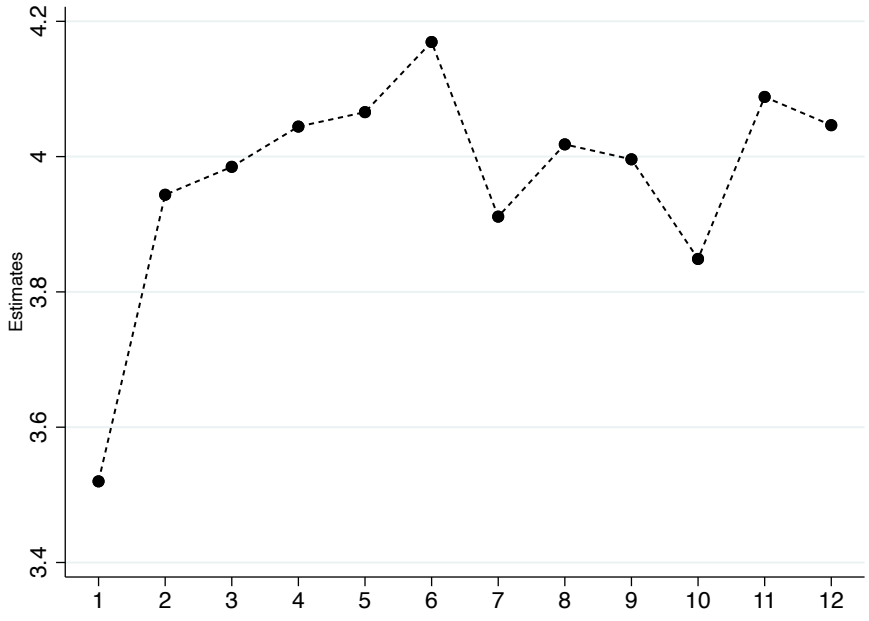
varying characteristics does not necessarily prevent the benchmark results from being driven by a small cluster of firms with specific features. Thus, I re-estimate the baseline results presented in Table 4.2 (columns (2) and (3)) as it is dropped sub-samples of firms based on a specific characteristic. The results are summarized in Table 4.8 and figure 4.13. For example, in panel A, I illustrate the results for the baseline estimates when state-owned (columns (1) and (2)), foreign-owned (columns (3) and (4)), small (columns (5) and (6)), and large (columns (7) and (8)) firms are excluded from the sample. In the same vein, panel B presents the results when large, young, mature and old firms are dropped from the sample. The definitions of each characteristic are those in line with what is discussed in section 4.3. In both panels, the results continue to suggest that firm performance decreases with fiscal consolidation and therefore findings are not driven by a specific firm's feature.

Figure 4.11: Impact of fiscal consolidation on dropped sector sub-samples



Note: This figure plots the impact of fiscal consolidation on firm performance in dropped sector sub-samples. The sectors are defined as follows: 1 stands for Other Manufacturing, 2 is Retail Trade, 3 is Construction, 4 is Machinery and Equipment, 5 is Garments and Textile, 6 is food, 7 is IT Services, 8 is Chemical Products, 9 is Furniture and Wood, 10 is Other Services, 11 is Metallic and Other Minerals, and 12 is Wholesale Trade. The definition and construction of the variable is discussed in section 4.3. Data source: WBES and IMF Article IV reports.

Figure 4.12: Impact of large fiscal consolidation on dropped regional sub-samples



Note: This figure plots the impact of large fiscal consolidation on firm performance in dropped sector sub-samples. The sectors are defined as follows: 1 stands for Other Manufacturing, 2 is Retail Trade, 3 is Construction, 4 is Machinery and Equipment, 5 is Garments and Textile, 6 is food, 7 is IT Services, 8 is Chemicals Products, 9 is Furniture and Wood, 10 is Other Services, 11 is Metallic and Other Minerals, and 12 is Wholesale Trade. The definition and construction of the variable is discussed in section 4.3. Data source: WBES and IMF Article IV reports.

Table 4.6: Dropping sector sub-samples

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dropped sector	Other Manufacturing		Retail trade		Construction		Machinery & Equipment	
Fiscal consolidation	–1.6989***	–3.2800**	–2.5803**	–4.1321***	–2.3434**	–3.9776***	–2.3958**	–4.0718***
	(0.3222)	(1.3170)	(1.1949)	(1.3698)	(1.1630)	(1.3137)	(1.1395)	(1.2688)
Fiscal consolidation >1.5% GDP		3.5200**		3.9436***		3.9849***		4.0444***
		(1.4811)		(1.4927)		(1.4859)		(1.4436)
Observations	67,453	67,453	71,234	71,234	85,254	85,254	83,550	83,550
R–squared	0.172	0.175	0.185	0.189	0.178	0.182	0.179	0.183
Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dropped sector	Garments & Textile		Food		IT services		Chemicals products	
Fiscal consolidation	–2.3675**	–4.0103***	–2.4002**	–4.0789***	–2.3249**	–3.9327***	–2.4179**	–4.0676***
	(1.1643)	(1.3037)	(1.1376)	(1.2288)	(1.1463)	(1.3055)	(1.1264)	(1.2581)
Fiscal consolidation >1.5% GDP		4.0657***		4.1694***		3.9113***		4.0181***
		(1.4593)		(1.4038)		(1.4742)		(1.4284)
Observations	78,308	78,308	78,040	78,040	84,207	84,207	78,217	78,217
R–squared	0.180	0.185	0.179	0.184	0.179	0.183	0.177	0.182
Panel C	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dropped sector	Furniture & Wood		Other services		Metallic & other minerals		Wholesales trade	
Fiscal consolidation	–2.3710**	–4.0128***	–2.3358**	–3.9522***	–2.3635**	–3.9571***	–2.3444**	–4.0040***
	(1.1533)	(1.3007)	(1.0948)	(1.2863)	(1.1521)	(1.2795)	(1.1640)	(1.3082)
Fiscal consolidation >1.5% GDP		3.9960***		3.8487**		4.0882***		4.0464***
		(1.4709)		(1.4839)		(1.4694)		(1.4917)
Observations	85,185	85,185	66,162	66,162	82,689	82,689	84,370	84,370
R–squared	0.176	0.180	0.183	0.187	0.181	0.185	0.176	0.181
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector–year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Dependent variable is firm growth proxied by the annual average growth rate in sales. Top one percent of companies with the highest growth rates have been dropped from the sample. Large consolidation is a dummy variable which equals 1 if fiscal consolidation is higher than 1.5% of GDP and 0 otherwise. The definition of the variables is in line with section 4.3. To save space, I omit the control variables as their coefficients are in line with those reported in table 4.2. Country, sector–year and firm fixed effects are included. The numbers in parentheses are robust standard errors clustered at the country–year level. *, **, ***: significance levels of 10%, 5% and 1% respectively. Data source: WBES and IMF Article IV reports.

Because there may be other omitted factors that are likely to influence the effects of fiscal adjustments on firm performance, I next consider different alternative specifications. I begin by including an additional control variable which accounts for banking, currency and debt crises. Although I use fiscal consolidation actions motivated by reductions in government debt rather than reactions to current economic activity, one may still argue that such fiscal actions may not be exogenous to ongoing financial conditions. I address this concern by controlling and including crisis episodes in the main specification. I construct the variable, *Crisis*, following the classification provided by Reinhart and Rogoff (2011) and Laeven and Valencia (2013). The result is presented in Table 4.9 (column (1)). Even though the coefficient on crisis is significantly positive, the benchmark results remain unaltered. Thereafter, I also include in the specification a proxy for currency distress – i.e., changes in the exchange rate of national currency in relation to the US dollar – to see if the validity of the baseline results still holds. The estimates are presented in Table 4.9 (column (2)) as I continue to find the adverse impact of fiscal consolidation on firm performance.

In the baseline specification, I did not account for aggregate risk factors that may be influencing the co-movement in firms' sales growth and fiscal consolidation actions. Because I am assessing the impact of debt-driven fiscal consolidation policies on firm performance in developing countries, it is deemed important to capture default risks since doubts about government financial solvency raise borrowing costs (Guajardo et al., 2014). As such, I include in the regression an additional control variable, *Sovereign rating*, to account for sovereign default risks. The variable is retrieved from Fitch Connect as I transform each letter rating into numerical scores. I assign the number 19 to the highest letter rating contained in the sample which is A+. For the remaining ratings, the value goes down for each downward score in rating. For example, A equals 18, A- equals 17, and so forth. The results are shown in column (3) of Table 4.9 as they confirm that firm growth is decreasing with fiscal consolidation policies. I next include an additional dummy variable, $Conflict$, to control for civil conflict. I define civil conflict as an event where two organized armed groups, of which at least one is the government of a state, use armed force that results in at least 25 battle-related deaths in a year (Harbom et al., 2008; Pettersson et al., 2019). Such events are particularly common in developing countries and they may affect firms' sales growth and fiscal consolidation actions. The data is collected from Pettersson et al. (2019) and the result is illustrated in column (4) of Table 4.9. Again, I continue to find results consistent with those reported in the baseline regressions in Table 4.2.

Table 4.7: Dropping one country at a time

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dropped country	AFG	ALB	AGO	ARG	ARM	AZE	BGD
Fiscal consolidation	–3.988***	–4.001***	–3.959***	–4.004***	–4.167***	–3.739***	–3.923***
	(1.316)	(1.310)	(1.308)	(1.331)	(1.264)	(1.383)	(1.302)
Fiscal consolidation >1.5% GDP	3.992***	4.100***	3.948***	4.042***	3.745**	3.821**	4.000***
	(1.492)	(1.514)	(1.476)	(1.492)	(1.461)	(1.517)	(1.469)
Observations	85,527	85,302	85,301	84,292	85,471	85,419	83,113
R–squared	0.183	0.184	0.183	0.181	0.184	0.184	0.184
Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dropped country	BLR	BLZ	BEN	BTN	BOL	BIH	BWA
Fiscal consolidation	–3.832***	–3.960***	–3.981***	–3.981***	–4.067***	–4.093***	–3.987***
	(1.314)	(1.317)	(1.307)	(1.309)	(1.299)	(1.312)	(1.318)
Fiscal consolidation >1.5% GDP	4.179***	3.953***	3.963***	3.999***	4.667***	4.087***	3.960***
	(1.480)	(1.491)	(1.477)	(1.506)	(1.593)	(1.494)	(1.493)
Observations	84,952	85,734	85,641	85,432	85,095	85,101	85,431
R–squared	0.183	0.182	0.183	0.182	0.183	0.183	0.183
Panel C	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dropped country	BRA	BFA	BDI	KHM	CMR	CPV	CAF
Fiscal consolidation	–3.985***	–3.970***	–3.958***	–3.980***	–3.965***	–3.985***	–3.966***
	(1.342)	(1.312)	(1.321)	(1.308)	(1.310)	(1.316)	(1.313)
Fiscal consolidation >1.5% GDP	3.999***	3.952***	4.009***	4.021***	3.932***	3.981***	3.986***
	(1.497)	(1.483)	(1.483)	(1.487)	(1.480)	(1.486)	(1.483)
Observations	84,423	85,563	85,528	85,521	85,231	85,799	85,769
R–squared	0.184	0.182	0.183	0.183	0.183	0.182	0.183
Panel D	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dropped country	TCD	CHL	CHN	COL	COG	CRI	CIV
Fiscal consolidation	–3.967***	–4.095***	–3.987***	–3.693***	–3.982***	–3.991***	–3.975***
	(1.317)	(1.147)	(1.313)	(1.392)	(1.319)	(1.352)	(1.331)
Fiscal consolidation >1.5% GDP	4.005***	3.987***	3.996***	3.663**	3.989***	3.990***	3.998***
	(1.492)	(1.312)	(1.488)	(1.554)	(1.492)	(1.512)	(1.492)
Observations	85,618	84,270	83,342	83,376	85,831	85,546	85,327
R–squared	0.182	0.189	0.184	0.19	0.182	0.182	0.182
Panel E	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dropped country	COD	DJI	DOM	ECU	EGY	SLV	ETH
Fiscal consolidation	–4.058***	–3.970***	–3.911***	–3.933***	–3.987***	–4.171***	–3.961***
	(1.345)	(1.316)	(1.320)	(1.294)	(1.359)	(1.241)	(1.341)
Fiscal consolidation >1.5% GDP	4.137***	3.971***	3.906***	3.933***	4.006***	4.200***	3.822**
	(1.512)	(1.488)	(1.483)	(1.491)	(1.538)	(1.462)	(1.530)
Observations	85,024	85,879	85,412	84,790	82,516	84,546	85,243
R–squared	0.181	0.182	0.182	0.185	0.186	0.187	0.184

Table 4.7: Dropping one country at a time (continued)

Panel F	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dropped country	GAB	GMB	GEO	GHA	GTM	GIN	GNB
Fiscal consolidation	–4.039***	–3.972***	–3.881***	–4.465***	–3.907***	–3.978***	–3.921***
	(1.303)	(1.313)	(1.295)	(1.180)	(1.329)	(1.302)	(1.328)
Fiscal consolidation >1.5% GDP	4.021***	3.954***	3.637**	4.404***	3.814**	3.922***	3.994***
	(1.480)	(1.488)	(1.445)	(1.400)	(1.483)	(1.480)	(1.491)
Observations	85,792	85,619	85,066	84,972	84,794	85,650	85,755
R–squared	0.183	0.182	0.183	0.187	0.183	0.183	0.183
Panel G	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dropped country	GUY	HND	IND	IDN	IRQ	JOR	KAZ
Fiscal consolidation	–4.086***	–3.943***	–3.507***	–3.954***	–3.907***	–3.932***	–3.982***
	(1.304)	(1.323)	(1.342)	(1.333)	(1.297)	(1.333)	(1.336)
Fiscal consolidation >1.5% GDP	4.135***	3.945***	3.506**	3.846**	3.879***	3.847**	3.985***
	(1.499)	(1.489)	(1.469)	(1.500)	(1.481)	(1.499)	(1.513)
Observations	85,757	85,090	77,559	83,473	85,176	85,223	85,235
R–squared	0.183	0.183	0.19	0.187	0.175	0.183	0.182
Panel H	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dropped country	KEN	KGZ	XKX	LBN	LSO	LBR	MDG
Fiscal consolidation	–4.114***	–3.957***	–3.969***	–4.102***	–3.970***	–3.948***	–3.953***
	(1.261)	(1.321)	(1.344)	(1.298)	(1.317)	(1.350)	(1.296)
Fiscal consolidation >1.5% GDP	4.155***	4.081***	3.992***	4.254***	3.997***	4.108***	3.999***
	(1.428)	(1.500)	(1.522)	(1.520)	(1.491)	(1.515)	(1.471)
Observations	83,846	85,245	85,502	85,456	85,628	85,597	85,237
R–squared	0.182	0.185	0.185	0.187	0.182	0.181	0.183
Panel I	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dropped country	MWI	MLI	MRT	MEX	MDA	MNG	MNE
Fiscal consolidation	–3.983***	–3.937***	–3.950***	–3.835***	–3.936***	–4.064***	–3.998***
	(1.310)	(1.340)	(1.320)	(1.311)	(1.327)	(1.298)	(1.316)
Fiscal consolidation >1.5% GDP	3.851***	3.937***	3.942***	3.678**	3.849**	3.248**	3.914***
	(1.478)	(1.508)	(1.491)	(1.503)	(1.489)	(1.505)	(1.486)
Observations	85,459	85,223	85,589	83,493	84,949	84,898	85,596
R–squared	0.184	0.182	0.182	0.182	0.184	0.184	0.183
Panel J	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dropped country	MAR	MOZ	MMR	NAM	NPL	NIC	NER
Fiscal consolidation	–3.994***	–4.005***	–3.936***	–4.172***	–3.972***	–3.946***	–3.968***
	(1.308)	(1.305)	(1.288)	(1.293)	(1.310)	(1.317)	(1.317)
Fiscal consolidation >1.5% GDP	3.934***	4.001***	3.932***	4.161***	3.981***	3.933***	3.967***
	(1.487)	(1.493)	(1.461)	(1.480)	(1.483)	(1.486)	(1.488)
Observations	84,582	84,916	84,854	85,418	85,107	84,928	85,699
R–squared	0.184	0.183	0.184	0.181	0.183	0.183	0.182

Table 4.7: Dropping one country at a time (continued)

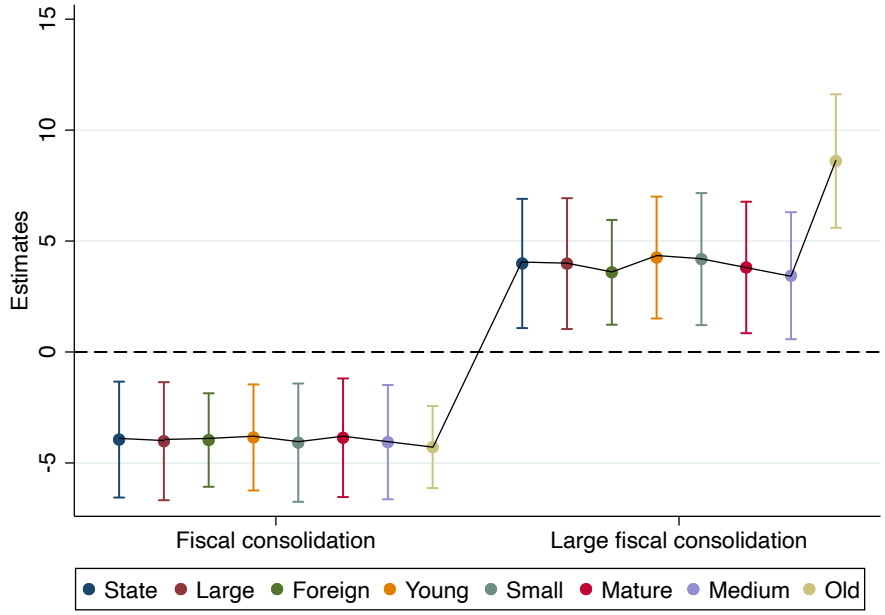
Panel K	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dropped country	NGA	MKD	PAK	PAN	PNG	PRY	PER
Fiscal consolidation	–4.246***	–3.964***	–3.962***	–3.896***	–3.970***	–4.136***	–4.433***
	(1.247)	(1.302)	(1.333)	(1.305)	(1.316)	(1.306)	(1.131)
Fiscal consolidation >1.5% GDP	3.903***	4.086***	3.954***	4.014***	3.971***	4.211***	4.721***
	(1.338)	(1.468)	(1.499)	(1.479)	(1.488)	(1.480)	(1.357)
Observations	82,614	85,028	84,844	85,404	85,879	84,994	83,746
R–squared	0.156	0.184	0.184	0.184	0.182	0.184	0.19
Panel L	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dropped country	PHL	RWA	SEN	SRB	SLE	SLE	LKA
Fiscal consolidation	–4.185***	–3.963***	–3.953***	–3.978***	–3.998***	–3.998***	–3.982***
	(1.300)	(1.315)	(1.320)	(1.339)	(1.304)	(1.304)	(1.308)
Fiscal consolidation >1.5% GDP	4.277***	3.983***	3.977***	4.048***	4.036***	4.036***	3.883***
	(1.507)	(1.491)	(1.492)	(1.513)	(1.483)	(1.483)	(1.484)
Observations	83,671	85,560	85,118	85,004	84,794	84,794	85,356
R–squared	0.188	0.182	0.183	0.183	0.183	0.183	0.183
Panel M	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dropped country	SDN	SWZ	TJK	TZA	THA	TLS	TGO
Fiscal consolidation	–3.968***	–4.072***	–3.932***	–3.923***	–3.989***	–3.934***	–3.988***
	(1.316)	(1.298)	(1.301)	(1.334)	(1.316)	(1.324)	(1.321)
Fiscal consolidation >1.5% GDP	3.986***	4.041***	4.388***	3.923***	3.982***	3.850**	4.006***
	(1.489)	(1.477)	(1.521)	(1.491)	(1.488)	(1.496)	(1.497)
Observations	85,684	85,556	85,482	85,136	85,162	85,675	85,675
R–squared	0.181	0.183	0.183	0.181	0.183	0.183	0.182
Panel N	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dropped country	TUN	UGA	URY	VNM	YEM	ZMB	ZWE
Fiscal consolidation	–3.949***	–4.047***	–3.940***	–4.045***	–3.970***	–3.841***	–3.888***
	(1.328)	(1.289)	(1.332)	(1.390)	(1.316)	(1.382)	(1.274)
Fiscal consolidation >1.5% GDP	3.950***	4.110***	3.999***	4.160***	3.971***	3.751**	3.906***
	(1.495)	(1.466)	(1.506)	(1.560)	(1.488)	(1.531)	(1.454)
Observations	85,321	84,960	84,853	84,110	85,879	84,927	85,204
R–squared	0.183	0.182	0.182	0.188	0.182	0.183	0.180
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector–Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Dependent variable is firm growth proxied by the annual average growth rate in sales. Top one percent of companies with the highest growth rates have been dropped from the sample. Large consolidation is a dummy variable which equals 1 if fiscal consolidation is higher than 1.5% of GDP and 0 otherwise. The definition of the variables is in line with section 4.3. All country codes are in line with the World Bank's country code. To save space, I omit the stand–alone regressions of fiscal consolidation (without large consolidations) and the control variables as their coefficients are in line with those reported in table 4.2. Country, sector–year and firm fixed effects are included. The numbers in parentheses are robust standard errors clustered at the country–year level. *, **, ***: significance levels of 10%, 5% and 1% respectively. Data source: WBES and IMF Article IV reports.

Next, from columns (5) to (10) in Table 4.9, I also consider several alternative specifications. For instance, in column (5) I start by adding lagged values of fiscal balance

which is the difference between the government's revenue and expenditure. In column (6), I incorporate a financial openness index which ranges from -2.66 (full capital control) to 2.66 (complete liberalization). The index is constructed based on the data from the IMF Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER), and it is provided by (Chinn and Ito, 2008). In column (7), I include financial development as an additional control variable. This variable is computed as the total domestic credit to the private sector as a share of GDP. In columns (8), (9) and (10), however, I add lagged values of fiscal consolidation, large fiscal consolidation and real GDP growth, respectively. The coefficients obtained for fiscal consolidation and large consolidation with all these alternative specifications are in line with the results reported in Table 4.2. One important question that needs to be answered is the fact that I included the logarithm form of lagged sales, $Sales(-3)$, in the right-hand side of the baseline specification. It is well documented in the literature that such dynamic models with fixed effects approach might be subject to the Nickell bias (Nickell, 1981). Because of the nature of the dataset on sales growth (i.e., survey data with one to three points in time), it is practically unfeasible to use lagged variables as instruments. To remedy this problem, I re-estimate equation 4.2 without the lagged sales variable in the right-hand side.

Figure 4.13: Impact of fiscal (large) consolidation on dropped firm sub-samples



Note: This figure plots the impact of fiscal (large) consolidation on firm performance in dropped firm sub-samples. Dependent variable is firm growth proxied by the annual average growth rate in sales. Top one percent of companies with the highest growth rates have been dropped from the sample. Large consolidation is a dummy variable which equals 1 if fiscal consolidation is higher than 1.5% of GDP and 0 otherwise. State (or foreign) share firms are those that part or all of its shares are owned by the government (or a foreign company). Young, mature and old firms are those with the age of (1–5 years old), (6–15 years old), and (more than 15 years old), respectively. The definition and construction of the variable is discussed in section 4.3. Data source: WBES and IMF Article IV reports.

The results are exposed in Table 4.10 (column (1)) as they are broadly consistent with

the baseline estimates. I next consider an alternative definition of firm performance based on Labor Productivity Growth (LPG). In the WBES survey, firms are asked to report their full-time employees one year t and three years $t-3$ before the survey. I, therefore, compute the LPG as the average annual growth of Labor Productivity (LP) over three years for each available survey as illustrated in equation 4.3. The findings are reported in columns (2) and (3) of Table 4.10 and the coefficients suggest that Labor Productivity Growth is decreasing with fiscal policy actions. In other terms, a one percentage point increase in fiscal consolidation as a share of GDP may result in a reduction of LPG of about 0.5 percentage points (Table 4.10, column (3)). This negative effect is mitigated for large fiscal consolidation.

$$LPG_t = \frac{PG_t - PG_{t-3}}{3} \tag{4.3}$$

Next, following Ağca and Igan (2019), I replace the measure of large fiscal consolidation with an alternative variable based on the 75^{th} percentile of fiscal consolidation distribution in the sample. I find 1.6 percent of GDP as the corresponding threshold for large fiscal consolidation and the results are exhibited in Table 4.10 (column (4)). I continue to observe a negative impact of fiscal consolidation which is mitigated when it exceeds 1.6 percent of GDP. Further, in column (5), I cluster the standard errors at the country level, instead of clustering them at the country-year level as in the baseline estimations. In column (6), however, I re-estimate the baseline regression but this time I replace sector-year dummies with sector and year dummies. Lastly, in column (7) the baseline specification is re-estimated but this time I use sector and year (instead of sector-year) dummies as well as standard errors clustered at the country (instead of country-year) level. The results for all these alternative specifications suggest that the benchmark results are not sensitive to these technical concerns.

A natural question to ask is whether the firm-level control variables may be endogenous to the dependent variable, $Growth_{i,k,j(t,t-3)}$, since they are measured at the same level. I tackle this issue by using the local average of each firm-level variable as a proxy for the local business environment faced by firms as suggested by Xu (2010) and Harrison et al. (2014). More specifically, as the basic unit for capturing the local business environment, I rely on industry-region-size cells. When computing the firm-level variables on cells at the industry-region-size level, the observation for the firm itself is omitted to avoid endogeneity. Because firms of distinct regions and sizes face different business environments, with this technique the business environment is allowed to differ by both size and region-specific dimensions.

Table 4.8: Dropping firm sub-samples

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dropped firms	State share		Foreign share		Small		Medium	
Fiscal consolidation	–2.2929**	–3.9472***	–2.2714**	–4.0207***	–2.6277***	–3.9682***	–2.1019*	–3.8518***
	(1.1487)	(1.3240)	(1.1406)	(1.3485)	(0.9741)	(1.0686)	(1.0666)	(1.2115)
Fiscal consolidation >1.5% GDP		3.9894***		3.9827***		3.5906***		4.2567***
		(1.4762)		(1.4951)		(1.1972)		(1.3919)
Observations	83,526	83,526	75,740	75,740	47,055	47,055	56,507	56,507
R–squared	0.170	0.175	0.171	0.176	0.174	0.178	0.179	0.184
Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dropped firms	Large		Young		Mature		Old	
Fiscal consolidation	–2.2845**	–4.0855***	–2.2764*	–3.8654***	–2.7119**	–4.0629***	–2.619***	–4.2844***
	(1.1465)	(1.3514)	(1.1588)	(1.3552)	(1.1073)	(1.3057)	(1.332)	(0.9375)
Fiscal consolidation >1.5% GDP		4.1864***		3.8099**		3.4390**		8.6063***
		(1.5083)		(1.5017)		(1.4509)		(1.5239)
Observations	68,196	68,196	84,728	84,728	72,143	72,143	14,887	14,887
R–squared	0.187	0.192	0.175	0.179	0.173	0.176	0.475	0.321
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector–Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Dependent variable is firm growth proxied by the annual average growth rate in sales. Top one percent of companies with the highest growth rates have been dropped from the sample. Large consolidation is a dummy variable which equals 1 if fiscal consolidation is higher than 1.5% of GDP and 0 otherwise. State (or foreign) share firms are those that part or all of its shares are owned by the government (or a foreign company). Young, mature and old firms are those with age of (1–5 years old), (6–15 years old), and (more than 15 years old), respectively. The definition of the variables is in line with section 4.3. To save space, I omit control variables as their coefficients are in line with those reported in table 4.2. Country, sector–year and firm fixed effects are included. The numbers in parentheses are robust standard errors clustered at the country–year level. *, **, ***: significance levels of 10%, 5% and 1% respectively. Data source: WBES and IMF Article IV reports.

Table 4.9: Additional control variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fiscal consolidation	–3.6593***	–4.5458***	–3.7654***	–3.5528***	–4.0681***	–3.7448***	–4.0858***	–4.0598***	–3.8031***	–4.7073***
	(1.3083)	(0.8509)	(1.3638)	(1.3343)	(1.2926)	(1.3529)	(1.3259)	(1.2829)	(1.3387)	(0.8855)
Crisis	6.2928***									
	(2.3461)									
Exchange rate (changes)		0.0326***								
		(0.0105)								
Sovereign rating			–0.9285							
			(0.6177)							
Conflict				5.2875*						
				(2.9282)						
Lag fiscal balance					0.0542***					
					(0.0134)					
Financial openness						–1.0761				
						(0.8229)				
Financial development							0.067			
							(0.0441)			
Lag fiscal								0.8887		
								(0.6863)		
Lag fiscal*Large consolidation									1.5359	
									(1.013)	
Lag real GDP growth										–0.4627
										(0.3389)
Fiscal consolidation >1.5% GDP	3.7035**	6.0563***	6.1881***	3.6831**	3.6686**	3.7300**	3.8091**	3.6913**	3.241**	4.8451***
	(1.4628)	(1.5195)	(1.6824)	(1.4787)	(1.4677)	(1.5564)	(1.5240)	(1.4206)	(1.517)	(1.4101)
Observations	85,879	69,317	62,406	85,879	85,596	83,085	85,243	85,879	85,879	67,542
R–squared	0.185	0.219	0.216	0.184	0.186	0.182	0.185	0.183	0.183	0.205
Number of countries	98	98	98	98	98	98	98	98	98	98
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector–year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Dependent variable is firm growth proxied by the annual average growth rate in sales. Top one percent of companies with the highest growth rates have been dropped from the sample. Large consolidation is a dummy variable which equals 1 if fiscal consolidation is higher than 1.5% of GDP and 0 otherwise. The definition of the variables is in line with section 4.3. To save space, I omit control variables as their coefficients are in line with those reported in table 4.2. Country, sector–year and firm fixed effects are included. The numbers in parentheses are robust standard errors clustered at the country–year level. *, **, ***: significance levels of 10%, 5% and 1% respectively. Data source: WBES and IMF Article IV reports.

The results are summarized in Table 4.10 (column (8)) as I re-arrange the firm-level control variables as follows: *Local_Sales*(−3), *Local_Size*, *Local_Age*, *Local_State share*, and *Local_Foreign share*. The coefficients on fiscal consolidation and large consolidation are very similar to those of the baseline estimates and therefore suggest that the results are not affected when I replace the firm-level controls with their mean values on industry-region-size cells. Although some firm-level controls lose their statistical significance, the variables of interest are still in line with the baseline results.

At the beginning of section 4.3, I revealed that the traditional approach of fiscal consolidation based on the statistical concept of cyclically-adjusted primary balance (CAPB) suffers from two major caveats: reverse causality and measurement errors. Moreover, as put forward by Guajardo et al. (2014) this measure usually includes non-policy variations which may be correlated with other developments impacting the economic activity. Nevertheless, to strengthen the validity of the findings, I separately match the action-based fiscal consolidation episodes with two alternative measures; (I) cyclically-adjusted balance (CAB) which is defined as the difference between cyclically-adjusted revenues and cyclically-adjusted expenditures. This variable is defined as a percentage of potential GDP and is retrieved from Kose et al. (2017); (II) cyclically-adjusted primary balance (CAPB) is computed as the difference between the actual primary balance (balance minus net-interest payment) and the estimated effects of business fluctuations on the budget (Blanchard, 1990).

In a nutshell, I would only use the second definition as an alternative measure for fiscal consolidation but given the fact that dataset on CAPB in developing countries is very rare, I only managed to gather data for 18 out of 98 countries in the sample.[5] However, since I aim to provide comparable estimates for as broad a set of countries as possible, I also use the first approach, CAB, for which I was able to find a much broader dataset.[6] In Table 4.11, I begin with the estimation of both measures by using the WITHIN transformation as illustrated in columns (1), (2), (5) and (6). I observe no significant impact of CAB-based consolidation on firm performance (Table 4.11, columns (1) and (2)) whereas for the CAPB approach it is only statistically significant when large consolidations are not considered (Table 4.11, columns (5) and (6)). This difference in results to the baseline findings in Table 4.2, could be due to the fact that estimates with these two alternative approaches may not reflect changes in firm performance due to discretionary changes on the fiscal accounts as I have been discussing throughout.

[5]These countries are Argentina, Brazil, Chile, China, Colombia, Dominican Republic, Ecuador, Egypt, India, Indonesia, Kenya, Kyrgyz Republic, Mexico, Morocco, Peru, Philippines, South Africa and Uruguay. The data have been collected from the IMF fiscal monitor database: https://www.imf.org/external/datamapper/GGCBP_G01_PGDP_PT@FM/ADVEC/FM_EMG/FM_LIDC

[6]I knowledge that the fluctuations in interest payments cannot be considered as discretionary, however, in the estimates, I instrument the CAB variable with the new action-based narrative (exogenous) variable.

Table 4.10: Alternative definition of firm performance and specification tests

	Dropping the lag dep. variable	Alternative definition of firm performance		Alternative definition of large fiscal cons.	Country clustered errors	Sector and year fixed effects (FE)	Sector and year FE, and country clustered errors	Firm–level endogeneity
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fiscal consolidation	–5.1074***	–0.2602**	–0.5067***	–3.803***	–3.9704***	–3.9704***	–3.9704***	–4.7544***
	(1.1644)	(0.1300)	(0.1504)	(1.339)	(1.3212)	(1.3160)	(1.3212)	(1.1523)
Fiscal consolidation >1.5% GDP	4.3577***		0.5487**					4.2618***
	(1.2187)		(0.2313)					(1.2129)
Fiscal consolidation*Large75th				3.666**				
				(1.487)				
Local_Sales (–3)								–0.7124***
								(0.2054)
Local_Age								–2.8332
								(2.6587)
Local_Foreign share								3.1951
								(2.7471)
Local_State share								25.9835***
								(9.4895)
Local_Export								1.8662
								(3.3542)
Local_Size								1.3071**
								(0.5538)
Observations	85,879	82,346	82,346	85,879	85,879	85,879	85,879	85,879
R–squared	0.069	0.471	0.471	0.182	0.182	0.182	0.182	0.0717
Number of countries	98	98	98	98	98	98	98	98
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector–Year fixed effects	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Clustering at country–year level	Yes	Yes	Yes	Yes	No	Yes	No	Yes

Notes: Dependent variable is firm growth proxied by the annual average growth rate in sales. Top one percent of companies with the highest growth rates have been dropped from the sample. Large consolidation is a dummy variable which equals 1 if fiscal consolidation is higher than 1.5% of GDP and 0 otherwise. The definition of the variables is in line with section 4.3. To save space, I omit control variables as their coefficients are in line with those reported in table 4.2. *, **, ***: significance levels of 10%, 5% and 1% respectively. Data source: WBES and IMF Article IV reports.

Table 4.11: Alternative definition of fiscal consolidation

	CAB–WITHIN		CAB–IV		CAPB–WITHIN		CAPB–IV	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CAB–Fiscal consolidation	0.1190	0.2338	–3.2536*	–9.3363*				
	(0.2180)	(0.4814)	(1.9160)	(5.0569)				
CAB–Fiscal consolidation >1.5% GDP		–0.1902		10.1315*				
		(0.5897)		(5.4003)				
CAPB–Fiscal consolidation					–2.8042***	–0.9464	–1.3294***	–6.9531***
					(0.6329)	(1.0782)	(0.1733)	(0.6135)
CAPB–Fiscal consolidation >1.5% GDP						–3.4880		4.1720***
						(1.8118)		(0.3838)
Observations	85,879	85,879	85,879	85,879	37,520	37,520	37,520	37,520
R–squared	0.1719	0.172	0.2781	0.1333	0.1407	0.1425	0.1815	0.1815
Number of countries	98	98	98	98	18	18	18	18
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector–Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Dependent variable is firm growth proxied by the annual average growth rate in sales. Top one percent of companies with the highest growth rates have been dropped from the sample. Large consolidation is a dummy variable which equals 1 if fiscal consolidation is higher than 1.5% of GDP and 0 otherwise. The definition of the variables is in line with section 4.3. To save space, I omit control variables as their coefficients are in line with those reported in table 4.2. *, **, ***: significance levels of 10%, 5% and 1% respectively. Data source: WBES and IMF Article IV reports.

Nonetheless, I next use the action-based narrative approach as an instrument for both alternative approaches, CAB and CAPB based, and the results are displayed in columns (3), (4), (7) and (8). With this instrumental variable approach, it is observed that the findings are broadly in line with the baseline results.

4.5 Conclusion

The macroeconomic effects of fiscal consolidations on growth have been widely researched in the developed world. Although it is sometimes true in terms of the micro effects in the same group of countries, very little is currently known in the developing world. This study set out to examine the effects of fiscal consolidations on growth in developing countries taking a micro approach. I construct a new dataset of more than 544 fiscal consolidation actions based on the narrative approach suggested by Romer and Romer (2010) and Devries et al. (2011).

By combining this dataset with the World Bank Enterprise Surveys for more than 118,278 firms in 98 developing countries, I show that fiscal consolidations are significantly associated with lower firm growth. This negative association is mitigated when fiscal consolidations are large. While fiscal tightening is more detrimental for the performance of non-exporting firms, it affects the exporting ones less because these latter potentially move their profit to low-tax jurisdictions. Moreover, in developing countries, small firms are less affected by fiscal retrenchments than large firms. In terms of fiscal consolidation packages, I find that debt-driven consolidation efforts based on tax hikes are more contractionary than those based on spending cuts which is in line with the existing literature on fiscal consolidation. This contractionary effect tends to lower when spending cuts are large with a particular emphasis on large capital spending cuts.

The findings of this study have a number of practical implications. Firstly, greater efforts are needed to ensure that high-debt-risk governments are committed to a fiscal discipline which disallows them from abandoning planned consolidation actions before their implementation. This could be achieved by establishing fiscal rules. Secondly, the probability of success of fiscal consolidation policies also depends on its size. I have shown that large consolidations are encouraged to be pursued in developing countries as they tend to have a more positive impact on firms' sales growth. This is particularly important because the expectations of such measures to be successful are higher than less ambitious measures. Lastly, the composition of fiscal adjustment also plays an important role in its success. I have demonstrated that adjustments based on spending cuts tend to be more effective than tax hikes at delivering fiscal consolidation. However, it is also understood that given the perceived low tax burden in developing countries, they also have greater

scope to implement tax-based consolidations because spending cuts, *per se*, may not be sufficient to bring sovereign debt to sustainable levels.

Chapter 5

General conclusions

This thesis aims to examine the impacts of debt relief and fiscal consolidation in the development world. The substantive empirical assessments are discussed in chapters 2 to 4 of the thesis. Even though these three empirical chapters explore different identification strategies, they uncover thought-provoking results of some interesting patterns which extend the literature on debt relief and fiscal consolidation in developing countries. In this chapter, we start by providing the summary and contributions of each empirical chapter highlighted in the thesis. Thereafter, we discuss the related policy implications and future research developments.

5.1 Summary and contributions

This thesis has strived to explore the impacts of debt relief and fiscal consolidation policies in developing countries. As such, the main contributions are discussed in three self-contained, but related, empirical chapters (chapters 2-4). More specifically, chapter 2 determines the transmission channels through which debt relief impacts human welfare in 80 developing countries over 1990-2016. The chapter generates three main contributions to the body of knowledge. Firstly, given the fact that debt relief policies should be tailored to country-specific characteristics as recently suggested by the Debt Sustainability Framework (DSF) in IMF (2018), this chapter conducts an empirical investigation between debt relief and human welfare which allows for a much broader dimension of country-specific characteristics including natural resource earnings and external debt burden conditions. Results show that debt relief only promotes human welfare in non-natural resource–HIPC countries, unlike the other group of countries. Secondly, this chapter explores the possible transmission channels through which debt relief fosters human welfare. It finds that national income and improvements in education are the

main transmissions channels of the effect of debt relief on human welfare in non-natural resource–HIPC countries. Thirdly and finally, chapter 2 also evaluates whether the so-called debt overhang theory is more pronounced in some countries rather than others. Contrary to previous studies, this chapter shows that natural-resource dependent HIPC countries do not suffer from debt overhang.

Chapter 3 investigates the impact of debt relief grants stemming from the HIPC and MDRI initiatives on the budget of 30 African beneficiary governments. In particular, the purpose of this chapter is to provide, for the first time, a more comprehensive assessment of the extent to which debt service savings from debt relief help the public finance of beneficiary countries given their fragility conditions. Results indicate that debt service savings from the HIPC initiative help African countries to increase domestic resource mobilization and create fiscal space for public spending in general and social spending in particular. When the fragility condition of beneficiary countries is accounted for, findings suggest that the fiscal response of domestic tax collection and public spending is more pronounced in fragile HIPC countries when compared to their non-fragile counterparts.

Lastly, chapter 4 looks at the impact of fiscal consolidation on the performance of more than 118,279 firms in 98 developing countries. It is constructed a novel dataset of more than 544 fiscal consolidation actions – motivated by the desire to reduce government debt levels – using IMF staff reports (e.g., Article IV consultations and IMF Program documents), and similar countries' specific reports. In addition, this chapter provides new insights into how different types of fiscal policy actions (e.g., tax hikes and spending cuts) affect the economic activity in developing countries from the perspective of firm growth. Findings reveal that firm performance in developing countries decreases with fiscal consolidation. This decline is mitigated when consolidation is large (e.g., higher than 1.5 percent of GDP). While debt-driven consolidation efforts based on tax hikes are more contractionary than those based on spending cuts, consolidations based on this latter are mitigated when spending cuts are large. Furthermore, although fiscal consolidation is not statistically relevant for firm growth in low-debt-risk developing countries when compared to their high-debt-risk counterparts, this effect is more pronounced in large and non-exporting firms.

5.2 Policy implications

This section discusses the policy implications of the thesis based on the aforementioned empirical chapters. In particular, chapter 2 investigates the effects of debt relief on human welfare in different groups of developing countries based on their level of dependency on natural resources. The results illustrate that similar debt relief policies affect beneficiary

countries differently. An implication of this is the importance of debt relief policies to be tailored to country-specific characteristics. For instance, this chapter suggests that, given the tendency of resource-dependent countries to suffer from low institutional quality, substantial improvements on the quality of institutions for this group of countries could be essential to achieve a significant positive effect of debt relief on human welfare. Thus, if debt relief grants are tied to a set of economic reforms and their effectiveness still differ among beneficiary countries, a one-size-fits-all policy reform does not seem to be the most suitable.

In addition, there is a need for the Debt Sustainability Framework (DSF) of the IMF (2018) to be adjusted to policy responses that support sustainable growth and development in the context of commodity price shock. Even though this framework already assesses the overall public debt sustainability based on certain characteristics such as dependency on primary commodity exports, we still believe that specific projects in the natural resource sector should be carefully taken into account in the DSF. This is because very often most of these projects turn out to be unachievable in the context of lower commodity prices which in turn jeopardize the sustainability of public debt in this group of countries.

Chapter 3, on the other hand, explores the impact of debt relief granted under HIPC and MDRI initiatives on the public finances of African countries. The results provide evidence that debt relief stemming from HIPC and MDRI assistances help African countries to improve domestic tax collection and create fiscal space for government spending. However, the fiscal response of domestic tax collection and government spending is more pronounced in fragile HIPC countries when compared to their non-fragile counterparts. This evidence indicates that policies targeting the enhancement of efficiency of tax effort and productive public expenditure (e.g., allowing a larger proportion of public investment anchoring towards merit goods and reducing unproductive recurrent expenditure) in non-fragile HIPC countries are more required. Also, even though debt relief might be an appealing source of fiscal space for African beneficiary countries, there is still a need to properly identify and improve the determinants of absorptive capacity when allocating such relief to these countries.

Lastly, chapter 4 examines the effects of fiscal policy actions – motivated by the desire to reduce government debt levels – on firm performance in developing countries. The results show that fiscal policy actions based on tax hikes or spending cuts reduce firm performance in developing countries. Policy actions based on tax hikes are more contractionary than those based on spending cuts. Taken together, these results suggest that there is a need to ensure that high-debt-risk countries are devoted to a fiscal discipline that disallows them from abandoning planned fiscal policy actions before their implementation. This could be accomplished by implementing fiscal rules. Moreover, chapter 4 also

highlights that large fiscal policy actions (e.g., higher than 1.5 percent of GDP) can have a positive impact on firm performance. An implication of this is the fact that large fiscal policy actions are perceived as anticipating forward-looking expectations about future economic output. This suggests that the probability of success of fiscal policy actions also depends on their size. Finally, even though spending cuts tend to be more effective than tax hikes at delivering fiscal policy actions in developing countries, we understand that the former may not be sufficient, *per se*, to bring sovereign debt to sustainable levels given the perceived low tax burden in this group of countries.

5.3 Future research developments

This thesis presents evidence on the impact of debt relief policies in developing countries and how fiscal consolidation actions affect firm performance in this group of countries. Even though this research provides novel empirical findings on the debt relief and fiscal consolidation literature, it is still possible to extend some of the results presented here.

Chapter 2 highlights the role played by debt relief policies in natural resource-dependent countries. More specifically, this chapter unfolds the impact of debt relief and its transmission channels on human welfare in this group of countries. To better reckon the positive impact of debt relief on human welfare, future research focusing on primary commodity-dependent import countries should shed more light.

Chapter 3 analyses the extent to which debt service savings from debt relief create fiscal space in the budget of African beneficiary countries. In particular, this chapter reports the fiscal response of domestic tax collection and government spending after a debt relief shock. Future work should concentrate on evaluating to what extent the determinants of absorptive capacity in both fragile and non-fragile HIPC countries influence the impact of debt relief on the budget of beneficiary countries.

Chapter 4 seeks to evaluate the impacts of fiscal consolidation actions – motivated by the desire to reduce government debt levels – on firm performance in developing countries. Specifically, this chapter disaggregates debt-driven fiscal consolidation measures into adjustment measures based on tax hikes and spending cuts. Future work may be able to answer questions related to the effect of more specific debt-driven consolidation actions – increase in corporate tax, property tax, personal income tax, value-added tax (VAT) as well as reductions in social benefits, social security contribution and pension – on firm performance in developing countries.

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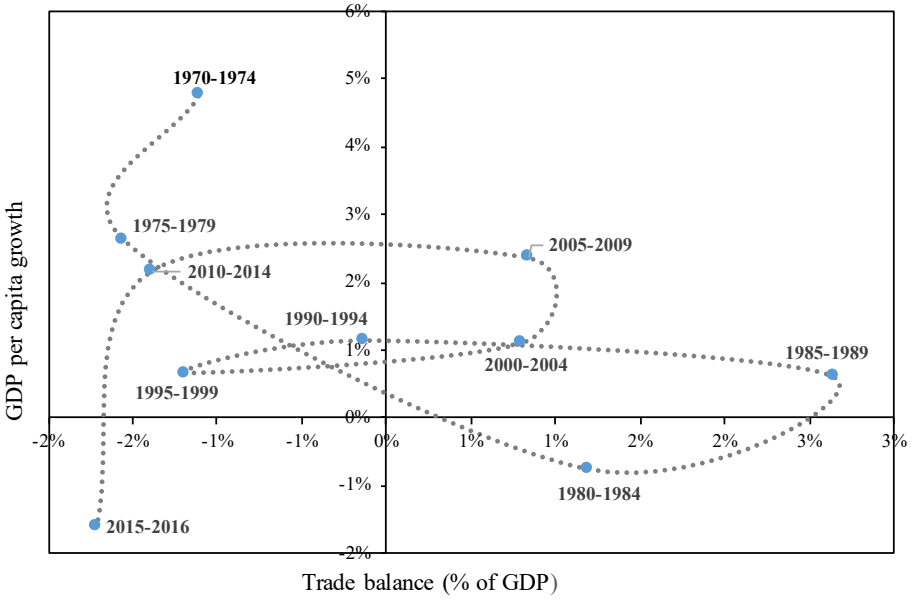
Appendices

Appendix A

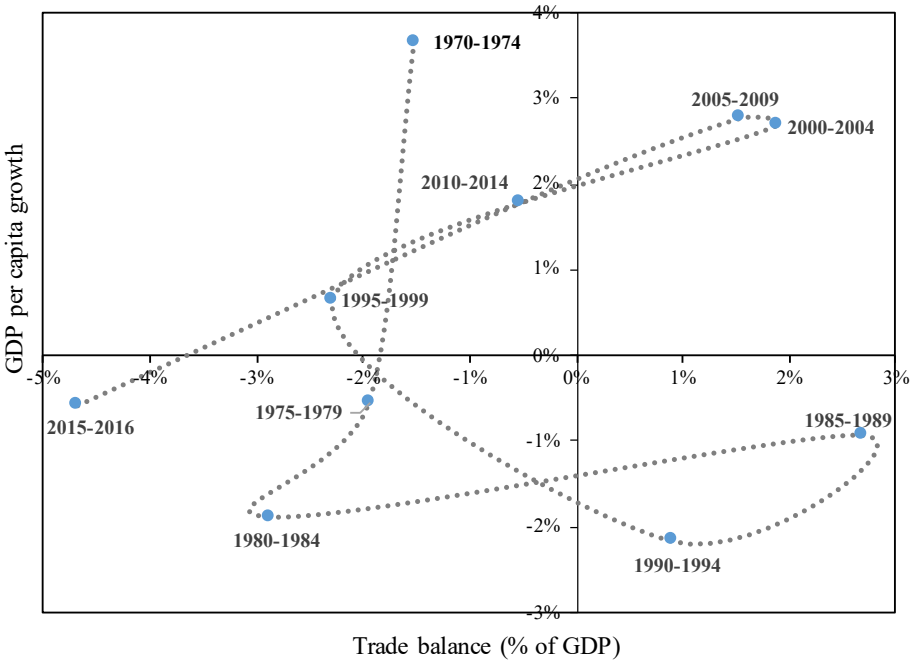
Appendix A (Chapter 1)

Figure A.1: Economic Growth and Trade Balance in Latin America



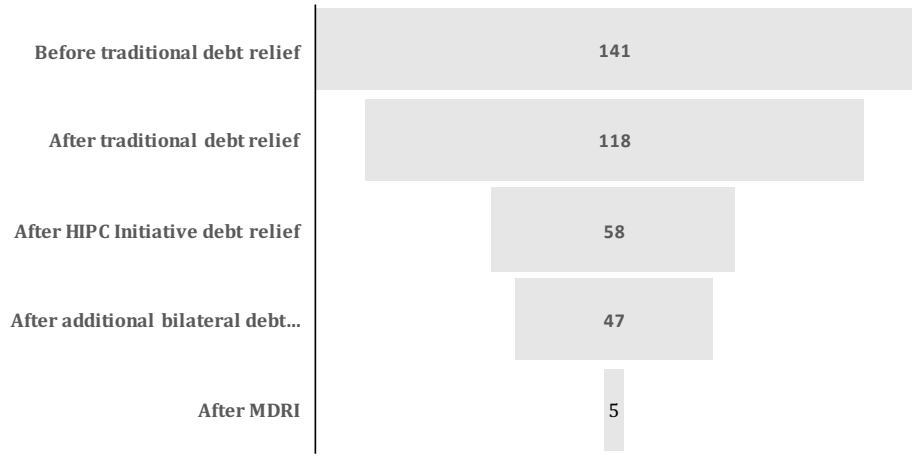
Data source: Own computation based on World Bank's WDI, 1970-2016.

Figure A.2: Economic growth and trade balance of Sub-Sahara Africa



Data source: Own computation based on World Bank's WDI, 1970-2016.

Figure A.3: Debt stocks of 36 post-decision point HIPCs, in US$ billion, end-2015 PV terms

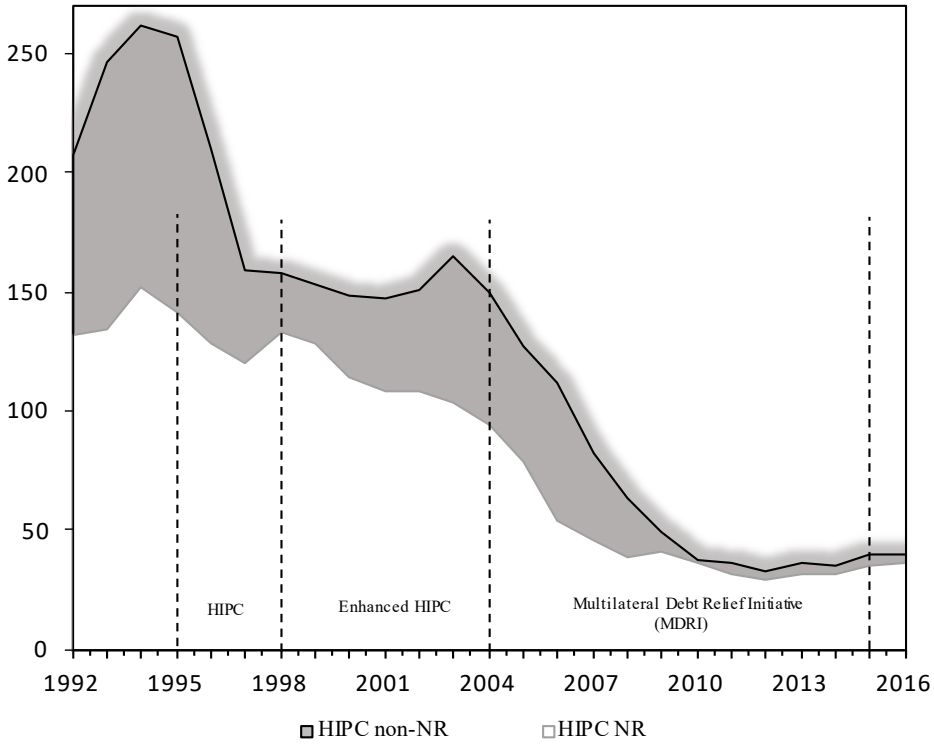


Data source: Own computation based on HIPC completion point documents.

Appendix B

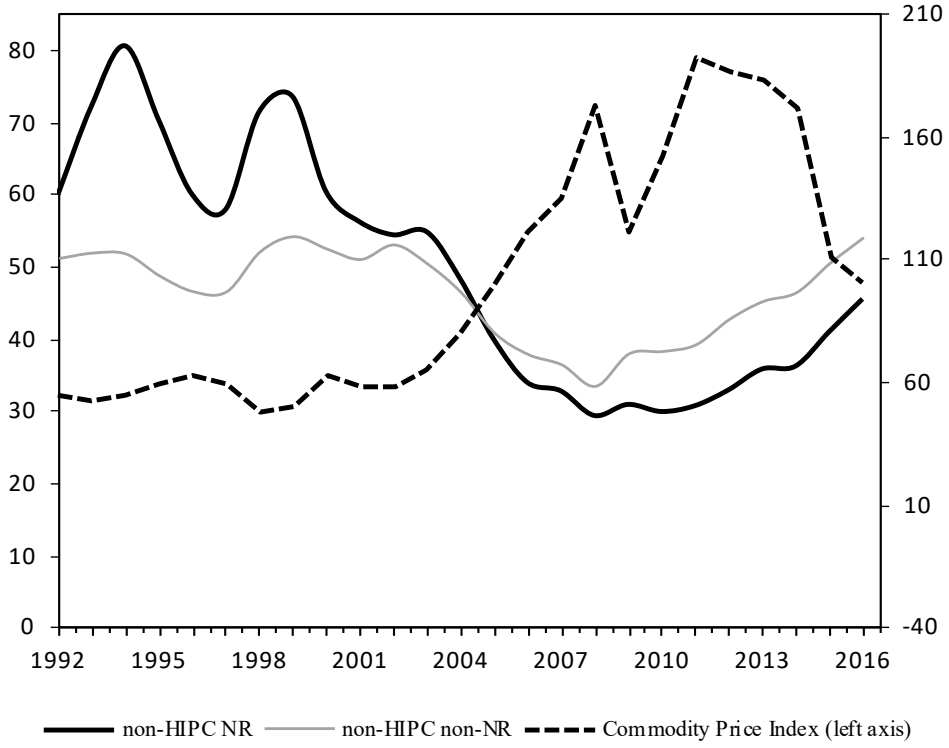
Appendix B (Chapter 2)

Figure B.1: External debt (% of GDP) of HIPC natural resource and HIPC non-natural resource countries, 1992-2016



Note: Authors' calculations based on data from World Development Indicators. HIPC = Heavily Indebted Poor Country. NR = Natural Resource.

Figure B.2: External debt (% of GDP) of non-HIPC natural resource and non-HIPC non-natural resource, 1992-2016



Note: Authors's calculations based on data from World Development Indicators and International Monetary Fund. HIPC = Heavily Indebted Poor Country. NR = Natural Resource.

Table B.1: Commodity exports as a percentage of total merchandise exports, UNCTAD (2016)

Natural Resource HIPC	Percentage	Natural Resource Non-HIPC	Percentage
Benin	87	Algeria	98
Bolivia	95	Angola	100
Burkina Faso	94	Botswana	94
Burundi	86	Colombia	81
Cameroon	92	Ecuador	94
Central Africa Republic	90	Gabon	89
Chad	98	Nigeria	97
Côte d'Ivoire	86	Maldives	94
Democratic Republic of Congo	95	Mongolia	98
Eritrea*	89	Myanmar	91
Ethiopia	92	Papua New Guinea	96
Ghana	94	Paraguay	91
Guinea	96	Turkmenistan	88
Guinea-Bissau	99	Venezuela	92
Guyana	93	Yemen	95
Malawi	84	Zimbabwe	83
Mali	92		
Mauritania	98		
Mozambique	93		
Republic of Congo	92		
Rwanda	82		
Sierra Leone	97		
Sudan*	98		
Tanzania	85		
The Gambia	80		
Zambia	86		
Somalia*	95		
Non-Natural Resource HIPC	**Percentage**	**Non-Natural Resource Non-HIPC**	**Percentage**
Afghanistan	65	Armenia	49
Comoros	77	Bangladesh	7
Haiti	11	Bhutan	36
Honduras	51	Brazil	63
Liberia	73	Cabo Verde	63
Madagascar	70	Cambodia	12
Nicaragua	53	Djibouti	65
Niger	64	Egipty	52
São Tomé and Príncipe	68	El Salvador	24
Senegal	72	Guatemala	61
Togo	65	Indonesia	58
Uganda	69	Iran	72
		Kenya	64
		Lesotho	36
		Mauritius	37
		Mexico	19
		Moldova	4
		Morocco	33
		Nepal	32
		Pakistan	25
		Philippines	19
		South Africa	55
		Sri Lanka	33
		Tajikistan	60
		Tunisia	23
		Vietnam	24

Notes: *Countries eligible for HIPC but are still on pre-decision point where no debt relief is granted. We excluded Somalia from the sample due to data availability.

Table B.2: Variable definition and source

Variables	Description/Sources
Human Welfare	Inequality Adjusted Human Development Index (IHDI)/UNDP, World Bank WDI
PV of debt relief/GDP	Present value of debt relief (% of GDP) including: Debt forgiveness or reduction, Interest forgiven, and Total amount of debt rescheduled/ World Bank WDI
PV of debt relief/Exports	Present value of debt relief (% exports) including: Debt forgiveness or reduction, Interest forgiven, and Total amount of debt rescheduled/ World Bank WDI
PV of external debt/GDP	Present value of external debt % of GDP/Dikhanov (2004), IMF, and World Bank WDI
PV of external debt/Exports	Present value of external debt % of exports of goods, services and primary income/Dikhanov (2004), IMF, World Bank WDI
Log (GDP per capita)	GPD per capita in constant US dollars /World Bank WDI
Population growth	Population growth rate (annual %)/World Bank WDI
Share of health and education	Government expenditure on education and health as a share of total government expenditures/World Bank WDI
Inflation	Change in consumer price index/IMF, World Bank WDI
Aid/GDP	Net official development Assistance received as a share of GDP
Corruption	Perceived levels of corruption in the public sector. It ranges from 0 (highly corrupted) to 100 (very clean)/Transparency International
Institutional quality	Political rights and civil liberties index. It ranges from 1 (lowest) and 7 (highest) level of institutional quality/Freedom house

Table B.3: Variable definition and source

	Full Sample	Natural Resource HIPC	Non-Natural Resource HIPC	Natural Resource Non–HIPC	Non–Natural Resource Non–HIPC
Human welfare (IHDI)	0.48	0.38	0.41	0.54	0.56
	(0.13)	(0.10)	(0.10)	(0.11)	(0.11)
PV of debt relief/GDP	21.12	34.94	59.18	3.20	2.89
	(52.79)	(40.93)	(109.23)	(7.60)	(7.51)
PV of debt relief/Exports	142.45	294.91	295.65	18.41	14.82
	(384.09)	(562.96)	(456.15)	(46.47)	(36.95)
PV of external debt/GDP	72.80	88.22	129.43	51.98	46.67
	(108.32)	(76.28)	(237.51)	(40.63)	(30.01)
PV of external debt/Exports	317.26	448.21	519.72	233.37	162.19
	(520.34)	(530.04)	(868.74)	(474.80)	(106.19)
Log (GDP per capita)	11.30	11.69	11.14	10.92	11.25
	(2.65)	(1.87)	(2.63)	(3.24)	(2.81)
Population growth	2.11	2.56	2.70	2.09	1.45
	(1.09)	(1.10)	(1.12)	(0.79)	(0.88)
Share of health and education	28.52	37.38	34.96	17.89	24.84
	(16.79)	(19.16)	(16.02)	(11.88)	(11.42)
Aid/GDP	7.41	10.85	15.41	2.03	4.14
	(10.37)	(9.40)	(16.84)	(2.87)	(6.37)
Inflation	46.22	64.53	19.19	53.25	35.64
	(569.73)	(957.45)	(175.66)	(295.21)	(241.12)
Corruption	29.27	27.63	26.76	26.82	33.09
	(9.73)	(7.01)	(6.97)	(11.15)	(10.34)
Institutional quality	3.63	3.52	3.85	3.21	3.91
	(1.56)	(1.46)	(1.36)	(1.73)	(1.55)
Observations	1,100	324	156	226	394

Notes: The numbers in the tables denote means and the figures in parentheses report standard deviations. HIPC = Heavily Indebted Poor Country. NR = Natural Resource. See Table B.2 in Appendix B for the definition of the variables. Data source: World Bank and UNDP, 1990-2016.

Table B.4: Variance Inflation Factor (VIF)

	VIF	1/VIF
PV of debt relief/GDP	4.97	0.20
PV of debt relief/Exports	3.21	0.31
External debt stock/GDP	4.49	0.22
External debt stock/Exports	2.89	0.35
Log (GDP per capita)	1.02	0.98
Population growth	1.32	0.76
Share of health and education	1.28	0.78
Aid/GDP	1.37	0.73
Inflation	1.01	0.99
Corruption	1.39	0.72
Institutional quality	1.30	0.77

Notes: See Table B.2 in Appendix B for the definition of the variables. Data source: Author's computation with data from the World Bank and the UNDP, 1990-2016.

Appendix C

Appendix C (Chapter 3)

Structural equations of the model developed in section 3.2 (derivations)

(a) Working for ce

From equation 3.7 we have $-\ a_2(ce - ce^*) + \lambda_1 = 0$ or in other terms it would be:

$$a_2ce = a_2ce^* + \lambda_1$$

We can use equation 3.8 to derive λ_1 as follows;

$$\lambda_1 = \ a_3(p - p^*) \text{ and therefore,}$$
$$a_2ce = a_2ce^* + a_3(p - p^*)$$

We can then derive p from equation 3.15:

$$p = r + df + \ el + \ eg + dr - ce$$

If we substitute this expression back to the previous equation and rearrange it yields:

$$a_2ce = a_2ce^* + a_3(r + df + \ el + \ eg + dr - ce) - a_3p^*$$

or

$$(\ a_3 + a_2)ce = a_2ce^* + a_3(r + df + \ el + \ eg + dr) - a_3p^*$$

and thus,

$$ce = \frac{a_2}{a_3+a_2}ce^* - \frac{a_3}{a_3+a_2}p^* + \frac{a_3}{a_3+a_2}r + \frac{a_3}{a_3+a_2}df + \frac{a_3}{a_3+a_2}el + \frac{a_3}{a_3+a_2}eg + \frac{a_3}{a_3+a_2}dr$$

(b) Working for p

From equation 3.8 we get; $-a_3(p-p^*)+\lambda_1 = 0$ otherwise written as:

$$a_3 p = a_3 p^* + \lambda_1$$

From equation 3.7 we can work for λ_1 to yield the following expression:

$$\lambda_1 = a_2 ce - a_2 ce^*$$

Substituting this equation in the previous expression we, therefore, obtain:

$$a_3 p = a_3 p^* + a_2 ce - a_2 ce^*$$

We can derive ce from equation 3.15 and rearrange the previous equation for p as follows:

$$(a_3+a_2)p = a_3 p^* + a_2(r + df + \ el + \ eg + dr) - a_2 ce^*$$

or

$$p = \frac{a_3}{a_3+a_2}p^* + \frac{a_2}{a_3+a_2}r + \frac{a_2}{a_3+a_2}df + \frac{a_2}{a_3+a_2}el + \frac{a_2}{a_3+a_2}eg + \frac{a_2}{a_3+a_2}dr - \frac{a_2}{a_3+a_2}ce^*$$

(c) Working for r

From equation 3.6 we know that $-a_1(r-r^*) - \lambda_1 - \lambda_2\beta_1 = 0$, and from equations 3.8 and 3.11 we can work for λ_1 and λ_2, respectively, and assuming that $df^* = 0$ to obtain the following expression;

$$-a_1(r-r^*) - a_3(p-p^*) - [-a_6(ce + p - r - el - \ eg - dr)] = 0$$

Working the above expression for r

$$(a_1+a_6)r = a_1 r^* - a_3(p-p^*) - [-a_6(ce + p - el - \ eg - dr)] = 0$$

and thus,

$$r = \frac{a_1}{(a_1+a_6)}r^* - \frac{a_3}{(a_1+a_6)}(p-p^*) - \frac{a_6}{(a_1+a_6)}ce + \frac{a_6}{(a_1+a_6)}p + \frac{a_6}{(a_1+a_6)}el + \frac{a_6}{(a_1+a_6)}eg + \frac{a_6}{(a_1+a_6)}dr$$

(d) Working for ed

From equation 3.9 we have $-a_4(ed - ed^*) + \lambda_2 = 0$ which could be written as,

$$a_4 ed = a_4 ed^* + \lambda_2$$

Substituting for λ_2 with equation 3.11 in the last expression and then for λ_1 with equation 3.8 we would have the following expression:

$$a_4 ed = a_4 ed^* + \left(\frac{-a_6 \left(\frac{ed+eh-\beta_1 r- \beta_3 el- \beta_4 eg- \beta_5 dr}{\beta_2} \right) - a_3(p - p^*)}{\beta_2} \right)$$

and thus,

$$ed = \frac{a_4}{(a_4 + a_6)} ed^* - \frac{a_6}{(a_4 + a_6)} eh + \frac{a_1}{(a_4 + a_6)} \beta_1 r - \frac{a_3}{(a_4 + a_6)} \beta_2 (p - p^*) + \frac{a_6}{(a_4 + a_6)} \beta_3 el + \frac{a_6}{(a_4 + a_6)} \beta_4 eg + \frac{a_6}{(a_4 + a_6)} \beta_5 dr$$

(e) Working for eh

From equation 3.10 we know that $-a_5(eh - eh^*) + \lambda_2 = 0$ and therefore,

$$a_5 eh = a_5 eh^* + \lambda_2$$

Substituting for λ_2 with equation 3.11 in the last expression and then for λ_1 with equation 3.8 we would have the following expression:

$$a_5 eh = a_5 eh^* + \left(\frac{-a_6 \left(\frac{ed+eh-\beta_1 r- \beta_3 el- \beta_4 eg- \beta_5 dr}{\beta_2} \right) - a_3(p - p^*)}{\beta_2} \right)$$

and therefore,

$$eh = \frac{a_5}{(a_5 + a_6)} eh^* - \frac{a_6}{(a_5 + a_6)} ed + \frac{a_6}{(a_5 + a_6)} \beta_1 r - \frac{a_3}{(a_5 + a_6)} \beta_2 (p - p^*) + \frac{a_6}{(a_5 + a_6)} \beta_3 el + \frac{a_6}{(a_5 + a_6)} \beta_4 eg + \frac{a_6}{(a_5 + a_6)} \beta_5 dr$$

(f) Working for df

From equation 3.10 we know that $-a_6(df - df^*) - \lambda_1 - \lambda_2 \beta_2 = 0$. If we then substitute for λ_1 and λ_2 as we did previously and assuming that $df^* = 0$, we would have the following expression:

$$(a_6 - a_2) df = (a_6 + a_2) r - (a_6 + a_2) ce + (a_6 + a_2) el + (a_6 + a_2) eg + (a_6 + a_2) dr - (a_2 + a_3) p^* - (a_6 - a_2) p$$

and thus,

$$df = \frac{(a_6 + a_2)}{(a_6 - a_2)}r - \frac{(a_6 + a_2)}{(a_6 - a_2)}ce + \frac{(a_6 + a_2)}{(a_6 - a_2)}el + \frac{(a_6 + a_2)}{(a_6 - a_2)}eg + \frac{(a_6 + a_2)}{(a_6 - a_2)}dr - \frac{(a_2 + a_3)}{(a_6 - a_2)}p^* - \frac{(a_6 - a_3)}{(a_6 - a_2)}p$$

(g) Working for el

Recall equation 3.12; $-a_7(el - el^*) - \lambda_1 - \lambda_2\beta_3 = 0$ which could also be written as,

$$a_7 el = a_7 el^* - \lambda_1 - \lambda_2\beta_3$$

If we then substitute for λ_1 and λ_2 as we did previously and assuming that $df^* = 0$ we would have the following expression:

$$(a_7 - a_6)el = a_7 el^* - a_2(ce - ce^*) - \left(\frac{a_6\,(ce + p - r - eg - dr) - a_2(ce - ce^*)}{\beta_2}\right)\beta_3$$

and therefore,

$$el = \frac{a_7}{(a_7 - a_6)}el^* - \frac{a_2}{(a_7 - a_6)}\left[(ce - ce^*)(\beta_2 + \beta_3)\right] - \frac{a_6\beta_3\beta_2^{-1}}{(a_7 - a_6)}ce - \frac{a_6\beta_3\beta_2^{-1}}{(a_7 - a_6)}p + \frac{a_6\beta_3\beta_2^{-1}}{(a_7 - a_6)}r + \frac{a_6\beta_3\beta_2^{-1}}{(a_7 - a_6)}eg + \frac{a_6\beta_3\beta_2^{-1}}{(a_7 - a_6)}dr$$

(h) Working for eg

From equation 3.13 we have $-a_8(eg - eg^*) - \lambda_1 - \lambda_2\beta_4 = 0$ which could be written as,

$$a_8 eg = a_8 eg^* - \lambda_1 - \lambda_2\beta_4$$

Substituting for λ_1 and λ_2 as previously and assuming that $df^* = 0$ we would have the following expression:

$$a_8 eg = a_8 eg^* - a_2(ce - ce^*) - \left(\frac{a_6\,(ce + p - r - el - eg - dr) - a_2(ce - ce^*)}{\beta_2}\right)\beta_4$$

and thus,

$$eg = \frac{a_8}{(a_8 - a_6)}eg^* + \frac{a_2}{(a_8 - a_6)}\left[(ce - ce^*)(\beta_2 + \beta_4)\right] - \frac{a_6\beta_4\beta_2^{-1}}{(a_8 - a_6)}ce - \frac{a_6\beta_4\beta_2^{-1}}{(a_8 - a_6)}p + \frac{a_6\beta_4\beta_2^{-1}}{(a_8 - a_6)}r + \frac{a_6\beta_4\beta_2^{-1}}{(a_8 - a_6)}el + \frac{a_6\beta_4\beta_2^{-1}}{(a_8 - a_6)}dr$$

(i) Working for dr

Recall equation 3.14; $-a_9(dr - dr^*) - \lambda_1 - \lambda_2\beta_5 = 0$ which could also be written as,

$$a_9 dr = a_9 dr^* - \lambda_1 - \lambda_2\beta_5$$

If we then substitute for λ_1 and λ_2 as we did previously and assuming that $df^* = 0$, we would have the following expression:

$$a_9 dr = a_9 dr^* - a_2(ce - ce^*) - \left(\frac{a_6\left(ce + p - r - el - eg - dr\right) - a_2(ce - ce^*)}{\beta_2} \right) \beta_5$$

and therefore,

$$dr = \frac{a_9}{(a_9 - a_6)} dr^* - \frac{a_2}{(a_9 - a_6)} \left[(ce - ce^*)(\beta_2 + \beta_5)\right] - \frac{a_6\beta_5\beta_2^{-1}}{(a_9 - a_6)} ce - \frac{a_6\beta_5\beta_2^{-1}}{(a_9 - a_6)} p + \frac{a_6\beta_5\beta_2^{-1}}{(a_9 - a_6)} r + \frac{a_6\beta_5\beta_2^{-1}}{(a_9 - a_6)} el + \frac{a_6\beta_5\beta_2^{-1}}{(a_9 - a_6)} eg$$

Table C.1: Summary statistics by each group of country

Variables	Full Sample	HIPC fragile	HIPC non-fragile
Debt service savings	1.00	0.62	0.60
	(3.98)	(1.05)	(1.00)
Debt relief/GDP	1.94	1.40	1.34
	(6.01)	(5.54)	(3.27)
Domestic revenue	18.49	20.01	18.05
	(9.59)	(12.75)	(5.30)
Domestic revenue net of NR	7.07	7.15	8.12
	(9.59)	(12.76)	(6.54)
Primary current expenditure	14.55	15.60	13.53
	(5.41)	(6.03)	(4.51)
Capital expenditure	11.48	9.66	12.02
	(9.15)	(8.97)	(8.15)
Expenditure on education	3.69	3.55	3.83
	(2.25)	(2.84)	(1.62)
Expenditure on health	5.24	5.96	5.05
	(2.87)	(3.22)	(2.18)
Domestic financing	2.28	2.51	2.09
	(2.85)	(2.96)	(2.89)
External loans	3.76	3.97	3.14
	(5.89)	(7.17)	(3.44)
External grants	5.08	6.35	3.64
	(6.39)	(8.32)	(3.51)

Notes: The numbers in the tables denote means and the figures in parentheses report standard deviations. HIPC = Heavily Indebted Poor Country. NR = Natural Resource. All variables are measured as a percentage of GDP. Data source: HIPC completion point documents, 1990-2017.

Table C.2: List of sample countries

HIPC fragile	CPIA score	HIPC non-fragile	CPIA score
Burundi	2.9	Benin	3.5
Central A. Republic	2.5	Burkina Faso	3.6
Chad	2.7	Cameroon	3.3
Comoros	2.8	Côte d'Ivoire	3.4
Dem. Rep. of Congo	2.8	Ethiopia	3.4
Guinea	3.2	Ghana	3.6
Guinea-Bissau	2.5	Madagascar	3.3
Liberia	3.1	Mali	3.4
Malawi	3.2	Mauritania	3.4
Mozambique	3.2	Niger	3.4
Rep. of Congo	2.7	Rwanda	4.0
São Tomé and Príncipe	3.1	Senegal	3.8
Sierra Leone	3.2	Tanzania	3.7
The Gambia	3.0	Uganda	3.6
Togo	3.1	Zambia	3.3

Notes: CPIA stands for Country and Policy Institutional Assessment. The data is from 2017 and was collected from the World Bank.

Figure C.1: Government revenue as a percentage of GDP

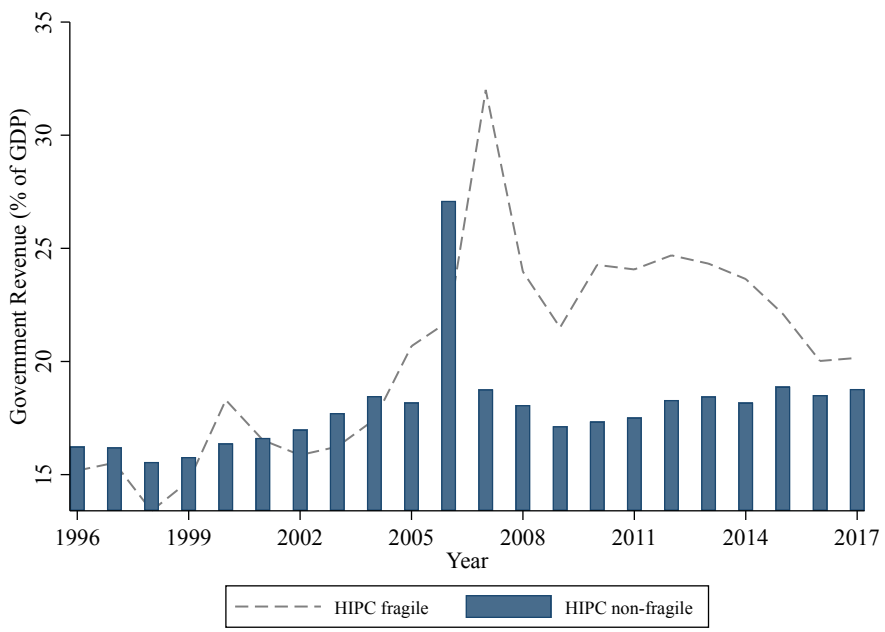
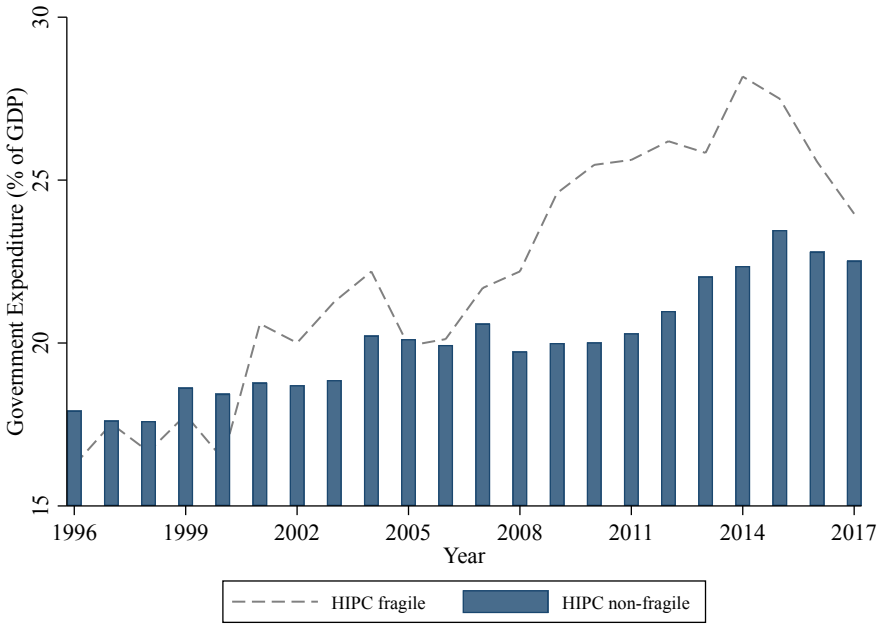


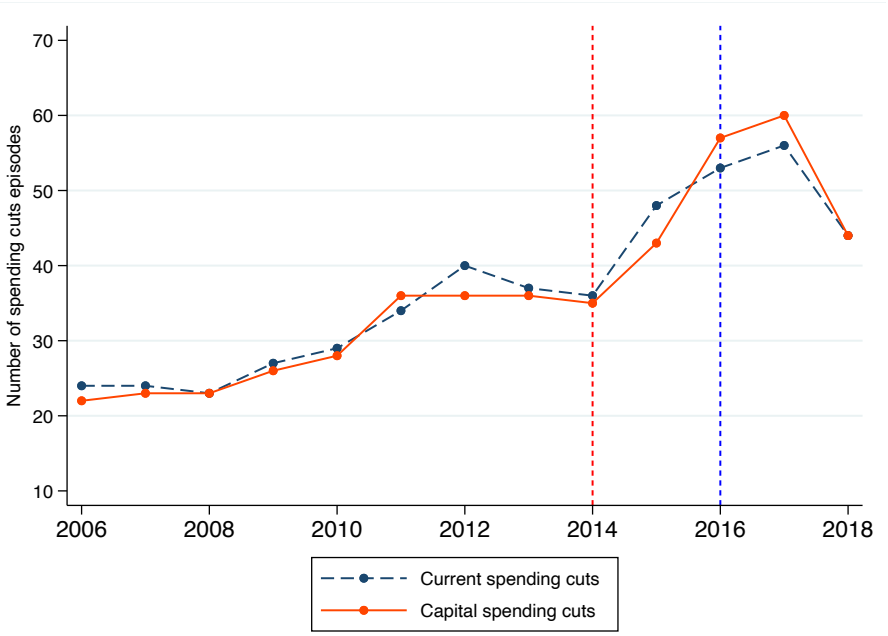
Figure C.2: Government expenditure as a percentage of GDP



Appendix D

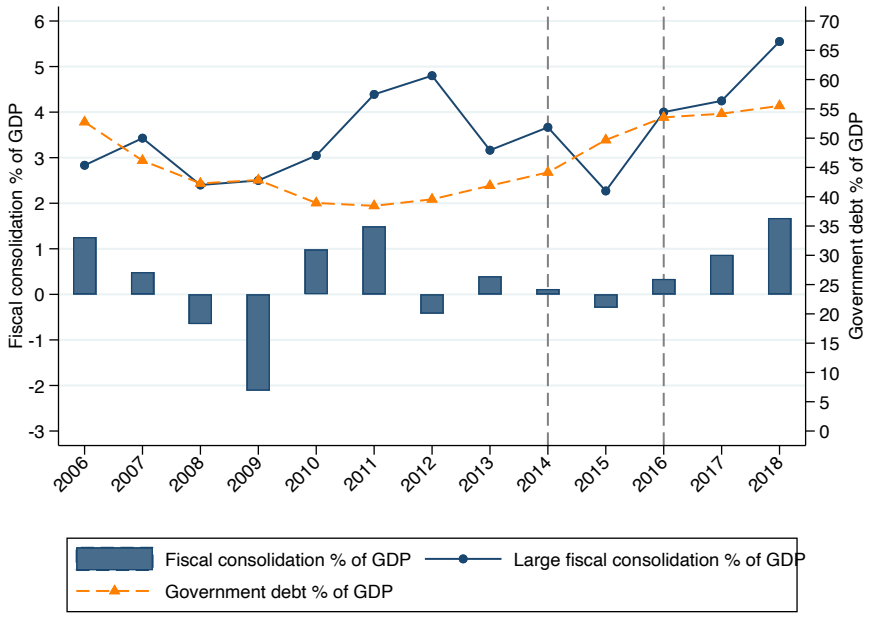
Appendix D (Chapter 4)

Figure D.1: Composition of spending cuts episodes



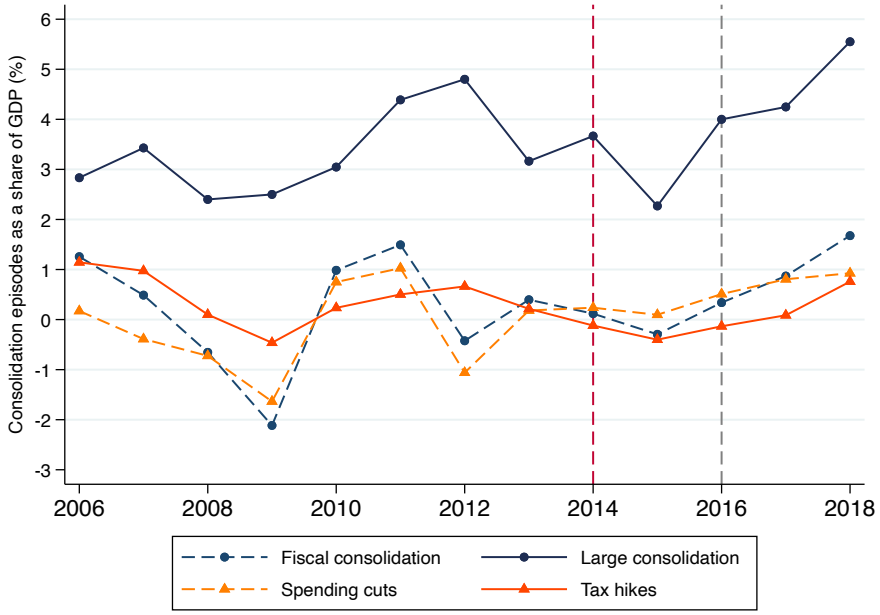
Note: This figure plots the composition of spending cuts episodes constructed as described in section 4.3. The area between the vertical red and blue lines represents the period in which there was more fiscal consolidation episodes. The definition and construction of the variable are discussed in section 4.3. Data source: IMF Article IV reports.

Figure D.2: Average fiscal consolidation (% of GDP) and Government debt (% of GDP)



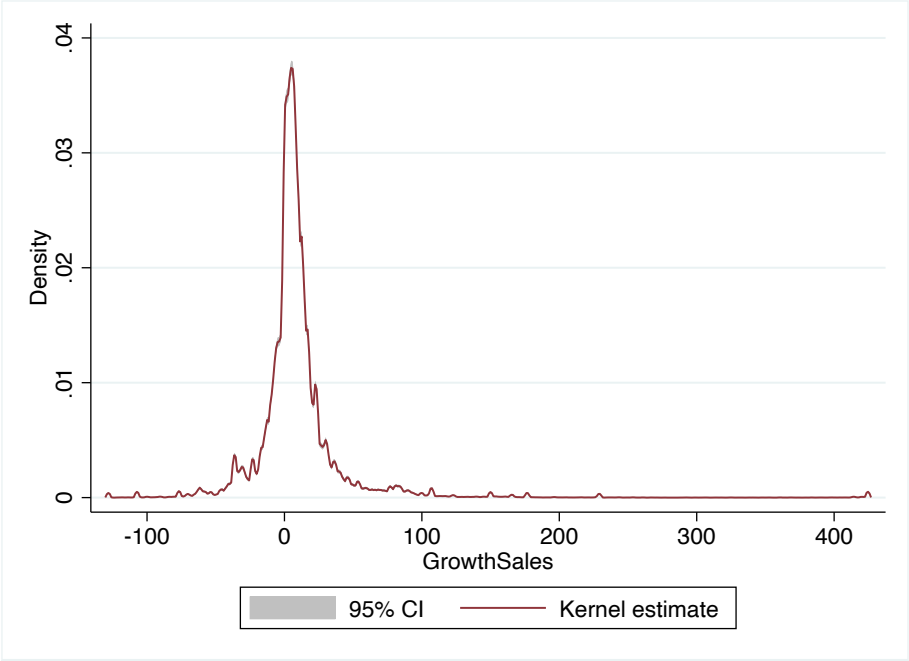
Note: This figure plots the average fiscal consolidation episodes as a share of GDP and government debt as a share of GDP. The area between the two vertical grey lines represents the period in which there was more fiscal consolidation episodes. The definition and construction of the episodes are discussed in section 4.3. Data source: IMF Article IV reports.

Figure D.3: Composition of fiscal consolidation (% of GDP) and Government debt (% of GDP)



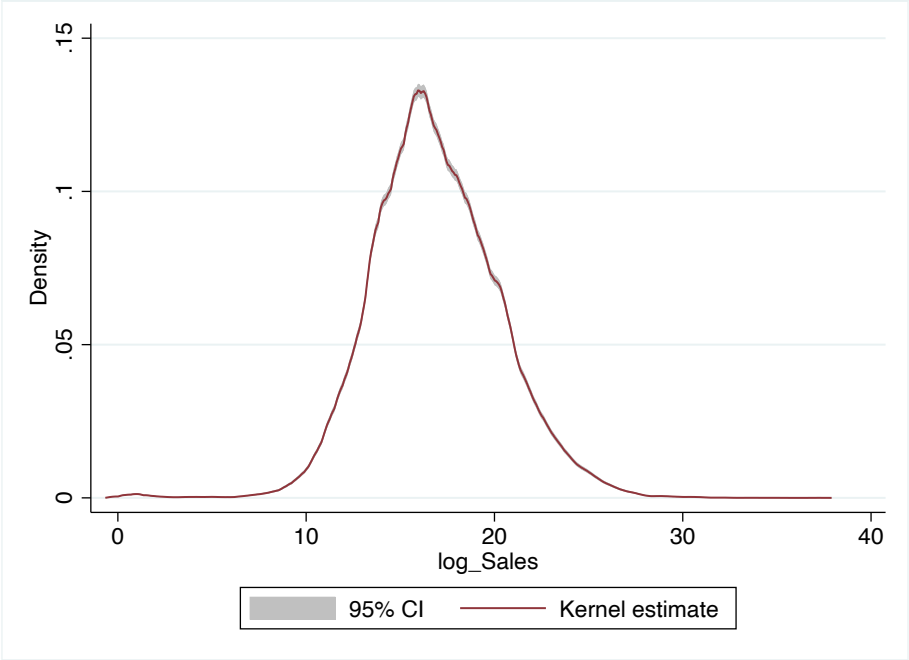
Note: This figure plots the composition of fiscal consolidation episodes as a share of GDP and government debt as a share of GDP. The area between the vertical red and grey lines represents the period in which there were more fiscal consolidation episodes. The definition and construction of the episodes are discussed in section 4.3. Data source: IMF Article IV reports.

Figure D.4: Kernel density (Firm growth)



Note: This figure plots the kernel density of firm growth constructed with data from the World Bank Enterprise Survey (WBES). The definition and construction of the variable are discussed in section 4.3.

Figure D.5: Kernel density (Log sales)



Note: This figure plots the kernel density of sales in logarithm constructed with data from the World Bank Enterprise Survey (WBES). The definition and construction of the variable are discussed in section 4.3.

Table D.1: Sample size and fiscal consolidation episodes

Country	Year of survey	Fiscal consolidation episodes	Country	Year of survey	Fiscal consolidation episodes
Afghanistan	2008; 2014	06–11; 14; 16–18	Kyrgyz Republic	2009; 2013; 2019	07–12; 17–18
Albania	2007; 2013; 2019	07; 10; 15–16; 18	Kosovo	2009; 2013; 2019	12–13; 17–18
Angola	2006; 2010	09; 11; 14–18	Lebanon	2013	08–10; 14–15
Argentina	2006; 2010; 2017	12–18	Lesotho	2009; 2016	06; 11–17
Armenia	2009; 2013	09–18	Liberia	2009; 2017	17–18
Azerbaijan	2009; 2013	14–18	Macedonia, FYR	2009; 2013; 2019	06–09; 14–16
Bangladesh	2007; 2013	13–16	Madagascar	2009; 2013	17–18
Belarus	2008; 2013; 2018	12–16	Malawi	2009; 2014	06; 08–09; 17–18
Belize	2010	08–18	Mali	2007; 2010; 2016	09–10; 18
Benin	2009; 2016	06–11; 18	Mauritania	2006; 2014	10–11; 15–16
Bhutan	2009; 2015	13–18	Mexico	2006; 2010	09–11; 16–17
Bolivia	2006; 2010; 2017	06–08; 17–18	Moldova	2009; 2013; 2019	10– 13; 16–18
Bosnia and Herzegovina	2009; 2013; 2019	06–16	Mongolia	2009; 2013; 2019	09; 17–18
Botswana	2006; 2010	11–13; 15–17	Montenegro	2009; 2013; 2019	07; 10–17
Brazil	2009	12–13; 17–18	Morocco	2013; 2019	06–07; 11–18
Burkina Faso	2009	13–14; 16–18	Mozambique	2007; 2018	15; 17–18
Burundi	2006; 2014	10–13	Myanmar	2014; 2016	16–18
Cape Verde	2009	06–08	Namibia	2006; 2014	06–07; 11–18
Cambodia	2013; 2016	08–13	Nepal	2009; 2013	16–18
Cameroon	2009; 2016	06; 16–18	Nicaragua	2006; 2010; 2016	15–16
Central Africa Republic	2011	06–07; 14–16	Niger	2009; 2017	13; 15; 17–18
Chad	2009; 2018	06–07; 11–13	Nigeria	2007; 2014	14–15; 17–18
Chile	2006; 2010	11; 13–17	Pakistan	2007; 2013	06–07; 11–13; 16–18
China	2012	16; 18	Panama	2006; 2010	06–08; 14–17
Colombia	2006; 2010; 2017	06–09; 12–16; 18	Papua New Guinea	2015	11–13; 15–17
Costa Rica	2010	08–18	Paraguay	2006; 2010; 2017	16–18
Côte d'Ivoire	2009; 2016	07; 13–15; 17–18	Peru	2006; 2010; 2017	07–10; 16–17
Democratic Republic of Congo	2006; 2010; 2013	10–12	Philippines	2009; 2015	06–12
Djibouti	2013	08–10	Republic of Congo	2009	06–07; 11–12; 17–18
Dominican Republic	2010; 2016	13–18	Rwanda	2006; 2011	09–11; 18
East Timor	2009; 2015	12–13	Senegal	2007; 2014	12; 15–17
Ecuador	2006; 2010; 2017	14–18	Serbia	2009; 2013; 2019	10–17
Egypt	2013; 2016	15–17	Sierra Leone	2009; 2017	11–12
El Salvador	2006; 2010; 2016	06–11; 16–18	South Africa	2007	10–11; 14–17
Ethiopia	2011; 2015	14–17	Sri Lanka	2011	09–13; 15–17
Gabon	2009	06; 08–09; 16–18	Sudan	2014	12–16
Georgia	2008; 2013; 2019	11–12; 14–16	Swaziland	2006; 2016	11–12; 15–17
Ghana	2007; 2013	12–17	Tajikistan	2008; 2013; 2019	11–13
Guatemala	2006; 2010; 2017	12–15	Tanzania	2006; 2013	14; 16–17
Guinea	2006; 2016	10–11; 16–18	Thailand	2016	14–17
Guinea-Bissau	2006	16–18	The Gambia	2006; 2018	06; 08–09; 12–14; 16
Guyana	2010	09–15	Togo	2009; 2016	10–12; 16–18
Honduras	2006; 2010; 2016	10; 14–18	Tunisia	2013	06–11; 16–17
India	2014	06–10; 13–14	Uganda	2006; 2013	06–08; 14–17
Indonesia	2009; 2015	06; 016–18	Uruguay	2006; 2010; 2017	15–18
Iraq	2011	13–18	Vietnam	2009; 2015	09–17
Jordan	2013; 2019	14–18	Yemen	2010; 2013	11–13
Kazakhstan	2009; 2013; 2019	11–12; 17–18	Zambia	2007; 2013	06; 12; 15–18
Kenya	2007; 2013; 2018	11–13; 16–17	Zimbabwe	2011; 2016	14–18