Debt Relief, Tax Effort, and Fiscal Incentives.
The Donkey and the Carrot Revisited.

Marin Ferry*
IRD, UMR225-DIAL and Université Paris Dauphine, LeDA

Abstract

The multilateral debt relief initiatives of the early and mid-2000s have canceled around $76 billion of external public debt that severely weighed on low-income countries’ governments, most of them located in sub-Saharan Africa. Using an event-study framework, this paper tries to empirically assess a relation that has not yet been investigated: the impact of debt relief on government’s tax effort. Our results suggest that having reached the decision point leads to higher level of tax effort. But our findings also reveal that HIPCs seem to deploy the bulk of their tax effort before the decision point in order to get debt relief, and then loosen this effort. Indeed, once debt relief has been provided, data suggest that HIPCs gradually reduce their tax effort. This result therefore stresses the recurrent moral hazard issue in development financing where required improvements from international financial institutions provide positive fiscal incentives which nevertheless vanish as soon as countries have been rewarded for their effort. However, additional tests expose that post-debt relief tax effort remains higher than the level recorded before the anticipatory effects took place, thus emphasizing an overall positive effect of the Enhanced HIPC initiative on government’s tax effort.

Keywords: Debt Relief. Tax Effort. Event-Study. Moral Hazard.
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*IRD, 4 rue d’Enghien - Paris 75010. +33 1 53 24 14 68. E-mail: ferry@dial.prd.fr
1 Introduction

"The importance of public revenue to the underdeveloped countries can hardly be exaggerated if they are to achieve their hopes of accelerated economic progress." Kaldor [1962]

"Development success stories go hand in hand with better mobilization of a country's own resources and less dependence on aid and other foreign finance." OECD [2010]

By the end of 2012, debt relief granted under the Enhanced Heavily Indebted Poor Countries (HIPC) initiative and the Multilateral Debt Relief Initiative (MDRI) was peaking at $76 billion and had been provided to 36 countries, 30 of them being Sub-Saharan African countries. These initiatives which aimed for the very first time to go beyond the international financial institutions' (IFIs) dogma by canceling multilateral claims, were associated with strong conditionality in terms of public finance management such as tax system improvement. Moreover according to the debt overhang theory literature, countries benefiting from debt relief should be more willing to engage in tax reforms since they would be now able to fully benefit from the reforms’ outcomes (which would no longer accrue to external creditors under debt repayments). The combination of this conditionality with these theoretical intuitions, could hence lead to think that debt relief might have positive impacts on government’s tax effort. However, such relationship is not straightforward. As many other development financing programs, the design of the Enhanced HIPC initiative could induce moral hazard effects that may severely blur the way in which debt relief positively affects tax effort. Debt relief expectations might indeed foster eligible countries to deploy, in front of IFIs, substantial efforts in terms of fiscal performances. But once debt relief would be provided, these countries could totally reduce their tax effort since there is no debt relief to get anymore.

This paper therefore explores how debt relief provided under the Enhanced HIPC initiative impacts benefiting countries’ tax effort, and also tries to identifies potential moral hazard effects that could be at play in such relationship. So far, the impact of debt relief on government’s tax effort has not been investigated. But the literature about debt, debt relief, and tax revenues gives some intuitions about the potential reaction of government’s tax effort to debt relief provisions. Looking first at the literature about tax determinants, several studies include the stock of debt as structural factors of taxes in developing countries. In most of these studies, results suggest that public debt tends to negatively impact tax ratios in developing countries, underlining debt overhang’s prediction where more indebted countries gradually loosen their tax policies since collected revenues directly go to creditors. Except the study by Crivelli and Gupta [2014] that finds a positive contribution of foreign debt on tax ratios for resource-rich countries, these of Teera and Hudson [2004] and Gupta [2007] indeed expose a negative correlation between public debt and tax ratio for low-income countries. In the same vein, the study by Mkandawire [2010] observes a similar negative relationship but for a sample of continental Sub-Saharan African countries only. Even more interesting, Clist and Morrissey [2011] show that in a sample of 82 developing countries, external loans (that can be considered as external debt) are positively correlated with tax revenues but that this effect is non-linear. According to them, there would be a threshold starting from which the amount of external loans reduces taxation, emphasizing (in a way) predictions of the debt overhang theory.

More directly, some studies tries to directly test the impact of debt relief on fiscal variables such as tax ratio or government capacity. Presbitero [2009], for instance, investigates the impact of debt relief on CPIA index but do not find any significant result. However his study as well as these by Freytag and Pehnelt [2006] and Chauvin and Kraay [2007] suggest that debt relief is provided to countries that record increasing institution quality. These results might therefore support the idea that in prospect of debt relief, potential eligible countries deploy increasing endeavors to implement structural reforms that in fine improves institutional quality. On the impact of debt relief on taxation per se, Chauvin and Kraay [2005] estimate the impact of debt relief on the tax revenues to GDP ratio and find positive but not significant effects¹.

However the absence of debt relief’s effects on taxation and on other fiscal variables in all these studies is largely due to the sample and especially the period of study considered. Papers by Presbitero [2009], Chauvin and Kraay [2005] and Johansson [2010] estimate the impact of debt relief on macroeconomic outcomes respectively over 1989-2003 for the first two and over 1992-2003 for the latter one. These studies thus assess the impact of debt relief over a period that ends in average around 2003. Moreover, they all transform their annual data set in three or four years-average periods to estimate the impact of debt relief in T on outcomes in T+1, considering thus only the impact of debt relief provided around 2000 when 22 countries had just reached their decision point and did not receive substantial amounts of debt forgiveness yet. By consequent, focusing on an inappropriate time span, these studies i) do not allow to observe the impact of the total debt relief provided along the Enhanced HIPC process; ii) do not enable to consider debt relief provided under the MDRI that occurred in 2005; and therefore logically do not highlight significant results. But two other studies by Cassimon and Campenhout [2008] and Cassimon et al. [2015] try to tackle this shortcoming using longer time series and considering more HIPCs that have recorded substantial amounts of debt relief. Collecting data from 1986 up to 2012 for 24 HIPCs that have at

¹ Coefficients are statistically significant at the 10% level but are not robust to specification or debt relief measure changes.
least reached their decision point and using time series analysis, Cassimon et al. [2015] highlight that debt relief flows are positively associated with larger public investment, current expenditures and tax ratio, hence supporting the debt overhang’s predictions. Nevertheless, as explained by the authors, these studies, realized on a sample exclusively composed of Heavily Indebted Poor Countries (HIPC) do not provide external validity for these debt relief fiscal effects.

Building on these latter studies, our article therefore considers longer enough time series in order to have sufficient temporal perspective regarding debt relief provision and also tries to properly assess the impact of debt relief using relevant control groups to provide external validity to our findings. In order to estimate the reaction of government’s tax effort to debt relief provision, we collected data on tax revenues for 117 developing countries over 1992-2012 using IMF Staff Papers and other Article IV. After having identified structural tax determinants in developing countries referring to the existing literature about taxation and development, we build tax effort indexes for each country and each year using residuals of tax effort equation. Such method allows to isolate structural factors that explain the country’s potential tax base, from the real government’s endeavors to collect these potential taxes. Then, using bootstrap procedure in an event-study framework, we test the reaction of government’s tax effort to debt relief provision around different stages of the Enhanced HIPC process such as the decision point, the completion point, and the interim period.

The event-study methodology enables to run difference in mean analysis before and after debt relief provision and to add relevant control group countries as counter-factual. In that sense, event-study draws on difference-in-differences estimates as explained in robustness checks. Regarding control group countries, we define several counter-factual using HIPC eligibility criteria such as income and indebtedness thresholds. Our selection process allows to identify a group of 16 countries which recorded the income status (low income countries) and the debt ratio required to be eligible for the Enhanced HIPC initiative but which never benefitted from debt relief under this programs. In addition, we also compare our treated group of HIPC’s to our whole sample of developing countries in order to control for potential trend that would affect the “developing world”. And since HIPC’s are mainly from Sub-Saharan Africa, we also run comparisons with a control group composed of non-HIPC African countries in order to control for potential regional trend that could influence the evolution of government’s tax effort around the different Enhanced HIPC initiative’s stages.

The article is structured as follows. Section 2 exposes the relationship between debt relief and domestic resource mobilization. We first briefly redraw the evolution of tax ratio in developing countries and how it has contributed in the creation of debt relief programs. We then identify the related theories and concepts that clearly establish a link between debt relief and government’s tax effort. We close this section with the potential incentive effects played by the design of these debt relief initiatives. Section 3 then describes our methodological approach to estimate the reaction of government’s tax effort to debt relief. Section 4 identifies tax structural determinants, the appropriate tax effort equation and exposes results for tax effort estimates. Section 5 shows results on tax effort’s reaction to debt relief under the different stages of the Enhanced HIPC process (the decision point, the completion point, and the interim period), presents robustness checks using other tax effort estimates, alternative econometric method, different control groups and also tries to decompose the timing reaction of tax effort according to debt relief provision. Finally, section 6 concludes.

2 Debt Relief and Taxation

2.1 Tax System Evolution and the HIPC Initiatives’ origins

Over the past fifty years, from Nicholas Kaldor to the OECD, domestic resource mobilization has been largely recognized as one of the keystones in low-income countries development process. Most of development actors have acknowledged that growing financial needs for infrastructure construction, social spending, or national security could not be entirely fulfilled with domestic resources and that therefore foreign aid was strongly needed. But they have also admitted that efficient tax system was essential to the state building process and that necessary improvement in taxation had to be made to gradually cut loose from international financial assistance. As a consequence, for decades, low-income countries and international institutions have deployed increasing endeavors to design, set up and foster tax systems across the developing world.

Historically, the first involvement of the international community into developing countries’ tax system occurred with the numerous expert assessments of Edwin Kemmerer in Latin America between 1917 and 1931 who mainly advised reorganization of the financial sector and reforms of the fiscal and budget systems (Alacevich and Asso [2009]). This international commitment in developing countries’ public finances then took another step with the Shoup mission that sent in 1949 seven US economists to the post-World War II Japan in order to get the tax system back on a solid ground. The success of this intervention led for the next two decades the international community to send influential occidental economists in developing countries to improve existing tax systems. However, starting from the 1980s, aid agencies and especially the World Bank and the IMF, stopped to rely on small groups
of leading individuals and started to promote the development of tax systems in recipient countries by tying their disbursements to structural reform programs. As a matter of fact, the SAF\textsuperscript{2} specially dedicated to poor countries was mainly targeting public deficit reduction by promoting increases in domestic revenues and wise control over public spending (Ghosh et al. [2005]). These efforts slowed down between 1992 and 1998 a period called the "Aid Fatigue", but started again in the early 2000s with increasing involvements from bilateral donors that also began to develop tax-related official assistance (Fjeldstad [2013]). Nowadays, given the increasing financial needs of developing countries (for some, related to post-MDG challenges), the international community is fully committed to support taxation in developing countries that also contributes to improve the well-functioning of the state (Kaldor [1981]), to reinforce its legitimacy and power (Di John [2009]) and, in a larger extend, fosters institutions quality and democracy (Fjeldstad [2013], Besley and Persson [2013]) if technical and financial assistance is provided in the right way.

However, past experiences have showed that the gap between commitments and outcomes remains usually wide. Indeed, despite all this assistance, tax ratios in developing countries and especially in Sub-Sahara Africa has remained significantly low since the mid-1960s. Causes are numerous and range from the insufficient tax base to the implementation of specific tax system in countries where environment was not appropriate yet to make such systems work (Fjeldstad [2013]). Indeed, the large incidence of corruption in developing countries did not help to develop efficient and inclusive tax system. On the tax payer side, corrupted elites and weak public services provision contributed to maintain low tax compliance since citizens could not see, touch or even catch sight of benefits from their tax payments (Fjeldstad and Therikldsen [2008]). On the tax administrator side, mismanagement and rent-seeking behavior basically led to extractive institutions that were grabbing natural resources receipts, supporting high reliance on exports taxes\textsuperscript{3}, and were thus monopolizing domestic resources for elites self-interest which were more often directed to shady foreign bank accounts rather than to the local economy (Boyce and Ndikumana [2011]).

This dramatically led developing countries to rely more and more on foreign financing and to contract substantial amounts of external debt. Furthermore, public mismanagement in recipient countries and political considerations in donor countries (McKinlay and Little [1978]) also contributed to the increasing provision of external loans, sometimes just to reimburse those previously contracted (Geginat and Kraay [2012]). This financing spiral, known as defensive lending, induced by insufficient domestic revenues and reinforced by the second oil shock that highly impacted commodity prices (and therefore low-income countries export-related revenues) in the early 1980s, ultimately led to external debt stockpiling from the mid-1980s onwards in developing countries and especially in Sub-Saharan Africa (Krumm [1985]), Greene [1989]). Indeed, from the late 1980s to the end of the 1990s a significant share of low income countries recorded large and unsustainable external public debt ratios. During this period, policy responses to what will be later called "the third-world debt crisis" only consisted in debt treatments under the Paris Club. These agreements, or with the right denomination; these "terms", mostly aimed to postpone the debt-due date by rescheduling debt service payments with more or less concessionality. The first debt treatment designed to cancel bilateral debt for poor countries (of around one-third) was the Toronto terms set up in 1988 and replaced by the London terms in 1991 with debt cancellation of 50%. This low income countries debt treatment were replaced by the Naples terms in 1994 which provided bilateral debt cancellation of around 67% (Thuggle and Boote [1997]). These treatments specially dedicated to poor countries then improved under the Lyon terms that extended public bilateral debt cancellation up to 80% in 1996. Cologne terms of 1999 finally pulled this ceiling up to 90% (Dasseking and Powell [1999]).

However, although these two latest terms helped to reduce the average external public debt of highly indebted poor countries (contrary to former debt treatments that did not managed to stop debt stockpiling - Cf. Figure 1 in appendix), debt ratios were still unsustainable and sky-scraping at the end of the 1990s. Why? Because debt treatments at the Paris Club were only focused on bilateral debt reduction whereas a significant share of low-income countries' debt was owed to multilateral financial institutions such as the World Bank, the IMF, and the regional development banks. The need for multilateral debt relief cancellation thus rose up in the middle of the 1990s and alongside with the setting up of the Naples terms, the international community decided in 1996 to launch the Heavily Indebted Poor Countries Initiative which aimed to provide for the very first time, debt relief on multilateral commitments (both flows and stocks).

The HIPC initiative has been designed as a process where debt relief is provided conditionally to target achievements which, once reached, lead to different stages such as the "decision point" for the entry in the debt relief initiative, and the "completion point" for the exit. At the decision point, the country is considered eligible for debt relief under the HIPC initiative only if it fulfills four criteria required by the international financial institutions (IFIs). These criteria are (1) being a low income country following the World bank classification; (2) being IDA-eligible only (not blend); (3) having successfully implemented reforms under IMF-PRGF programs, and finally

\textsuperscript{2}The Structural Adjustment Facility which provided conditional loans for low-income countries will be replaced by the Enhanced Structural Adjustment Facility in 1987, and by the Poverty Reduction and Growth Facility program (PRGF) in 1999 which has now been replaced with the Extended Credit Facility.

\textsuperscript{3}What in way contributed to narrow the tax base.
Therefore, it is quite easy to take again this numerical example but now assuming that expenditures actually support the development of the private sector).

resources (although public resources from investment are likely to be collected through taxation if public investment explaining that such additional capital expenditures contribute to generate future government’s adjustment effort not as an improvement in direct tax effort but as extra investment undertaken by the debtor country. Sachs [1989] even gives a simple but really representative example of this situation. However, he defines the adjustment effort as a trade-off for a new and solid start in term of tax policies. Moreover according to theories and the design of these debt cancellation programs, debt relief granted under the Enhanced HIPC initiatives should have provided appropriate environment with potential fiscal incentives for better tax policies as the next section emphasizes.

2.2 Theoretical Considerations

Following the developing countries’ debt crisis of 1982, many authors, in the late 1980s, looked into details at the macroeconomic effects of high level of public indebtedness. Studies by Krugman [1988], Sachs [1989], and in a larger extend by Cohen [1990], led to transpose the debt overhang theory developed by Myers [1977] from the corporate level to the government level, and then applied it to low-income countries’ debt crisis. According to this seminal work, a debtor country experiences a situation of debt overhang when it becomes beneficial for both the debtor and its creditors to partially cancel its stock of debt. Indeed, when public debt reaches unsustainable levels, it can negatively impact the economic growth what finally lowers the debtor’s capacity to pay and hence the creditors’ asset value.

Transmission channels from large public indebtedness to slowed economic growth are threefold. First, a really large stock of public debt can be considered by domestic and foreign investors as an implicit tax burden that persuades them to postpone their investment by fear of future hikes in capital taxes. Second, high level of public indebtedness must be paid back and is thus often associated with large debt service payments. Sizable debt service payments can therefore monopolize the bulk of government’s resources and crowd public development expenditures out. These two effects simultaneously reduce the capital accumulation process (both private and public) what, by definition, tends to hamper the economic growth.

The third effect, which is directly related to the debtor’s capacity to pay and which is at the heart of this study, is relative to the negative incentives induced by large amounts of public debt. Krugman [1988], Sachs [1989], and also Corden [1989] expose that a substantial public debt can create disincentives for the debtor to invest or deploy efforts in order to raise additional revenues since the benefits of these efforts will directly accrue to creditors as debt repayments. In other words, Krugman explains that if "the debt burden on a country is as large as the maximum that the country could positively pay, even with maximum adjustment effort. Then there is in fact no reason for the country to make the adjustment effort, since the reward goes only to its creditors" (Krugman [1988], p.14). Sachs also summarizes this trade-off in a quite straightforward way maintaining that "Why should a country adjust if that adjustment produces income for foreign banks rather than for its own citizenry?" (Sachs [1989], p.257).

These authors have thus developed theoretical models showing how large public debt can hamper the level of investment undertaken by the debtor country. Sachs [1989] even gives a simple but really representative example of this situation. However, he defines the adjustment effort not as an improvement in direct tax effort but as extra public investment explaining that such additional capital expenditures contribute to generate future government’s resources (although public resources from investment are likely to be collected through taxation if public investment supports the development of the private sector).

Therefore, it is quite easy to take again this numerical example but now assuming that expenditures actually
aim to improve tax collection\textsuperscript{4} (like additional tax administrators, taxpayers registering software, tax offices, etc.). So following Sachs \textsuperscript{[1989]}, we assume that a country owes $150 million to its creditors but can just raise $100 as domestic revenues which represents its capacity to pay. Now, let’s suppose that in the future, the debtor country will honor its debt as much as he can and will default on the remaining debt service payments (what is a strong assumption). We can then see that, given its debt overhang situation, any attempt to raise domestic revenues up to $150 millions (so additional tax-related expenditures or just additional government tax effort) would entirely go to creditors rather than to the debtor’s government. Indeed, let’s assume that the debtor country can spend $10 millions today to improve the efficiency of its tax system. These current expenditures will lead to collect more taxes in the future which will increase its capacity to pay to $120 million in the subsequent period. This adjustment effort would be beneficial for creditors but totally irrational for the debtor country. Indeed, it renounces to $10 million in current consumption to get nothing in the future since all additional revenues will naturally fall to the creditors. But if we add for creditors the possibility to cancel debtor’s liabilities, things become different. Assuming that creditors agree to provide debt relief of $45 million (so 30\% of debt forgiveness) and continue to ask for total repayment of the remaining stock of debt, so $105 million. If the debtor country spends now $10 millions or reduces its current consumption to reallocate civil servants to tax collection activities, its earnings raise its capacity to pay up to $120 million what is now enough to repay its debt and even allows to consume the remaining $15 million. Under such circumstances, debt relief leads to improve government future utility of a little bit more than $1.5 million if we assume a government’s discount rate of 0.3\textsuperscript{5}.

By consequence, according to this simple numerical application and assuming a government’s preference for present not too high\textsuperscript{6}, one could theoretically expect to observe that government raises its tax effort and therefore its tax level once debt relief is provided, since it can now reap the benefits of its efforts.

\subsection*{2.3 Structural Reforms Incentives and the Debt Relief Initiatives Design}

But debt relief under the Enhanced HIPC initiative can also positively impact tax ratio through conditionality. As previously explained, this debt relief initiative came with strong conditionality in terms of both macroeconomic stabilization and poverty-reducing policies. One of the eligibility criteria required to benefit from the Enhanced HIPC initiative is indeed to have contracted a PRGF program with the IMF and to have undertaken structural reforms defined into it. Moreover, as already exposed, most of the PRGF’s reforms for low-income countries are strongly focused on fiscal deficit reduction and therefore on improvements in taxation (Ghosh et al. \textsuperscript{[2005]}).

As a matter of fact, looking into details at the \textit{Decision Point Document Under the Enhanced HIPC Initiative} for several HIPCs, one can see that the IDA and the IMF strongly advice to undertake significant reforms to improve the tax system and increase the domestic resource mobilization. For instance, the Decision Point Document Under the Enhanced HIPC Initiative prepared by the IDA and the IMF for Benin (IMF \textsuperscript{[1997-2005]}) highlights that "Benin satisfies the eligibility criteria for assistance under the Enhanced HIPC initiative. [...] Performance under the adjustment programs has been satisfactory, [...], the primary fiscal deficit has been considerably reduced, [...]. These achievements reflect mostly an improvement in government revenue and better controls over the government spending.”. For the Burkina Faso Decision Point Documents (IMF \textsuperscript{[1997-2005]}) also underlines that "the key structural reforms under the IDA and Fund-Supported Programs [...] include; introduction WAEMU’s common external tariff [...] revise tax benefits under investment code; complete computerization of tax revenue collection”. IMF also recalls that "in the fiscal area, a key objective was to widen the tax base, [...]”. Calls for enhancement in structural reforms are also exposed in documents for Mali (IMF \textsuperscript{[1997-2005]}) where the IDA and the IMF state that "Mali’s current three-year ESAF arrangement, approved on April 10, 1996, supports a program of policy reforms covering the period 1996-1999; [...]. In support of his request, the Malian authorities significantly strengthened macroeconomic policies and deepened structural reforms, [...], with regards public finances, [...] revenue enhancement (including a sharp reduction of exemptions, unification of the value-added tax at a single rate of 18 percent, and improving the efficiency of tax-collection agencies”. Many examples can be also found for other HIPCs using these documents that list the structural reforms to implement and provide detailed follow-up of those already undertaken.

Therefore debt relief granted under the Enhanced HIPC initiative could represent a sufficient rewards to push potentially eligible countries to implement needed and recommended structural tax reforms that would increase the level of tax collected but would also improve the efficiency of the entire tax system. However it is not really clear when HIPCs should undertake such efforts. According to the debt overhang theory, countries should undertake structural reforms once debt relief is provided. However, considering conditionality attached to the Enhanced HIPC, tax efforts should be made before the debt relief process i.e. before the decision point and the first debt

\textsuperscript{4}We can also assume that government does not spend more to improve the tax system but just reallocate civil servant to tax collection activities rather than public investment production. This reallocation or adjustment effort would therefore represents a current opportunity cost which is expected to be offset by induced future earnings, raising in fine the future capacity to pay.

\textsuperscript{5}Government’s utility gain in net present value is equal to 10 + 15/(1.3) = 1.54

\textsuperscript{6}What is also questionable in the context of developing countries
relief provision. But in overall, tax effort should increase around the decision point and last after debt relief has been provided.

Nevertheless, once debt forgiveness is granted one needs to cautiously consider the "after-debt relief". Indeed, if under the debt overhang hypothesis and conclusions countries receiving debt relief should rationally continue to deploy higher than before efforts to collect domestic resources; it is not guaranteed that the pre-debt relief conditionality on public finances will not create moral hazard and lead to misbehavior from benefiting countries afterward. For instance, it is likely that potentially eligible countries show substantial adjustment efforts (such as tax improvement) in order to get debt relief but then, once debt relief is granted, just relax in their efforts, loosen their tax policies and even worst engage in uncontrolled new external borrowing. Empirically, Dijkstra [2013] in her study on the impacts of debt relief in Nigeria shows that, although non-HIPCs, the country engaged in significant fiscal reforms in prospect of debt relief agreements with its bilateral creditors at the Paris club, confirming that such incentive effects might be at play. But her study does not emphasize any moral hazard and loosening in fiscal policies during the post-debt relief period.

3 Empirical Approach and Data

3.1 The Event-Study Methodology

Given the temporal perspective available as regards the Enhanced HIPC initiative (more than 10 years for HIPCs entered in 2000) and its one-shot feature, this study resorts to an event-study methodology to analyze the effect of having benefited from debt relief under different stages of the Enhanced HIPC process. This methodology initially designed to observe abnormal returns in finance (see MacKinlay [1997] for an extensive literature review) has been gradually applied to macroeconomic and political economy issues. Indeed, since the mid-2000s, several studies use the event-study framework to observe the direct and transitional effects of civil war (Chen et al. [2008] or democratization (Rodrik and Wacziarg [2005], Papaioannou and Siourounis [2008]) and institutional changes (Méon et al. [2009]) on economic growth.

The interest of the event-study is the ability to look at the evolution of a given outcome over a calendar that has as central point the occurrence of a particular event, such as the Enhanced HIPC initiative for example. Another important feature of this approach is the possibility to review the evolution of the outcome after the event occurred relative to the evolution before it happens. Therefore, under our debt relief setting, this methodology provides opportunities to graphically and econometrically see what happens before and after debt relief is granted and so run difference in mean analysis. Moreover, the event-study design also enables to observe how the outcome reacts one, two, three or ten years after a country experienced this exceptional event which, considering our research question, allows to gradually analyze the response of our variable of interest, the country’s tax effort, to debt relief delivery under the decision point, the completion point, or to the entire debt relief process.

From a technical point of view, the event-study methodology basically changes regular time-calendar into an "event-calendar" where each year is now defined according to its distance from the occurrence year of the event in which we are interested in. This transformation allows reviewing the impact of an event that commonly occurred for a set of countries, but at different dates. By consequence, since several low-income countries have benefited from the Enhanced HIPC initiative at different periods, this event-study methodology allows to settle these countries on a similar calendar; the "debt relief calendar". Under this calendar, the point that anchors the data (i.e. the year 0 in the "debt relief calendar") is defined as the "debt relief point" which can alternately be the decision point, the completion point, or the interim period. Therefore the year +1 and +2 will be respectively the year after and the second year after this "debt relief point". In the other way around, the year -1 and -2 will respectively denote one and two years before the "debt relief point" occurs, and so on.

However, in order to see how tax effort reacts to debt relief, one needs to consider HIPCs which have received debt relief soon enough to be able to observe tax effort evolution over a sufficient time period after debt relief has been granted. A longer enough ex-post period therefore implies to exclude from the sample countries like Comoros, Cote d’Ivoire, Togo or Liberia that all entered and exited the Enhanced HIPC initiative in the late 2000s.

Following this idea and in order to conserve a constant sample overtime, the study only considers HIPCs for which six years before and six years after the "debt relief point" are available. By consequence, the definition of the HIPC sample evolves according to the "debt relief point" considered. Indeed, taking the decision point as "debt relief point" allows to include into the sample 29 HIPCs that had at least reached their decision point in 2006. However if the "debt relief point" considered is now the completion point or the interim period, the sample

\(^{7}\)Haiti is excluded from the sample because of the 2010 earthquake that devastated the country and directly impacted macroeconomic aggregates.

\(^{8}\)Countries that are not in italic in Table 1
reduces to 21 HIPCs\(^9\) that exited the Enhanced HIPC initiative no later than 2006. So to summarize, the pre-debt relief period is defined as the 6 years before the HIPC has reached the "debt relief point" whereas the post-debt relief period denotes the 6 years after this point. In addition we also review the impact of having reached the decision point for a sample of 26 HIPCs having met their decision point no later than 2002 what enables to observe government’s willingness to tax over the ten years following this point and therefore to have longer insight on the decision point impacts.

Table 1: Heavily Indebted Poor Countries and "Debt Relief Points"

<table>
<thead>
<tr>
<th>Countries</th>
<th>Decision point</th>
<th>Completion point</th>
<th>Interim Period</th>
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<tbody>
<tr>
<td>Ethiopia</td>
<td>2001</td>
<td>2004</td>
<td>2001-2004</td>
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<tr>
<td>Ghana</td>
<td>2002</td>
<td>2004</td>
<td>2002-2004</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>2002</td>
<td>2006</td>
<td>2002-2006</td>
</tr>
<tr>
<td>Guinea Bissau</td>
<td>2000</td>
<td>2010</td>
<td>2000-2010</td>
</tr>
<tr>
<td>Chad</td>
<td>2001</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Democratic Republic of Congo</td>
<td>2003</td>
<td>2010</td>
<td>2003-2010</td>
</tr>
<tr>
<td>Republic of Congo</td>
<td>2006</td>
<td>2010</td>
<td>2006-2010</td>
</tr>
<tr>
<td>Haiti</td>
<td>2006</td>
<td>2009</td>
<td>2006-2009</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>2007</td>
<td>2010</td>
<td>2007-2010</td>
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<tr>
<td>Liberia</td>
<td>2008</td>
<td>2010</td>
<td>2008-2010</td>
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<tr>
<td>Togo</td>
<td>2008</td>
<td>2010</td>
<td>2008-2010</td>
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<tr>
<td>Cote d’Ivoire</td>
<td>2009</td>
<td>2012</td>
<td>2009-2012</td>
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<tr>
<td>Comoros</td>
<td>2010</td>
<td>2012</td>
<td>2010-2012</td>
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</tbody>
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Sources: HIPC and MDRI Status of Implementation - International Monetary Fund

\(^9\)Countries in **bold** in Table 1. Sao Tome and Principe is not included in this sample because of numerous missing values that prevent to have a complete observation set over -6/+6.
Consequently, we draw on the estimation model used in Chen et al. [2008] which, in our debt relief context, allows to observe the average difference before and after this "debt relief point". The model takes the following form:

$$TE_{i,s} = \alpha + \beta Post_{i,s} + \nu_i + \epsilon_{i,s}$$ (1)

Where $TE_{i,s}$ is the tax effort for HIPC $i$ in debt relief-period $s$ (with $s$ running from -6 to +6 or -10 to +10 depending on the sample reviewed), $Post_{i,s}$ is a dummy variable that takes 1 for all the period after the "debt relief point" with the year of the "debt relief point" included (so over [0; +6]) and 0 otherwise (so over [-6; -1]), and $\nu_i$ is n-1 HIPCs fixed effect. Under this model, our parameter of interest $\beta$ therefore represents the average absolute difference in tax effort between the pre- and the post-debt relief point periods.

3.2 Providing External Validity: Looking for a valid Control Group

Under the event-study settings, the empirical analysis aims to examine the average difference between the pre- and post-debt relief period. However, if we want to identify and generalize potential impacts of debt relief initiatives, we definitely need to examine the reaction to debt relief with respect to control group countries and therefore find a valid counter-factual.

As exposed above, studies of Cassimon and Campenhout [2008] and Cassimon et al. [2015] have showed that debt relief might have positive fiscal impacts among benefiting countries, especially on tax ratio. But these analysis warn us against the fact that results obtained are only valid for reviewed countries and do not guarantee that debt relief policy leads to positive fiscal effects regardless the country we consider. We could indeed say that positive reactions of fiscal variables to debt relief flows might be due to other economic phenomenon that are shared by other and relatively similar developing countries which, however, did not benefit from the Enhanced HIPC initiative. For example, a non-HIPC country that was classified as low-income country at the end of the 1990s possibly experienced fiscal improvement during the early 2000s, when debt relief mainly occurred. Cassimon et al. [2015] account for this potential trend by including time fixed effects as exogenous block in their structural vector auto-regressive model, which finally do not influence their results.

However, some other facts that are not considered in their study might also potentially affect the external validity of their results. Though they control for potential unobservable country characteristics, the economic situation of the benefiting countries before debt relief could be considered as a potential explanation for the subsequent fiscal improvements. Indeed, HIPCs from the 1980s to the 1990s always had difficulty to meet their debt service obligations and as many other low-income countries, hardly controlled their fiscal deficit. In order to tackle these issues, the IMF and other multilateral institutions provided macro-stabilizing programs (which were not tied to debt relief in the first place, but became afterward) which aimed to improve and balance public finances. As a result, one could say that the positive reaction of HIPCs’ public finances to debt relief flows during the early 2000s might be due to efforts deployed by these countries under the early and mid-1990s PRGF rather than debt relief provided from 2000 onward. In order to outshine these doubts, it is therefore essential to find low-income countries which were similar to HIPCs in the early and mid-1990s but which did not benefit from debt relief under the HIPC initiative.

As previously explained, the Enhance HIPC initiative of 1999 came with strict eligibility criteria (low-income countries classification, IDA only, PRGF program, external public debt in NPV superior to 150% of exports). By consequent, proper control group should definitely be composed of countries that were satisfying these criteria (more or less strictly) alongside HIPCs but that finally did not benefit from the Enhanced HIPC initiative. Nevertheless, finding an adequate control group for HIPCs is not an easy task. Indeed, a poor country with a really high level of indebtedness has necessary been confronted to the HIPC program, and probably received a proposal from international institutions to benefit from it. So if some countries were satisfying eligibility criteria in the early 2000s, it is quite sure that these countries have benefited from the HIPC initiative or have turned down the IFIs proposal in order to take care of their indebtedness issues by themselves. By consequence, even if countries that received debt relief and countries that did not, have similar economic characteristics; given the discretionary feature of the Enhanced HIPC initiative and the inability to enforce countries to benefit from it, there will still exist some differences between treated and control groups that might explain, in a certain extent, why some have accepted to enter into the HIPC initiative and why some have not.

When defining the control group, an important point to be very cautious with is that HIPCs did not reach their decision point the same year. By consequent, following the approach of Chen et al. [2008] we define a control group specific to each HIPCs’ cohort relative to their decision point. In this event-study we therefore identify several control groups in order to estimate the impact of debt relief per se, but also in order to control for global and regional trends that might affect the reaction of the government’s tax effort to debt relief. We first consider,
for what we call the "narrow" control group, countries which, over the five years preceding the decision point (for each HIPCs’ cohort), have been classified by the World Bank as low-income countries at least over three years and experienced an average ratio of external public debt over exports superior to 170% in nominal values. It would have been better to use a threshold in net present value but long time series on such data are not available in international financial sources and computing them by ourselves would have exposed this criteria to debatable assumptions (such as the value of the discount rate). We therefore choose the threshold of 170% of debt-to-exports ratio in order to account for the degree of concessionality that contributes to reduce this ratio if we would have considered it in net present value.

Table 2 exposes figures for our "narrow" control groups associated to each HIPCs’ cohort and shows that in average the level of indebtedness in nominal value for our "narrow" control group is in average around 300% of the exports over the five years preceding the HIPCs’ decision point. Therefore, although not in net present value, our indebtedness threshold for control group eligibility is pretty good since even a concessionality rate of 50% on the external debt would lead to an average indebtedness ratio into our control group that satisfies the threshold required in order to benefit from the Enhanced HIPC.

Table 2: External PPG Debt Stock over Exports ratio - Average level over 5 years before Decision Point

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Control Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangladesh</td>
<td>282.76</td>
<td>255.60</td>
<td>241.14</td>
<td>235.95</td>
<td>214.42</td>
<td>202.59</td>
</tr>
<tr>
<td>Bhutan</td>
<td>119.56</td>
<td>136.30</td>
<td>166.47</td>
<td>200.81</td>
<td>233.57</td>
<td>230.59</td>
</tr>
<tr>
<td>Cambodia</td>
<td>191.86</td>
<td>178.18</td>
<td>155.55</td>
<td>142.13</td>
<td>104.82</td>
<td>94.69</td>
</tr>
<tr>
<td>Eritrea</td>
<td>173.36</td>
<td>249.57</td>
<td>340.82</td>
<td>514.53</td>
<td>789.52</td>
<td>872.66</td>
</tr>
<tr>
<td>Georgia</td>
<td>213.65</td>
<td>216.17</td>
<td>195.72</td>
<td>180.06</td>
<td>131.22</td>
<td>110.98</td>
</tr>
<tr>
<td>India</td>
<td>177.62</td>
<td>164.62</td>
<td>150.79</td>
<td>132.56</td>
<td>79.79</td>
<td>62.56</td>
</tr>
<tr>
<td>Kenya</td>
<td>188.35</td>
<td>181.60</td>
<td>177.69</td>
<td>176.20</td>
<td>152.35</td>
<td>137.75</td>
</tr>
<tr>
<td>Kyrgyz Republic</td>
<td>150.41</td>
<td>171.73</td>
<td>189.79</td>
<td>206.88</td>
<td>205.07</td>
<td>195.40</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>503.87</td>
<td>499.98</td>
<td>498.84</td>
<td>461.33</td>
<td>379.24</td>
<td>327.59</td>
</tr>
<tr>
<td>Lesotho</td>
<td>274.68</td>
<td>244.55</td>
<td>223.32</td>
<td>199.59</td>
<td>142.14</td>
<td>114.77</td>
</tr>
<tr>
<td>Nepal</td>
<td>222.50</td>
<td>219.90</td>
<td>227.97</td>
<td>250.28</td>
<td>257.11</td>
<td>265.08</td>
</tr>
<tr>
<td>Nigeria</td>
<td>201.47</td>
<td>254.33</td>
<td>260.04</td>
<td>257.75</td>
<td>230.23</td>
<td>213.30</td>
</tr>
<tr>
<td>Pakistan</td>
<td>251.72</td>
<td>254.33</td>
<td>260.04</td>
<td>257.75</td>
<td>230.23</td>
<td>213.30</td>
</tr>
<tr>
<td>Sudan</td>
<td>1177.49</td>
<td>1055.14</td>
<td>908.73</td>
<td>739.79</td>
<td>446.08</td>
<td>388.81</td>
</tr>
<tr>
<td>Vietnam</td>
<td>179.32</td>
<td>136.54</td>
<td>110.74</td>
<td>94.04</td>
<td>60.02</td>
<td>54.48</td>
</tr>
<tr>
<td>Yemen</td>
<td>266.46</td>
<td>189.69</td>
<td>166.60</td>
<td>161.95</td>
<td>103.46</td>
<td>97.09</td>
</tr>
</tbody>
</table>

Included in the relative cohort control group
Not included in the relative cohort control group

In a second time, we define as the "extended" control group, all countries that were ranked by the World Bank as low-income countries or lower-middle-income countries at least one time over the five years preceding the HIPCs decision point. This second control group, as in Chen et al. [2008], controls for a potential trend within the "developing world" that might influence the evolution of HIPCs’ willingness to tax and that could be fallaciously attributed to debt relief. Finally, considering the geographical composition of the HIPC sample, we also control for potential regional trend by considering a third control group of non-HIPC African countries, regardless to their indebtedness and income level during the five years preceding the decision point.

Therefore, model (1) now includes control groups what allows to make sure that the average pre- and post-debt relief difference is due to the debt relief program per se and not to a tendency that affects countries having the same economic features as the treatment group, or to a common trend within the "developing world" or the African continent. In order to add the counter-factual evolution, we then replace the dependent variable by its difference from the control group average. Basically the dependent variable $TE_{t,s}$ of model (1) can now take four

11Note that low-income countries that were receiving aid from the World Bank and/or the IMF were systematically under and ESAF or PRGF program.
12Cf. Table 16 in appendix.
13Cf. Table 16 in appendix.
14Which have also been at least once classified as low-income or lower-middle-income countries by the World Bank between 1993 and 2000.
different values:

\[
TE_{i,s} = \begin{pmatrix}
TE_{i,s} \\
TE_{i,s} - \bar{TE}_{i,s} \\
TE_{i,s} - \tilde{TE}_{i,s} \\
TE_{i,s} - \hat{TE}_{i,s}
\end{pmatrix}
\]  

(2)

Where \(TE_{i,s}\) is still the tax effort for HIPC \(i\) in debt relief-period \(s\), \(TE_{i,s}\) is the average tax effort of the "narrow" control group associated to HIPC country \(i\) in debt relief-period \(s\), \(TE_{i,s}\) denotes the average level of the "extended" control group associated to HIPC country \(i\) in debt relief-period \(s\), and \(TE_{i,s}\) denotes the average level of the "African" control group associated to HIPC country \(i\) in debt relief-period \(s\).

4 Estimating Developing Countries’ Tax Effort

Before running event-study models, we must first find relevant measure of the government’s willingness to tax in order to assess its reaction to the debt relief provision under the different Enhanced HIPC initiative’s stages.

4.1 What is Tax Effort and How can We Measure it?

How can we define the government’s willingness to tax? Many studies have attempted to estimate this intangible measure using collectable proxies or first-stage estimate procedure. For example, in their study estimating the impact of government’s fiscal capacity on institutions quality in a sample of Sub-Sahara African countries, Baskaran and Bigsten [2013] use several measures for the state’s fiscal capacity. They first explain that fiscal capacity can be proxied by the total amount of tax revenues, given that domestic resources of Sub-Saharan African countries substantially rely on non-tax revenues such as natural resources receipts coming from nationalized corporates that operate and trade these resources (Burgess and Stern [1993]). They then suggest to only use income taxes which, given the low rate of tax compliance in developing countries (Fjeldstad and Therkildsen [2008]), might be seen as a real effort from the government if it increases. Finally they document on the classic tax effort measure which is computed as the ratio of actual over potential tax revenues.

Following the definition of Gupta [2007], this latter measure of tax effort can be seen as the endeavors deployed by a government to collect what its economy actually offers. Indeed, domestic economic performances and abroad activities lead to shape the tax base from which government can collect taxes. The extend of this tax base actually depends on economic, social, demographic or even historical characteristics and therefore represents the potential tax revenues or the country’s “Tax Capacity” (Fenochietto and Pessino [2013]). But if there is a gap between what the government can levy and what it actually collects (the actual tax revenues) one can consider that this shortage in domestic revenues is mostly due to insufficient efforts from the government in collecting taxes, and so associate this to a weak desire for mobilizing domestic resources. By consequences, any tax effort ratio inferior to one means that the government does not meet its level of “Tax Capacity” and can be interpreted as low willingness to tax.

So even if tax effort ratio might be subject to measurement errors (Baskaran and Bigsten [2013]), it still represents the best proxy for the government willingness to tax since it denotes the variation in tax level which is not captured by taxes’ structural determinants. Moreover, looking at other potential proxies exposed above, it appears that the total amount of taxes is not the best fit for the government willingness to tax given that it includes international trade-related taxes which are quite easy to collect and are therefore not so much representative of the government’s fiscal effort. Finally, given the data availability about disaggregated taxes in developing countries, it is rather complicated to gather long and full time-series for our entire sample (both HIPCs and control group countries) on income taxes (although this paper reviews this method in section 5 using a newly released dataset), what therefore prevents us to use it as a proxy for the government’s fiscal effort.

4.2 Taxation’s Structural Determinants and Tax Effort Model

4.2.1 Literature Review

The construction of tax efforts for developing countries first requires to isolate structural determinants of tax ratios in this kind of countries. Since the 1970s, a large strand of the literature has worked on developing countries’ tax effort, thus identifying a wide range of taxation’s structural determinants that we are going to use in our following empirical specification.

Following seminal work of Lotz and Morss [1967] and Heller [1975], studies by Bahl [1971], Chelliah et al. [1975], Tait et al. [1979], and Leuthold [1991] have first emphasizes the role played by the level of development in taxation. The level of development, which is usually approximated by per capita GDP, is expected to be positively
related to tax ratio since it might be assimilated to the level of sophistication of the economy. Moreover, one argument frequently claimed to justify this expected relation is that according to the Wagner’s law, which defines the demand for public services as income-elastic, increase in income should lead to an increase in public services provision and so in public financing needs that could be satisfied through additional taxes.

Alongside the per capita GDP, existing studies show that the openness of an economy also represents one of the taxation’s key drivers. In a quite straightforward way, for countries where tax on international trade represented one of the principal sources of revenues since the early 1980s (Burgess and Stern [1993], Agbeyegbe et al. [2006]) because of easy collecting process, more intense trade were generally associated with additional customs duties and taxes on exports. However the relationship between trade and taxation has been challenged as international financial institutions have promoted trade openness over the past decades through the Washington consensus. But although widely investigated, the impact of trade liberalization on tax revenues still remains ambiguous. Trade liberalization can indeed negatively impact tax revenues since most of developing countries heavily rely on import taxes (Khattry and Rao [2002]). But on the other side, if the initial tax rate on imports was so high that it was acting as a disincentive for foreign exporters, a reduction in tax rate might lead to larger volumes of imports and therefore offset the loss induced by the reduction in tariffs. Finally another argument would be that countries which experience trade liberalization and see their primary sources of revenues drying up, look for other sources of revenues and increase their efficiency in collecting taxes on domestic goods and services (Khattry and Rao [2002], Baunsgaard and Keen [2010]).

Next to these two variables, the economy’s composition is also systematically defined as one of the main taxation keystones. Some sectors are indeed easier to tax than others. For example, a dominating agricultural sector, in view of its high degree of informality and the difficulty to identify tax payers, is likely to be negatively associated with tax revenues whereas large industry and mining sectors, which are often both composed of big corporates easy to target, are likely to provide substantial revenues (Gupta [2007]). More importantly, the share of natural resources in the economy has large implications on tax revenues. Indeed, windfalls from natural resources can act as a disincentive for government to tax the rest of its economy and have indeed been shown to be negatively associated with other domestic tax revenues (Bornhorst et al. [2009], Thomas and Treviño [2013], Crivelli and Gupta [2014]).

In a lesser extent, demographic factors have also been recognized as tax’s determinants in developing countries. First investigated by Bolnick [1978], the role of demographic variables such as population size, population density, urbanization rate, or dependency ratio in developing countries' tax level have led subsequent authors to include the demographic dimension in their tax effort estimates. Large population provides large tax base that can favor income taxes Khattry and Rao [2002]. But as underlined by Bolnick [1978], large population can also be detrimental for tax collection if people are spread over the country and therefore make taxes harder to collect. That is why, in some studies, population density is often positively associated to tax revenues (Mahdavi [2008], Mkandawire [2010]). Urbanization rate has however an undetermined effect on taxation. High urbanization rate might lead to more concentrated population which would ease tax collection. But, largely urbanized population might also favor informality what provides more opportunities to escape the tax system. Urbanization rate has nevertheless been found positively associated to tax revenues in most of the studies that include it as tax determinants (Khattry and Rao [2002], Mahdavi [2008] (especially on tax on goods and services) and Thomas and Treviño [2013]). Finally, on the demographic variables side, the dependency ratio is also often included in tax effort equations since it can be viewed as a proxy for demand in public services. Indeed, according to Mahdavi [2008], dependency ratio should increase social security contributions, property taxes (since old people are more likely to own taxable assets relative to young workers). However, the impact of the dependency ratio is not totally obvious since graying population also reduces the percentage of active people subject to income tax what can therefore offset the positive effect induced by the demand for public goods and services.

On the political side, institutional variables can also have large impact on taxation. Corruption in its larger extent has many times been defined as the biggest impediment to efficient and inclusive tax system (Kaldor [1962]). In developing countries, corruption and institutional failures contribute to tax evasion, tax exemptions, and other rent-seeking behaviors that in fine leads to maintain domestic resource mobilization at gripping low levels (Tanzi and Davoodi [1998]). From an empirical point of view, each time this assumption has been tested, it has revealed that indeed, prevalence of corruption, weak rule of law, fragile political democratization, and low level of voice accountability were negatively associated with tax revenues (Ghura [1998], Tanzi and Davoodi [1998], Teera and Hudson [2004], Gupta [2007], Mahdavi [2008], Bird et al. [2008], Bornhorst et al. [2009], Thomas and Treviño [2013]).

Finally, some studies interestingly show that other factors might also deserve to be considered as determinants of taxation in developing countries such as the colonial legacy (especially for African countries, see Mkandawire [2010]), the exchange rate adjustment (Adam et al. [2001], Agbeyegbe et al. [2006], Ghura [1998]), and the inflation rate (Ghura [1998], Tanzi and Zee [2000]).
4.2.2 Empirical Specification

According to this literature, we therefore design our tax effort model using all these contributions on taxation determinants in developing countries. But since we want to observe the reaction of the residuals from this first stage estimate to debt relief provision, we decide to not include as tax structural determinants, factors that are theoretically at play in this relation, such as the stock of debt and the institutional quality. By consequent our final model of tax effort for the whole sample of 117 developing countries which includes HIPC’s and countries present in our three control groups, can be represented as follow:

\[
Tax_{i,t} = \alpha + \mu_i + \gamma_t + \beta X_{i,t} + \phi Z_{i,t} + \epsilon_{i,t}
\]

(3)

Where \( Tax_{i,t} \) represents the government’s tax revenues in percentage of GDP, net from natural resources receipts, grants and other non-tax revenues for country \( i \) in time \( t \). \( X_{i,t} \) is a vector of economic structural determinants of taxation for country \( i \) in period \( t \) that includes the logarithm of per capita GDP in 2005 constant $USD, the trade openness of the economy computed as exports plus imports over GDP, the agriculture value-added in percentage of GDP as well as the share of the total natural resources rent into the GDP. \( Z_{i,t} \) denotes then a vector of demographic variables that comprises the total population size (in logarithm), the age dependency ratio and the urbanization rate (in percentage of the total population), also for country \( i \) in time \( t \). Finally \( \alpha_i \) and \( \gamma_t \) represents respectively n-1 country and t-1 time fixed effects, and \( \epsilon_{i,t} \) denotes the classic error term. Basic descriptive statistics and data sources for these variables are exposed in Table 17 in appendix.

Most of studies estimate tax effort using classic LSDV estimators (OLS with country fixed effects) as exposed in our specification. However, as underlined by Gupta [2007] and Mkandawire [2010], tax revenues are subject to heteroskedasticity and serial auto-correlation issues. Looking at the evolution of tax revenues for some countries of our sample shows indeed that tax revenues seem to be highly persistent over time (Cf. Figure 2 in appendix). This persistence of tax revenues is not unexpected since the volatility of domestic revenues in developing countries is often associated to fluctuations in natural resources receipts due to exogenous shocks on international commodities prices. But since we net out our variable of tax revenues from natural resources receipts we logically suspect the tax revenues variable to be serially auto-correlated. This intuition is reinforced by the Wooldridge test\(^\text{15}\) that confirms tax revenues series is affected by serial auto-correlation. Therefore, as in Gupta [2007] and Mkandawire [2010], we estimate equation (3) using the Prais-Winsten estimators (or the Panel Corrected Standard Error (PCSE) methodology) which account for both serial auto-correlation and heteroskedasticity.

Furthermore, according to this observed continuity in tax revenues, one would also test a dynamic specification where the lagged dependent variable is included in the equation as determinant of the contemporaneous tax revenues value. Modeling such relationship leads us to estimate the following model:

\[
Tax_{i,t} = \alpha + \mu_i + \gamma_t + \lambda Tax_{i,t-1} + \beta X_{i,t} + \phi Z_{i,t} + \epsilon_{i,t}
\]

(4)

Using such specification with panel data necessarily requires to instrument the lagged dependent variable included as explanatory variable. Such estimation usually resorts to GMM-class estimators of Arellano and Bond [1991] and Arellano and Bover [1995] which in addition provide adequate treatment for heteroskedasticity and serial auto-correlation issues. Moreover, looking at the model (3) and (4), one could hardly ignore the potential reverse causality between economic structural determinants and tax revenues. Indeed, a government that wants to quickly raise its domestic revenues might suddenly decide to increase tariffs on imports. Such discretionary policy is likely to negatively impact the volume of imported products and therefore to reduces the openness rate. The same can be true with agriculture if the government also decides unilaterally to increase taxes on agricultural products. Such policies could significantly harm the agriculture sector and hence reduce its share in the total value-added.

Finally, if a low-income country’s government decides to not take care of its atrophied or embryonic tax system because it chose to provide low level of public services, it basically prevents the country to reach higher level of development and therefore of per capita GDP. However, as one can see, the reverse causality between tax revenues and economic structural determinants entirely depends on government’s willingness to raise or not its tax ratio. But since reverse causality goes through the equation error term that includes omitted variables, removing this reverse causality would necessary “wash” the residuals from the factor that drives this endogeneity and which in this case is the government’s tax effort. By consequent, model that tries to control for potential endogeneity such as PCSE or fixed effects models with lagged values of endogenous variables will be just presented for robustness purposes only.

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\(^{15}\)Not reported by save of space.
4.3 Results for the Whole Sample and Graphic Analysis

4.3.1 Tax Determinants in Developing Countries between 1993 and 2012

We therefore run model (3) on our panel of 117 developing countries over 1993 to 2012 using PCSE\footnote{With panel specific correlation coefficients} and OLS estimators both with country and time fixed effects. We then also estimate model (4) using two-step System-GMM estimators with the Windmeijer correction for standard errors. Table 3 exposes the results.

We can see that results are in line with findings of the existing literature. The per capita GDP (in log) is positively associated with tax revenues and the magnitude of its coefficient is really close from what we observe in Gupta [2007] or Mkandawire [2010] which respectively find a coefficient for per capita GDP (in log) that ranges between [3.521; 4.425] and [2.948; 5.339] (keeping in mind that Mkandawire [2010] runs tax effort models for continental Sub-Saharan Africa only). The openness trade also seems to play positively on tax revenues. However its impact is quite smaller than what previous studies found. Indeed Ghura [1998], Khattry and Rao [2002], Teera and Hudson [2004], Mkandawire [2010] and Thomas and Treviño [2013] all find a contribution of trade openness (that sometimes is decomposed between exports and imports share) that is higher than 0.1, whereas studies of Agbeyegbe et al. [2006], Gupta [2007], Mahdavi [2008] and Baunsgaard and Keen [2010] show coefficients that are more in line with ours and range from 0.001 to 0.07. As regards the contribution of the different economic sectors such as agriculture, our results expose expected negative coefficients which are really close from those found in Mkandawire [2010] [-0.08; -0.1]. Though we also expected to find a negative contribution of the natural resources rent share on tax revenues, the table does not expose significant results. However, running models with tax receipts from natural resources instead of the natural resources rent share\footnote{Cf. Table 18 in appendix.} leads to find a kind of crowding-out effect from these resources that confirms findings by Bornhorst et al. [2009], Thomas and Treviño [2013] and Crivelli and Gupta [2014]. Looking at the demographic variables, we do not find strong evidences of contribution from the population density or the urban population. We do find some significant results for the dependency ratio but the direction of the correlation is not really clear. Finally, looking at the GMM specification where in addition of the lagged dependent variable, the agriculture share and the openness rate\footnote{We do not instrument the per capita GDP since it would lead to a number of instruments superior to the number of countries, hence violating the rule of thumb for instrument number (Roodman [2009]). Moreover, we prefer to instrument the agriculture share rather than the per capita GDP, since the estimate gives coefficients for the lagged dependent variable that are comprised in the bracket defined by fixed effect-downward estimates and OLS-upward estimates.} have been instrumented with their one and second-period lagged values, we find that tax revenues is strongly correlated with its lagged value confirming that a certain persistence is at play.

As previously explained, over these six estimates, we define estimate (I) as our preferred one since it controls for both heteroskedasticity, serial auto-correlation and does not account for potential endogeneity which, as also previously exposed, would contribute to partially erase the government’s willingness to tax from the residuals. Moreover, dynamic estimates attribute a really large explanatory power to the lagged dependent variable, what does not really reflect the structural composition of tax revenues. By consequence, using estimate (I), we can now compute tax effort for each country and for each period since our panel is almost perfectly balanced and has really few missing values. The computation of the tax effort index is really simple and follows what has been done in the tax effort literature. We just divide the actual tax ratio of a country and period by the predicted value of the tax ratio which comes from our tax effort equation (the estimate (I) for example). The tax effort ratio can hence be written as:

\[
TE_{i,t} = \frac{Tax_{i,t}}{\hat{Tax}_{i,t}} = \frac{\alpha + \mu_i + \gamma_t + \beta X_{i,t} + \phi Z_{i,t} + \epsilon_{i,t}}{\hat{\alpha} + \hat{\mu}_i + \hat{\gamma}_t + \hat{\beta} X_{i,t} + \hat{\phi} Z_{i,t}} = 1 + \frac{\epsilon_{i,t}}{\hat{\alpha} + \hat{\mu}_i + \hat{\gamma}_t + \hat{\beta} X_{i,t} + \hat{\phi} Z_{i,t}}
\]

\[\text{(5)}\]

Tax effort indexes obtained from other specifications would be then used to test the robustness of the relationship between debt relief and tax effort. But looking at the pairwise correlation matrix in appendix (Cf. Table 20), one can see that tax effort estimates are quite similar regardless the PCSE or the fixed effect estimators. There is nevertheless a larger difference with System GMM estimates that reflects the complete treatment of the reverse causality in the residuals and the large contribution of the lagged dependent variable in the model.

4.3.2 Tax Effort Evolution and Graphic Analysis

Using these tax effort estimates, it is now possible to evaluate the impact of having reach a ”debt relief point” on the government’s willingness to tax. However, before running these models, graphical analysis of Figure 3 and 4, which respectively represents the evolution of tax revenues (in % of GDP) and of tax effort around different debt relief points, can first give intuitions about the debt relief effects. In Figure 3, Graph (a) denotes the average evolution of the tax ratio for 22 HIPCs that have all reached their decision point in 2000 (and therefore entered into the Enhanced HIPC initiative the same year). One can clearly see that the difference in tax share between
Table 3: Tax Effort Model for 117 Developing Countries

<table>
<thead>
<tr>
<th>Dep. Var: Tax revenues</th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
<th>(VI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimators</td>
<td>PCSE</td>
<td>PCSE.L</td>
<td>LSDV</td>
<td>LSDV.L</td>
<td>SGMM</td>
<td>SGMM</td>
</tr>
<tr>
<td>Tax revenues&lt;sub&gt;t−1&lt;/sub&gt;</td>
<td>0.795***</td>
<td>0.776***</td>
<td>0.436</td>
<td>-0.204</td>
<td>(15.53)</td>
<td>(13.51)</td>
</tr>
<tr>
<td>Log GDP pc&lt;sub&gt;t−1&lt;/sub&gt;</td>
<td>2.737***</td>
<td>3.584***</td>
<td>0.436</td>
<td>-0.204</td>
<td>(3.287)</td>
<td>(5.374)</td>
</tr>
<tr>
<td>Openness rate&lt;sub&gt;t−1&lt;/sub&gt;</td>
<td>0.024***</td>
<td>0.035***</td>
<td>0.022</td>
<td>0.0148</td>
<td>(2.577)</td>
<td>(3.356)</td>
</tr>
<tr>
<td>Agriculture share&lt;sub&gt;t−1&lt;/sub&gt;</td>
<td>-0.067***</td>
<td>-0.066***</td>
<td>-0.084***</td>
<td>-0.094***</td>
<td>(2.577)</td>
<td>(3.356)</td>
</tr>
<tr>
<td>Resources share&lt;sub&gt;t−1&lt;/sub&gt;</td>
<td>0.007</td>
<td>0.004</td>
<td>0.005</td>
<td>0.008</td>
<td>(0.611)</td>
<td>(0.321)</td>
</tr>
<tr>
<td>Log Pop. density&lt;sub&gt;t−1&lt;/sub&gt;</td>
<td>-0.657</td>
<td>2.311</td>
<td>0.013</td>
<td>-0.013</td>
<td>(-0.578)</td>
<td>(1.235)</td>
</tr>
<tr>
<td>Age dependency&lt;sub&gt;t−1&lt;/sub&gt;</td>
<td>-0.050***</td>
<td>0.001</td>
<td>0.039***</td>
<td>0.026*</td>
<td>(-2.634)</td>
<td>(0.604)</td>
</tr>
<tr>
<td>Urban population&lt;sub&gt;t−1&lt;/sub&gt;</td>
<td>0.052</td>
<td>0.025</td>
<td>0.017</td>
<td>0.020</td>
<td>(1.140)</td>
<td>(0.448)</td>
</tr>
<tr>
<td>Constant omitted</td>
<td>omitted</td>
<td>omitted</td>
<td>-17.80***</td>
<td>-13.34**</td>
<td>(-3.632)</td>
<td>(-2.566)</td>
</tr>
</tbody>
</table>

| Country fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Time fixed effects    | Yes | Yes | No | No | No | No |
| Observations          | 2,058 | 1,961 | 2,058 | 1,961 | 1,972 | 1,953 |
| R-squared             | 0.943 | 0.947 | 0.943 | 0.947 | 0.943 | 0.947 |
| Number of country     | 113 | 113 | 113 | 113 | 114 | 113 |
| F-Statistic (p.value) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Number of instrument  | . | . | . | . | . | . |
| AR(1) Stat (p.value)  | 107 | 107 | 107 | 107 | 107 | 107 |
| AR(2) Stat (p.value)  | 0.179 | 0.183 | 0.179 | 0.183 | 0.179 | 0.183 |
| Hansen Stat (p.value) | 0.329 | 0.238 | 0.329 | 0.238 | 0.329 | 0.238 |

Columns (I) and (II) are estimated using PSCE estimators with panel specific correlation coefficients and with country and time fixed effects. Their related robust z-statistics are exposed in parentheses. Columns (III) and (IV) are estimated using OLS estimators with country fixed effects only. Inclusion of time fixed effects is indeed rejected with a joint p-value superior to 0.3 in both equations. Their related robust t-statistics are exposed in parentheses. Note that using WITHIN estimators leads to the same results and clustering the standard errors at the country level leads to non-significant coefficients for the age dependency ratio only. Finally Columns (V) and (VI) are estimated using two-step system GMM estimators. The lagged dependent variable as well as the openness rate and the agriculture share are in GMM style (instrumented with two lags). According to Roodman [2009] only the Hansen statistics is reported and in both equations, the statistics cannot reject the null hypothesis that instruments are valid. Robust and corrected standard errors (Windmeijer s.e. correction) are exposed in parentheses. ***p ≤ 0.01, **p ≤ 0.05, *p ≤ 0.1.

the post- and pre-decision point is positive, what leads to confirm findings of Cassimon et al. [2015]. However, if we now look for external validity and observe the average tax share’s evolution for the "narrow" control group (graph (b)), it appears that the difference between the pre- and the post-decision point (or between the pre- and post-2000 year) is also positive. The same is true for the "extended" control group and the "African"
control group, though less obvious for the latter. Turning to graphs (c) and (d) that now pool different HIPCs’
cohorts according to the event-year\textsuperscript{19}, confirms that although the post-debt relief period seems to be associated
with higher tax ratios, this increase is probably due to the tendency among low-income countries to increase
domestic resource mobilization.

Nevertheless, looking closely to these graphs, we can isolate certain fluctuations in tax share which seem to
be observed only for HIPCs. Focusing on the decision point, we can notice an acceleration in tax ratio for HIPCs
countries over the 4-5 years before they reach their decision point. This improvement in tax ratio is moreover not
shared by the "narrow" control group as well as by the two other control groups that are more on a downward
path as we approach the decision point. This increase might therefore reflects the adjustment effort of potentially
eligible countries in prospect of debt relief under the Enhanced HIPC initiative.

But as we previously explained, increase in tax revenues does not reflect the real effort deployed by the gov-
ernment to raise its domestic resources. The increase in tax ratios is indeed likely to be induced by several factors
such as an increase in imports because of the domestic demand, the broadening of the domestic tax base, or even
an unexpected and sharp fall in gross domestic product (since tax ratio is expressed in percentage of GDP). By
consequence, we next turn to Figure 4 which provides visual examination of the government’s willingness to tax
evolution around different debt relief points. Looking at graph (a), (b), (d), (e) and (f), we clearly see that the
closer the HIPCs are getting to the decision point, the higher their deployed tax effort is.

More in particular, there seems to be a common trend\textsuperscript{20} for the HIPCs group and the "narrow" control group
over the years running from -10 to -5/-4, and then a sharp acceleration of HIPCs to reach the decision point, that
is not shared by other control groups. As previously explained, the first HIPC initiative has been launched in
1996, and even if the Enhanced HIPC initiative of 1999 differs in terms of indebtedness threshold and debt relief
delivery speed, conditions on structural reforms were already part of requirements to benefit from the original
HIPC initiative. So one can see that the increase for HIPCs, which accelerates 4 years before the decision point
(2000 if we look at graph (a)), coincides with the year of the first HIPC initiative’s launch (1996). By consequence,
this sharp improvement in tax effort recorded from -4 to 0 could reflect the willingness of potential eligible gov-
ernment to get debt relief under the Enhanced HIPC and therefore the desire of fulfilling the required eligibility
criteria such as structural reforms’ implementation. Under this assumption, where debt relief can be assimilated
to a carrot for the government that has no choice except implementing structural reforms to get debt forgive-
ness, one can reasonably think that the signal effect of the HIPC initiative of 1996 has contributed to increase
tax effort in poor and highly indebted low-income countries over the years preceding the Enhanced HIPC initiative.

Nevertheless, according to the same graphs, HIPCs also seem to loosen their effort once they have reached the
decision point, reflecting hence potential moral hazard effects. The level of tax effort for HIPCs in the post-decision
point period indeed seems to be, in average, lower than the level reached the year just before the country enter into
the Enhanced HIPC initiative, what could be taken for show-off from the government in order to be graduated
of debt relief. If we take a look at the evolution of tax effort in graph (d) we also observe this decrease after the
HIPC process and even a quite worrying fall at the end of the period.

\textsuperscript{19}The average tax share for control group is computed over the different control groups’ average value with respect to
their associated HIPCs’ cohort (cf. Table 2).

\textsuperscript{20}Test for differences in trend between HIPCs and the "narrow" control group are exposed in Table 19 in appendix.
5 Debt Relief Impacts on Government’s Tax Effort

5.1 Benchmark Results

Table 4 exposes results of model (1)\(^{21}\) where estimates have been obtained using Bootstrap procedure which is based on intensive re-sampling and hence provides reliable estimates given the feature of our dependent variable. Since tax effort is obtained through first-stage estimate, the risk of measurement errors is non-negligible and can therefore be reduced using this re-sampling methodology. Note that tax effort estimates used in the results reported in Table 4 are obtained using our first-stage preferred estimators; the Panel Corrected Standard Errors (PCSE) estimators.

Looking at results in columns (I) to (IV) for our sample of 29 HIPCs over the [-6; +6] debt relief calendar and for our sample of 26 HIPCs over the expanded debt relief calendar [-10; +10], we observe that there is an average positive impact of having reached the decision point on government willingness to tax, supporting thus the debt overhang theory’s predictions as well as our ”graphical intuitions”. Moreover, if in absolute value the impact of having reached the decision point is positive, the ”real” impact of the program as compare the ”narrow” control group is even higher given the negative difference recorded by the counter-factual between the pre- and post-decision point period. According to those results, we can say that, in average, having reached the decision point leads to levy 10% more of the country tax base or ”Tax Capacity”, as compare to the situation where country would not benefit from debt relief under the decision point of the Enhanced HIPC initiative. Table 4 also shows that this higher level of tax effort after the decision point is not due to global or even regional trends, since coefficients for comparison with both the ”extended” and the ”African” control groups are positive and statistically significant.

Columns (V) to (VIII) in Table 4 then show results for the tax effort reaction to completion point and the whole HIPC process. As expected looking at graphs in Figure (2), having reached the completion point seems to reduced the willingness to tax in HIPCs. Results in column (V) include over-estimated coefficients for Niger which explains why coefficients for the post-completion point are not statistically significant. However if we look at results in column (VI) relatively to the ”narrow” control group, the impact of having reached the completion point seems to be a little bit less robust. But one could expect to observe such effect in HIPC countries since the completion point marks the end of the Enhanced HIPC process and therefore the end of the conditionality linked to debt relief provision. Now the country has received debt forgiveness and is not under the IMF and World Bank ”supervision” anymore, it could basically decide to loosen domestic resource mobilization and look for new financing sources abroad, reinforcing moral hazard suspicions. Nevertheless, looking at coefficients relative to the ”African” control group, one can think that the decrease in government willingness to tax follows a regional trend and is not wholly due to the end of the Enhanced HIPC program.

By consequent, according to Table 4, we can reasonably think that HIPCs develop higher tax effort after the decision point but that this effort is gradually reducing. So, although the level of tax effort during the interim period is larger than the one prior the decision point, the gradual reduction during this period associated with the slight drop observed after the completion point, finally leads to an average level over the period after the HIPC process, that is equal to the one recorded before as exposed by column (VIII).

\(^{21}\)Using absolute and relative values of the dependent variable in order to account for the counter-factual evolution, as exposed in equation (2).
Table 4: Tax Effort - Reaction to the Decision-Point - Bootstrap Estimates

<table>
<thead>
<tr>
<th>Debt Relief Point:</th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
<th>(VI)</th>
<th>(VII)</th>
<th>(VIII)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.P. [-6; +6]</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
</tr>
<tr>
<td>D.P. [-10; +10]</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
</tr>
<tr>
<td>C.P. [-6; +6]</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
</tr>
<tr>
<td>HIPC P. [-6; +6]</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
</tr>
</tbody>
</table>

**Absolute variation**

<table>
<thead>
<tr>
<th>Post-Debt Relief Point</th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
<th>(VI)</th>
<th>(VII)</th>
<th>(VIII)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.P. [-6; +6]</td>
<td>0.068***</td>
<td>0.050***</td>
<td>0.099***</td>
<td>0.064***</td>
<td>-0.027</td>
<td>-0.054***</td>
<td>0.056**</td>
<td>0.008</td>
</tr>
<tr>
<td>C.P. [-6; +6]</td>
<td>0.099***</td>
<td>0.115***</td>
<td>0.150***</td>
<td>0.115***</td>
<td>-0.004</td>
<td>-0.032*</td>
<td>0.074**</td>
<td>0.025</td>
</tr>
<tr>
<td>HIPC P. [-6; +6]</td>
<td>(8.053)</td>
<td>(6.602)</td>
<td>(2.282)</td>
<td>(1.279)</td>
<td>(-1.728)</td>
<td>(-0.233)</td>
<td>(2.151)</td>
<td>(1.505)</td>
</tr>
</tbody>
</table>

**Narrow Control Group**

<table>
<thead>
<tr>
<th>Post-Debt Relief Point</th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
<th>(VI)</th>
<th>(VII)</th>
<th>(VIII)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.P. [-6; +6]</td>
<td>0.118***</td>
<td>0.099***</td>
<td>0.150***</td>
<td>0.115***</td>
<td>-0.004</td>
<td>-0.032*</td>
<td>0.074**</td>
<td>0.025</td>
</tr>
<tr>
<td>D.P. [-10; +10]</td>
<td>(7.708)</td>
<td>(5.391)</td>
<td>(8.053)</td>
<td>(6.602)</td>
<td>(-1.233)</td>
<td>(-0.728)</td>
<td>(2.282)</td>
<td>(1.279)</td>
</tr>
<tr>
<td>C.P. [-6; +6]</td>
<td>0.150***</td>
<td>0.115***</td>
<td>0.150***</td>
<td>0.115***</td>
<td>-0.004</td>
<td>-0.032*</td>
<td>0.074**</td>
<td>0.025</td>
</tr>
<tr>
<td>HIPC P. [-6; +6]</td>
<td>(6.536)</td>
<td>(4.111)</td>
<td>(2.282)</td>
<td>(1.279)</td>
<td>(-1.728)</td>
<td>(-0.233)</td>
<td>(2.151)</td>
<td>(1.505)</td>
</tr>
</tbody>
</table>

**Extended Control Group**

<table>
<thead>
<tr>
<th>Post-Debt Relief Point</th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
<th>(VI)</th>
<th>(VII)</th>
<th>(VIII)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.P. [-6; +6]</td>
<td>0.081***</td>
<td>0.063***</td>
<td>0.120***</td>
<td>0.085***</td>
<td>-0.010</td>
<td>-0.038**</td>
<td>0.076**</td>
<td>0.027</td>
</tr>
<tr>
<td>D.P. [-10; +10]</td>
<td>(3.817)</td>
<td>(3.604)</td>
<td>(6.536)</td>
<td>(4.111)</td>
<td>(-0.483)</td>
<td>(-2.151)</td>
<td>(3.053)</td>
<td>(1.505)</td>
</tr>
<tr>
<td>C.P. [-6; +6]</td>
<td>0.120***</td>
<td>0.085***</td>
<td>0.120***</td>
<td>0.085***</td>
<td>-0.010</td>
<td>-0.038**</td>
<td>0.076**</td>
<td>0.027</td>
</tr>
<tr>
<td>HIPC P. [-6; +6]</td>
<td>(6.168)</td>
<td>(4.411)</td>
<td>(6.168)</td>
<td>(4.411)</td>
<td>(-1.037)</td>
<td>(-0.483)</td>
<td>(3.053)</td>
<td>(1.505)</td>
</tr>
</tbody>
</table>

**African Control Group**

<table>
<thead>
<tr>
<th>Post-Debt Relief Point</th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
<th>(VI)</th>
<th>(VII)</th>
<th>(VIII)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.P. [-6; +6]</td>
<td>0.109***</td>
<td>0.090***</td>
<td>0.138***</td>
<td>0.103***</td>
<td>0.0099</td>
<td>-0.018</td>
<td>0.117***</td>
<td>0.068***</td>
</tr>
<tr>
<td>C.P. [-6; +6]</td>
<td>0.138***</td>
<td>0.103***</td>
<td>0.138***</td>
<td>0.103***</td>
<td>0.0099</td>
<td>-0.018</td>
<td>0.117***</td>
<td>0.068***</td>
</tr>
<tr>
<td>HIPC P. [-6; +6]</td>
<td>(5.618)</td>
<td>(5.465)</td>
<td>(5.618)</td>
<td>(5.465)</td>
<td>(0.569)</td>
<td>(-1.307)</td>
<td>(4.456)</td>
<td>(3.368)</td>
</tr>
</tbody>
</table>

| F-Statistics (p-value) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

| Country Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Outliers (Niger)      | Yes | No  | Yes | No  | Yes | No  | Yes | No  |
| Observations          | 362 | 349 | 507 | 486 | 266 | 253 | 245 | 233 |
| HIPC Countries        | 29  | 28  | 26  | 25  | 21  | 20  | 21  | 20  |

All equations are estimated using the bootstrap procedure applied with the option vce(bootstrap) under STATA 13. Equations (I) and (II) expose results for a sample of 29 HIPCs that have reached their decision point no later than 2006. The debt relief calendar for this sample therefore runs from -6 to +6. Equations (III) to (IV) expose results for a sample of 26 HIPCs that have reached their decision point no later than 2002 which allows to have a longer insight on the tax effort’s reaction to debt relief provided under the decision point. The relative debt relief calendar runs indeed from -10 to +10. Equations (V) to (VIII) expose results for a sample of 21 HIPCs that have reached their completion point no later than 2006. The debt relief calendar for this sample therefore runs from -6 to +6. Finally some estimates intentionally omit tax effort figures for Niger which when estimated with PCSE estimators are over-estimated (gives tax effort indexes above 2 for the 2000s). Note that running these models without country fixed effects leads to identical results. Robust z-statistics are exposed in parentheses **p ≤ 0.01, *p ≤ 0.05, p ≤ 0.1.
5.2 Validity of Benchmark Estimators and Control Groups

5.2.1 Event-Study versus Difference-in-Differences

In a way, the model (1) we estimate is quite close to the difference-in-differences approach. However, even if this model allows to test the variation before and after, relatively to a given control group, the specification does not lead to an exact difference-in-differences estimate. If the difference-in-differences model was correctly specified, we should be able to compare HIPCs that have reached their decision point with HIPCs that did not reach their decision point yet. In order to do that, one must exit from the debt relief-calendar previously defined and test the following model:

\[ TE_{i,t} = \alpha + \delta \text{HIPC}_i + \phi \text{Post}_{i,t} + \beta \text{HIPC}_i \ast \text{Post}_{i,t} + \epsilon_{i,t} \]

Where \( t \) is now the year expressed in regular time-calendar (not in debt relief-calendar), \( \text{HIPC}_i \) is a dummy variable that takes 1 if the country \( i \) is an HIPCs and 0 otherwise. \( \text{Post}_{i,t} \) is a dummy variable that takes 1 for the year the HIPC \( i \) reaches its decision point and for all the subsequent years (the dummy is thus equal to 0 in all years prior the decision point), and \( \text{HIPC}_i \ast \text{Post}_{i,t} \) is an interaction term that takes only 1 for the HIPC \( i \) that, in \( t \), are in its post-decision point period. Such methodology leads to proper difference-in-differences estimates (Angrist and Pischke [2008]), and in addition allows to "inflate" the number of countries in the control group which now represents a counter-factual even closer from the treated group since some control group countries will become eligible for the Enhanced HIPC initiative one, two, three, or five years after first HIPCs had reached their decision point. However, one problem remains: what is the \( \text{Post} \) period for control group countries which do not benefit from the Enhanced HIPC initiative at all? Given that these countries did not reach any debt relief-point and that countries which did, did it at different dates, it is impossible to define a specific post-debt relief period for non-HIPC control group countries. Therefore we use another widely-used specification of this model which replaces the HIPC dummy by country fixed effects, and the \( \text{Post} \) variable by time fixed effects. This model is therefore expressed as:

\[ TE_{i,t} = \alpha + \nu_i + \delta_t + \beta \text{HIPC}_i \ast \text{Post}_{i,t} + \epsilon_{i,t} \]

(7)

Where \( \nu_i \) and \( \delta_t \) denote respectively the n-1 country and t-1 time fixed effects. Nevertheless this model is not suitable for the study of every "debt relief point". Though appropriate for the review of the decision point and the whole interim period effects, equation (7) cannot be used for the study of the completion point’s impact. Indeed, if one defines the \( \text{Post}_{i,t} \) variable as a dummy taking 1 for the year the HIPC \( i \) reaches its completion point and for all the subsequent years, some HIPCs that have reached their decision point but not their completion point yet will be included in the control group. Therefore, the control group will include countries that have benefited from debt relief between the decision and the completion point and that are by consequent defined as treated. Moreover, running model (7) with the extended and the African control groups to control for global and regional trend would also lead to include some HIPCs in these control groups what would therefore prevent to accurately test the role played by these potential trends.

Equation (7) is therefore only estimated for the decision point, both on the HIPCs sample that have entered the initiative no later than 2006, and on the one where HIPCs have reached their decision point no later than 2002 (in order to have a longer post-decision point period). We also estimate this model for the whole HIPC process. Table 5 hence displays coefficients of interest (\( \beta \) in equation (7) i.e. coefficients associated to the interaction term \( \text{HIPC}_i \ast \text{Post}_{i,t} \)), so respectively for tax effort reaction to the decision point and to the interim period.

Looking at this table, we can see that the positive impact following the achievement of the decision point and relative to the "narrow" control group is robust regardless the empirical specification we favor. So considering diff-in-diff estimates that use tax effort measure obtain with PCSE, leads to find an effect of having reached the decision point which is also statistically significant, though a little bit lower than the one found with the event-study methodology. However, coefficients remain quite close from the latter ones and now range between 7.8 and 9.6% of additional share of the tax capacity collected relatively to the narrow control group, giving hence additional support to results already obtained. Results are also robust to potential global or regional trends, since the difference between the "extended" and the "African" control groups is also positive and statistically significant. Here again, although slightly lower (for the "extended" control group only), coefficients are in line with those previously found. Moreover, one might think that our estimates under this specification are more accurate since the number of observations increases considerably. Indeed, since we do not define an observation as the difference in value between the HIPC and the average of its related control group, the number of observations is now significantly larger, what provides even more reliable estimates.

Furthermore, according to Table 5, one can also note that, as for estimates with the event-study procedure, the HIPC process taken as a whole does not seem to have any impact on the government’s willingness to tax. Coefficients are only statistically significant when we compare HIPCs to the "extended" and the "African" control
### Table 5: Tax Effort - DiD Coefficients - Bootstrap Estimates

<table>
<thead>
<tr>
<th>Debt Relief Point</th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narrow Control Group</td>
<td>D.P. PCSE</td>
<td>D.P. Ext. PCSE</td>
<td>HIPC P. PCSE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIPC*Post-Debt Relief Point</td>
<td>0.103*** (3.411)</td>
<td>0.078*** (2.627)</td>
<td>0.133*** (3.899)</td>
<td>0.096*** (3.166)</td>
<td>0.048 (1.542)</td>
</tr>
<tr>
<td>Outliers (Niger)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Observations</td>
<td>843</td>
<td>823</td>
<td>896</td>
<td>873</td>
<td>609</td>
</tr>
<tr>
<td>Extended Control Group</td>
<td>D.P. PCSE</td>
<td>D.P. Ext. PCSE</td>
<td>HIPC P. PCSE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIPC*Post-Debt Relief Point</td>
<td>0.107*** (5.832)</td>
<td>0.077*** (4.037)</td>
<td>0.130*** (5.512)</td>
<td>0.090*** (4.372)</td>
<td>0.045** (2.388)</td>
</tr>
<tr>
<td>Outliers (Niger)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Observations</td>
<td>1,961</td>
<td>1,941</td>
<td>2,138</td>
<td>2,115</td>
<td>1,727</td>
</tr>
<tr>
<td>African Control Group</td>
<td>D.P. PCSE</td>
<td>D.P. Ext. PCSE</td>
<td>HIPC P. PCSE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIPC*Post-Debt Relief Point</td>
<td>0.122*** (3.837)</td>
<td>0.097*** (3.520)</td>
<td>0.136*** (5.250)</td>
<td>0.099*** (3.348)</td>
<td>0.074** (2.523)</td>
</tr>
<tr>
<td>Outliers (Niger)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Observations</td>
<td>857</td>
<td>837</td>
<td>919</td>
<td>896</td>
<td>623</td>
</tr>
</tbody>
</table>

All equations are estimated using the bootstrap procedure applied with the option `vce(bootstrap)` under STATA. Equations (I) to (II) expose results for a sample of 29 HIPCs that have reached their completion point no later than 2006. The debt relief calendar for this sample therefore runs from -6 to +6. Equations (III) to (IV) expose results for a sample of 26 HIPCs that have reached their completion point no later than 2002. The debt relief calendar for this second sample goes from -10 to +10. Equation (V) finally exposes results for a sample of 21 HIPCs that have reached their completion point no later than 2006. The debt relief calendar for this sample therefore runs from -6 to +6. All estimates are obtained from model 7 and thus include both country and time fixed effects. Some estimates intentionally omit tax effort figures for Niger which when estimated with PCSE estimators are over-estimated (gives tax effort indexes above 2 for the 2000s). Robust z-statistics are exposed in parentheses ∗∗∗∗∗∗ ≤ 0.01, ∗∗∗ ≤ 0.05, ∗∗ ≤ 0.1.

groups, which, as already explained, are just used to control for potential trend effects within the developing world and the African continent. So in overall, our intuition that tax effort increases only at the decision point and then reduces gradually alongside debt relief provision seems confirmed by these robustness checks. As regards these results that do not take into account the level of tax effort during the interim period, which in average lasts around 4 or 5 years, it looks like HIPCs are making sufficient effort at the decision point in order to be granted of debt relief. But then, according to the graphs previously exposed, they seem to maintain a pretty good level of tax effort during the interim period (which also provides conditional debt relief). But once, the completion point has been reached, HIPCs probably loosen their tax effort, what therefore makes them converge toward their pre-debt relief level.

#### 5.2.2 Alternative Control Groups

Up to this point, we have seen that results seem to support this recurrent path of a higher tax effort around the decision point and a subsequent loosening once debt relief has been provided. The comparison with the "extended" and the "African" control groups shows that these results are not influenced by a common tendency among developing countries as well as among African countries. However, since the "narrow" control group represents our benchmark control group, one might have some doubts about the level of the cutoffs we use in order to identify the "narrow" control group countries. As explained in section 3.2, we include in this control group countries similar to the HIPCs in terms of level of income and indebtedness ratio, but which finally did not benefit from the Enhanced HIPC initiative. We have therefore selected countries which, over the five years preceding the decision-point date
of each HIPCs’ cohorts, had an average debt-to-exports ratio superior to 175% and which have been classified, at least 3 years over these 5, as a low-income country by the World Bank. But what happen if we change these criteria? Do we get a really different control group? Do the results still hold? In order to test the robustness of our results to these selection criteria, we identify four other potential "narrow" control groups that have been obtained using different cutoffs in terms of indebtedness ratio and income classification.

First of all and as exposed in section 2, the required indebtedness ratio in order to be eligible for the Enhanced HIPC Initiative was set to 150% of the exports (in NPV). However, the IMF and the World Bank were able to make some exceptions for countries which recorded a large openness rate and were not satisfying the 150% ratio, although their external public debt was burdensome\textsuperscript{22}. For this particular type of country, the required ratio was not defined in balance of payments terms but in fiscal terms with a required indebtedness threshold equal to 250% of their domestic revenues (in NPV). By consequence, we first define a new control group called "Panel A" which includes countries that, over the five years preceding the decision-point date of each HIPCs' cohorts, had an average debt-to-domestic revenues ratio superior to 300%\textsuperscript{23} and which have been classified, at least 3 years over these 5, as a low-income country by the World Bank. We then declare as "Panel B" countries that meet the same indebtedness criteria but which were classified as a low-income country all along the pre-decision point period of each HIPCs’ cohort (so 5 years over 5). Then, for the two remaining control groups, we use again the debt-to-exports ratio and defined two other control groups which are closer from our reference one. The third control group called "Panel C" includes countries with an average debt-to-exports ratio superior to 175% (as before) but which have been classified each year of the pre-decision point period as a low-income country (so here also, 5 years over 5). And finally, as regards the last control group named "Panel D", we gather countries which recorded an average indebtedness ratio superior to 200% of their exports, and which have been classified at least 3 years over the 5\textsuperscript{24} preceding the decision point of each HIPCs’ cohort. Table 18 in appendix exposes the different control groups.

Table 6 exposes estimates with the event-study procedure and the several alternative control groups. Looking first at columns (I) to (IV) and the impact of having reached the decision point, we can see that whatever the control group we consider, results are positive and highly statistically significant hence supporting previous findings with our reference control group. Moreover, looking at the magnitude of this impact, we note that the positive effect of having reached the decision point is higher when we consider in the control group, countries close to our reference one. The third control group called "Panel C" includes countries with an average debt-to-exports ratio superior to 175% (as before) but which have been classified each year of the pre-decision point period as a low-income country (so here also, 5 years over 5). And finally, as regards the last control group named "Panel D", we gather countries which recorded an average indebtedness ratio superior to 200% of their exports, and which have been classified at least 3 years over the 5\textsuperscript{24} preceding the decision point of each HIPCs’ cohort. These results reinforce our belief that having reached the decision point is favorable to benefiting countries in terms of tax effort. Furthermore, they also suggest that our benchmark results might be even larger if we could compare HIPCs to a large enough control group composed of highly indebted and recurrent low-income non-HIPC countries.

Then looking at column (V), results seem to indicate different effects of having reached the completion point according to the control group we consider. If one compare the evolution of HIPCs’ tax effort around the completion point relative to Panel A and D, results indicate that the impact is negative. However, considering now Panel C, one can think that the impact is positive. The same is however not true if one look at the impact of having benefited from the whole Enhanced HIPC initiative. Results from column (VI) indeed suggest that the positive impact is larger when control group includes countries which are highly indebted and always classified as low-income country prior to the decision point. In overall, this table mostly exposes that contrary to the decision point, the impact of the having reached the completion point although likely negative, is not evident. Finally, we also run difference-in-differences estimates using these several control groups\textsuperscript{25}. Results are in line with those just exposed. The magnitude of the coefficients is however slightly lower, but results clearly support a positive effect of having benefited from debt relief under the decision point, and an undefined impact of having reached the completion point.

\textsuperscript{22}Countries like Senegal or Cameroon for instance
\textsuperscript{23}In order to allow for a certain concessionality in this debt ratio
\textsuperscript{24}If we had considered countries which were low-income countries over the 5 years, we would have end with a too small control group.
\textsuperscript{25}Results are not reported here in order to save space.
Table 6: Alternative Control Groups - Sensitivity to Selection Criteria - Bootstrap Estimates

<table>
<thead>
<tr>
<th></th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
<th>(VI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tax Effort Estimators</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Panel A</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Debt Relief Point</td>
<td>0.067***</td>
<td>0.049***</td>
<td>0.126***</td>
<td>0.091***</td>
<td>-0.055***</td>
<td>0.013***</td>
</tr>
<tr>
<td></td>
<td>(3.331)</td>
<td>(3.030)</td>
<td>(6.179)</td>
<td>(6.354)</td>
<td>(-3.349)</td>
<td>(0.663)</td>
</tr>
<tr>
<td>F-Statistics (p-value)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.019</td>
</tr>
<tr>
<td><strong>Panel B</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Debt Relief Point</td>
<td>0.156***</td>
<td>0.137***</td>
<td>0.223***</td>
<td>0.188***</td>
<td>0.018</td>
<td>0.130***</td>
</tr>
<tr>
<td></td>
<td>(7.885)</td>
<td>(7.927)</td>
<td>(10.33)</td>
<td>(10.06)</td>
<td>(1.031)</td>
<td>(5.996)</td>
</tr>
<tr>
<td>F-Statistics (p-value)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.001</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Panel C</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Debt Relief Point</td>
<td>0.213***</td>
<td>0.194***</td>
<td>0.263***</td>
<td>0.228***</td>
<td>0.038*</td>
<td>0.148***</td>
</tr>
<tr>
<td></td>
<td>(9.530)</td>
<td>(11.78)</td>
<td>(11.75)</td>
<td>(11.21)</td>
<td>(1.916)</td>
<td>(6.576)</td>
</tr>
<tr>
<td>F-Statistics (p-value)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Panel D</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Debt Relief Point</td>
<td>0.085***</td>
<td>0.067***</td>
<td>0.129***</td>
<td>0.093***</td>
<td>-0.042**</td>
<td>0.042*</td>
</tr>
<tr>
<td></td>
<td>(5.058)</td>
<td>(3.669)</td>
<td>(5.882)</td>
<td>(5.016)</td>
<td>(-2.168)</td>
<td>(1.897)</td>
</tr>
<tr>
<td>F-Statistics (p-value)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Country Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Outliers (Niger)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Observations</td>
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<td>349</td>
<td>507</td>
<td>486</td>
<td>253</td>
<td>253</td>
</tr>
<tr>
<td>HIPC Countries</td>
<td>29</td>
<td>28</td>
<td>26</td>
<td>25</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

All equations are estimated using the bootstrap procedure applied with the option `vce(bootstrap)` under STATA. Equations (I) to (II) expose results for a sample of 29 HICPs that have reached their completion point no later than 2006. The debt relief calendar for this sample therefore runs from -6 to +6. Equations (III) to (IV) expose results for a sample of 26 HICPs that have reached their completion point no later than 2002. The debt relief calendar for this second sample goes from -10 to +10. Equations (V) and (VI) expose results for a sample of 21 HICPs that have reached their completion point no later than 2006. The debt relief calendar for this sample therefore runs from -6 to +6. Some estimates intentionally omit tax effort figures for Niger which when estimated with PCSE estimators are over-estimated (gives tax effort indexes above 2 for the 2000s). Panel A: Debt/Revenues sup. 300% and LIC status (3/5), 30 control group countries; Panel B: Debt/Revenues sup. 300% and LIC status (5/5), 23 control group countries; Panel C: Debt/Exports sup. 175% and LIC status (5/5), 15 control group countries; Panel D: Debt/Exports sup. 200% and LIC status (3/5), 12 control group countries. Robust z-statistics are exposed in parentheses **p ≤ 0.01, *p ≤ 0.05, p ≤ 0.1.

5.2.3 Selection Issue

Across all these estimates, we have compared the evolution of HICPs’ tax effort around different debt relief points, and relatively to several control groups. Comparisons with the "narrow" control group have led to measure the potential treatment effect, with the treatment defined as debt relief provided under the debt relief points and over the years following these points. This control group has been identified using indebtedness and income criteria in order to obtain a counter-factual having economic characteristics as close as possible to those of the HICPs. Moreover, the robustness of these control groups has been tested using different cutoffs for the criteria that define the inclusion in the "narrow" control group. Finally, we have also compared the evolution of HICPs’ tax effort to the average evolution of this variable within both the "developing world", and the non-HIPC Africa, in order to control for potential global and regional tendencies.

However, although these multiple comparisons can lead to think that debt relief granted under the Enhanced
HIPC initiative has indeed impacted tax effort in benefiting countries, we still could have some doubts about the real impact of this debt relief program since, as described in section 3, the "narrow" control group is not totally satisfying. Indeed, we explained above that even if countries included into the "narrow" control group recorded similar economic characteristics over the years preceding the implementation of the Enhanced HIPC initiative (what made them eligible for debt relief under this program), the simple fact that they did not benefit from the initiative make them different from the HIPCs. In that sense, although the "narrow" control group provides certain external validity to our results, findings are still slightly sullied by selection bias.

A final attempt to control for potential selection bias would be to define a control group only composed of "HIPCs-to-be", i.e. countries that entered late into the Enhanced HIPC process and that, although eligible for the initiative in the early and mid-2000s, only benefited from it after 2006. Using this kind of control group would lead to use a pipeline approach commonly applied in experimental economics where control group is composed of individuals who are eligible for the treatment but who have not been randomly chosen to benefit from the treatment in the first stage, and will benefit from it later on. We can see the parallel with a control group made of future HIPCs, though the random feature is completely unlikely in our case. By consequence, using model (7) with only HIPCs in the sample, regardless their decision or completion point date (i.e. considering all HIPCs), leads to define a moving control group made of future HIPCs. However, the moving feature of this control group represents a problem in this kind of model. Since HIPCs are entering the Enhanced HIPC initiative at different dates, one by one or by clusters of countries, the control group reduces as we move away from the debt relief point. For instance, as regards the decision point, in 2000, the control group is composed of 15 future HIPCs (Cf. Table 1 above). But in 2006, the control group is only composed of 8 HIPCs that did not reach their completion point in 2006, and this number even falls to 4 in 2008. Therefore, results must not be taken too seriously but can nevertheless give additional intuitions about the impact of the Enhanced HIPC initiative on benefiting countries’ tax effort.

Table 7 exposes estimates of model (7) where 37 countries defined as HIPCs are included into the sample. Results seem to confirm that having reached the decision point leads to higher tax effort level. Coefficients associated with the interaction term between HIPC and the post-decision point period are statistically significant at the 1% level. The magnitude of these coefficients are in line with those observed for the "narrow" control group, what supports that having reached the decision point leads to an increase in tax effort of between 8 and 11.5 percentage point. For instance, a country that would collect 80% of what its economy offers during the pre-decision point would, once the decision point reached, collect between 88 and 91.5% of its tax base. Results also seem to confirm moral hazard effects at the completion point. According to Post-Completion point coefficients, attaining this stage of the process leads to a significant decrease in tax effort that totally offsets the positive impact of having met the decision point. Therefore, it is not surprising to find an absence of debt relief effects when we look at the impact of the whole HIPC process. The coefficient is indeed not statistically significant due to these two opposite effects of having reach the decision and the completion point.

Table 7: Tax Effort Evolution among Current and Future HIPCs - Bootstrap Estimates

<table>
<thead>
<tr>
<th></th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
<th>(VI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt Relief Point:</td>
<td>D.P.</td>
<td>D.P. Ext.</td>
<td>C.P.</td>
<td>HIPC P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tax Effort Estimators</td>
<td>PCSE</td>
<td>PCSE</td>
<td>PCSE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIPC*Post-Debt Relief Point</td>
<td>0.086*** (2.901)</td>
<td>0.082*** (2.829)</td>
<td>0.097*** (3.808)</td>
<td>0.089*** (2.699)</td>
<td>-0.089*** (-3.120)</td>
<td>-0.033 (-1.183)</td>
</tr>
<tr>
<td>Observations</td>
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<td>648</td>
<td>762</td>
<td>739</td>
<td>648</td>
<td>502</td>
</tr>
<tr>
<td>Outliers (Niger)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Number of HIPCs</td>
<td>37</td>
<td>36</td>
<td>37</td>
<td>36</td>
<td>37</td>
<td>36</td>
</tr>
</tbody>
</table>

All equations are estimated using the bootstrap procedure applied with the option vce(bootstrap) under STATA. Column (II) intentionally omits tax effort figures for Niger which are over-estimated (gives unreliable tax effort indexes). F-statistics p-values are not reported here but are all significant at the 1% level (except for the "HIPC process" equation). Robust z-statistics are exposed in parentheses **p ≤ 0.01, *p ≤ 0.05, p ≤ 0.1.

Haiti is excluded for the reasons previously exposed. However we include Eritrea and Sudan that are defined as HIPCs in pre-decision point phase. We do not include Somalia which has the same status, because of lack of data.
5.3 Validity of the Tax Effort’s Measure

5.3.1 Testing for Different Tax Effort Estimates

After having tested the external validity of our results, we now test their robustness by estimating model (1) relatively to our different control groups, but now using alternative dependent variable estimates. As explained in section 4, our preferred tax effort measure is the one obtained using PCSE estimators, which both take into account heteroskedasticity and serial auto-correlation issues, and in addition do not treat for potential reverse causality. But since we find that having reached the decision point leads to a positive impact on HIPCs governments’ tax effort with our preferred estimate of tax effort, it would be now interesting to test whether these effects hold when we replace tax effort obtained with PCSE estimators by tax effort obtained using alternative estimators.

Consequently, Table 8 shows results of model (1) with now different measures of tax effort (that is still expressed relatively to the "narrow", the "extended", the "African", the Panel B, C, and the "HIPCs-to-be" control groups) obtained from tax effort models exposed in Table 3. Columns (I), (III), (V) and (VII) describe results when tax effort is estimated using the OLS estimators with country fixed effects (LSDV estimators). These estimates are the closest from those of Table 4, since like PCSE estimators, tax effort model with LSDV estimators does not account for potential endogeneity issue.

Columns (II), (IV), (VI), (VII) and (VIII) then show results for model (1), when we try to control for potential endogeneity within the first-step estimate in an ad-hoc way. Tax effort is indeed obtained from specifications where potential endogenous variables are one year-lagged. This treatment of reverse causality is not optimal since expectations of future tax policies is likely to shape actual economic outcomes. Nevertheless, we suppose that it can slightly accounts for simultaneous endogeneity issues that can bias coefficients’ magnitude and significance. Tax effort measures for these columns are therefore obtained with PCSE estimators.

Results of Table 8 suggest that having reached the decision point has a relative positive impact on benefiting countries regardless the control groups we consider. The coefficients are moreover really close from those we obtained using the non-lagged PCSE estimates what therefore reinforce the robustness of our benchmark results.

Furthermore we also notice that, as with PCSE estimators, average tax effort seems to reduce once HIPCs have reached their completion point. However, although the effect is rather strong, it is only significant when we compare HIPCs’ tax effort evolution relatively to the "narrow", the "extended" and the "HIPCs-to-be" control groups. The effect of having reached the completion point is indeed equal to zero when we compare the evolution of tax effort between the treated group and the "African", and Panel B and C control groups. Therefore, although there seems to be a fall in tax effort around the completion point, it is likely that this fall is due to a downward regional or global-LICs trend, rather than a disincentive effect of having reached the completion point.

Finally, as regards the effect of the whole HIPC process, we can see that having benefited from debt relief during the interim period does not lead in average to higher level of tax effort relatively to the "narrow", the "extended" and the "HIPCs-to-be" control groups which is quite logical since the impact of having reached the completion point is significantly negative relatively to these three countries groups. On the contrary, we can note an average improvement as compare to the "African", Panel B and C control groups which, in average, do not have a statistically different evolution of their tax effort around the completion point. By consequence, since the overall effect is not statistically significant regardless the control group we consider, we cannot attribute this relative larger tax effort to debt cancellation under the whole Enhanced HIPC Initiative’s process.
Table 8: Sensitivity to Tax Effort Estimates - Bootstrap Estimates

<table>
<thead>
<tr>
<th>Debt Relief Point:</th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
<th>(VI)</th>
<th>(VII)</th>
<th>(VIII)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I) D.P. [-6; +6]</td>
<td>0.084***</td>
<td>0.090***</td>
<td>0.061***</td>
<td>0.099***</td>
<td>-0.040**</td>
<td>-0.028</td>
<td>0.010</td>
<td>0.028</td>
</tr>
<tr>
<td>(II) D.P. [-10; +10]</td>
<td>0.032**</td>
<td>0.030</td>
<td>0.033**</td>
<td>0.026</td>
<td>-0.051***</td>
<td>-0.051***</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>(III) C.P. [-6; +6]</td>
<td>0.065***</td>
<td>0.071***</td>
<td>0.064***</td>
<td>0.076***</td>
<td>-0.022</td>
<td>-0.019</td>
<td>0.054***</td>
<td>0.062***</td>
</tr>
<tr>
<td>(IV) HIPC P. [-6; +6]</td>
<td>0.110***</td>
<td>0.118***</td>
<td>0.127***</td>
<td>0.156***</td>
<td>-0.001</td>
<td>0.013</td>
<td>0.101***</td>
<td>0.123***</td>
</tr>
<tr>
<td>(V) Effective Control Group</td>
<td>0.182***</td>
<td>0.189***</td>
<td>0.179**</td>
<td>0.223***</td>
<td>0.028</td>
<td>0.043**</td>
<td>0.120***</td>
<td>0.152***</td>
</tr>
<tr>
<td>(VI) Future HIPCs</td>
<td>0.078***</td>
<td>0.089***</td>
<td>0.096***</td>
<td>0.106***</td>
<td>-0.079***</td>
<td>-0.052*</td>
<td>-0.011</td>
<td>0.009</td>
</tr>
<tr>
<td>(VII) Observations</td>
<td>362</td>
<td>362</td>
<td>507</td>
<td>468</td>
<td>266</td>
<td>267</td>
<td>245</td>
<td>246</td>
</tr>
<tr>
<td>(VIII) HIPC Countries</td>
<td>29</td>
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<td>29</td>
<td>28</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
</tr>
</tbody>
</table>

**Narrow Control Group**

HIPC*Post-Debt Relief Point

- Columns (I), (III), (V) and (VII) report results when tax effort is estimated with LSDV estimators.
- Columns (II), (IV), (VI) and (VIII) report results when tax effort is estimated using PCSE estimators with lagged endogenous variables.
- Robust z-statistics are exposed in parentheses.

Future HIPCs

All equations are estimated using the bootstrap procedure applied with the option vce(bootstrap) under STATA. Equations (I) and (II) expose results for a sample of 29 HIPCs that have reached their decision point no later than 2006. The debt relief calendar for this sample therefore runs from -6 to +6. Equations (III) to (VI) expose results for a sample of 26 HIPCs that have reached their decision point no later than 2002 which allows to have a longer insight on the tax effort’s reaction to debt relief provided under the decision point. The relative debt relief calendar runs indeed from -10 to +10. Columns (I), (III), (V) and (VII) report results when tax effort is estimated with LSDV estimators. Columns (II), (IV), (VI) and (VIII) report results when tax effort is estimated using PCSE estimators with lagged endogenous variables. Robust z-statistics are exposed in parentheses. **p ≤ 0.01, *p ≤ 0.05, p ≤ 0.1.**
5.3.2 Non-Estimated Tax Effort Variables

So far, we have used a first-stage estimated tax effort variable which according to us and the fiscal data availability in developing countries represents the best proxy for the government willingness to tax. However, as we have already explained, this variable is subject to measurement errors that can still fuel some doubts about the real reaction of HIPC government’s tax effort to debt relief provision. Therefore, we finally suggest to use disaggregated tax variables using the ICTD (International Center for Tax and Development) dataset of April 2014 (Prichard et al. [2014]) which gathers tax data for many developing countries with breakdown between direct and indirect taxes. This dataset basically builds on the same sources than ours. The pairwise correlation between our variable of tax revenues excluding natural resources revenues and the one from the ICTD dataset is superior to 75% supporting hence the reliability of our own dataset. Using Article IV, Staff Report and the Government Finance Statistics (GFS) dataset of the IMF, the ICTD dataset manages to gather lot of information about disaggregated taxes in the developing world. However, this dataset presents the inconvenience of still having a sizable amount of missing values as compare to ours (Cf. Table 18 in appendix). Indeed, more than a fourth of the information is lacking, especially for HIPCs which therefore prevents us to use variables from this dataset as our benchmark results. Nevertheless, looking at the impact of debt relief points on disaggregated tax variables that can reflect the government’s willingness to tax can provide interesting additional robustness checks and definitely validate results found with our estimated tax effort measure.

Therefore, we decide to look at two types of disaggregated taxes that could reflect the government’s willingness to tax: the indirect and the direct taxes (both excluding natural resource revenues). Among indirect taxes which mainly comprise taxes on goods and services (value-added taxes (VAT), sales and excise taxes) and international trade taxes, we consider taxes on and services as the best proxy for government willingness to tax since increases in VAT and sales taxes is partly related to economic performances but also depends largely on the quality of tax administration’s follow-up of self-assessed tax declarations. As regards direct taxes that includes taxes on incomes, profits and capital gains, we consider the aggregated direct taxes variable as a good proxy for this government willingness to tax since collecting taxes on incomes and profits in developing countries also requires strong involvement of the tax administration (although taxes on income represents more than 93% of the direct taxes). However, according to the Decision-Point Documents, we expect to find positive impact of the Enhanced HIPC initiative mainly on goods and services taxes since macroeconomic reforms required to be eligible for the debt relief initiative, especially the ones focused on taxation, concern more indirect taxes rather than direct taxes. Indeed, looking back at the Decision-Point Document for Mali, IFIs were calling for a “ [...] unification of the value-added tax at a single rate of 18 percent, and improving the efficiency of tax-collection agencies.”.

We therefore run event-study models (the model (1)) to observe the impact of the debt relief points on these disaggregated measures as compared to our different control groups. However, we do not include control variables yet, since, according to Baskaran and Bigsten [2013], Burgess and Stern [1993], Fjeldstad and Therkildsen [2008] these variables reflect the government’s tax effort and can therefore be considered as independent from the economic environment.

Focusing on Table 9 that exposes the reaction of these disaggregated tax variables to debt relief provided under the decision point, one can notice that the average level of direct and indirect taxes and of taxes on goods and services is significantly higher after the decision point than before it. This result is quite robust to the control group we consider, except for the “extended” control group as regards taxes on goods and services. Moreover, looking at the taxes disaggregation allows to see that the reaction of taxes on goods and services to debt relief leads the positive impact of debt relief on indirect taxes since revenues related to international trade do not react to debt relief provision. In terms of magnitude, results of table 13 therefore show that having reached the decision point increases, in average, indirect taxes by between 0.60 and 1.56 percentage point of GDP, as compare to the situation where countries would not have benefited from debt relief under the decision point. The relative increase on direct taxes is smaller ranging between, 0.24 and 0.49 percentage point of GDP while the one for taxes on goods and services ranges between 0.52 and 0.84. These results therefore support previous findings using the estimated tax effort measures. However, looking then at the reaction around the completion point and the HIPC taken as a whole, we find opposite effects depending on the control group we consider. Considering our preferred one, the “narrow” control group, it seems that all the increase recorded after the decision point on the indirect taxes and especially the goods and services taxes vanishes after the HIPC process taken as a whole because of the fall recorded after the completion point. However, this story is not robust across all other control groups what prevents us to consider it as the truth.

\footnote{Results are not reported by save of space}
## Table 9: Disaggregated Taxes - Reaction to Debt Relief

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dep. variable:</strong> Taxes of which</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Direct</td>
<td>Indirect</td>
<td>G&amp;S</td>
</tr>
<tr>
<td><strong>Event-Study methodology</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Narrow Control Group</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Debt Relief Point</td>
<td>0.358** (2.663)</td>
<td>1.567*** (5.110)</td>
<td>0.524** (2.443)</td>
</tr>
<tr>
<td><strong>Extended Control Group</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Debt Relief Point</td>
<td>0.567*** (4.288)</td>
<td>0.603** (2.400)</td>
<td>0.327 (1.544)</td>
</tr>
<tr>
<td><strong>African Control Group</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Debt Relief Point</td>
<td>0.245* (1.871)</td>
<td>1.490*** (5.812)</td>
<td>0.848*** (3.881)</td>
</tr>
<tr>
<td><strong>Panel B</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Debt Relief Point</td>
<td>0.493*** (3.792)</td>
<td>1.277*** (5.091)</td>
<td>0.742*** (3.414)</td>
</tr>
<tr>
<td><strong>Panel C</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Debt Relief Point</td>
<td>0.321** (2.132)</td>
<td>1.597*** (6.374)</td>
<td>0.796*** (3.708)</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>459</td>
<td>447</td>
<td>441</td>
</tr>
<tr>
<td><strong>HIPC Countries</strong></td>
<td>26</td>
<td>26</td>
<td>26</td>
</tr>
</tbody>
</table>

### Diff-in-Diff methodology

| **Future HIPC**s | | | |
| **Post-Debt Relief Point** | | | |
| | 0.541** (2.609) | 0.896* (1.951) | 0.784** (2.413) | 0.066 (-0.290) | -0.251 (-0.629) | 0.617** (2.509) | 0.336 (1.062) | 0.220 (0.349) | 1.456** (3.848) |

All equations are estimated using WITHIN estimators under STATA 13. Equations (I) to (III) expose results for a sample of 26 HIPC's that have reached their decision point no later than 2002 which allows to have a longer insight on the tax effort's reaction to debt relief provided under the decision point. The relative debt relief calendar runs indeed from -10 to +10. Equations (IV) to (IX) expose results for a sample of 21 HIPC's that have reached their decision point no later than 2006. The debt relief calendar for this sample therefore runs from -6 to +6. Robust t-statistics based on clustered standard deviation (at the country level) are exposed in parentheses. **p ≤ 0.01, *p ≤ 0.05, p ≤ 0.1.
However, the absence of control group variables for these estimates can be largely considered as debatable. Indeed following Mahdavi [2008], we believe that disaggregated taxes such as direct of indirect taxes can response to the economic environment. Therefore, in order to control for structural factors evolution that might explain in place of debt relief these increases in disaggregated taxes, we now run models with disaggregated tax variables including the same control variables as the ones present within the tax effort specification in section 3. We also switch from the event-study to the difference-in-difference approach in order to consider more observations and to make easier the definition of the control variables (not expressed as the difference between the HIPC observation and the average value in its corresponding control group). Table 10 shows the results for the decision point and the whole HIPC process but not for the completion point since in diff-in-diff control groups include HIPCs that have not reached their completion point yet (cf. above).

Table 10 indicates that positive effects of debt relief under the decision point on indirect taxes and especially goods and services taxes remain significant and robust across all the control groups (except for the “extended” and “future HIPCs” control groups). Moreover, looking at columns (IV) to (VI) it seems that after having controlled for the economic environment, having benefited from the HIPC initiative as a whole is positively correlated with taxes on goods and services. However, since results for taxes on goods and services are positive and significant, the non significance of indirect taxes might be therefore driven by a lower level of trade taxes after the post-HIPC process period what could be possible given the trade-oriented macroeconomic reforms defined within the PRGF.

In overall, results of Table 9 and 10 appear to support those previously found using estimated tax effort variables. Furthermore, these robustness checks allow us to think that additional governments’ tax efforts have probably been about indirect taxes improvements such as the VAT taxes, what is also in line with recommendations defined into the Decision-Point documents. So in order to finally verify whether this increase depends on the conditional-ity set into these documents or on the opportunity of enjoying domestic revenues following debt cancellation, we turn to the next section which tries to observe the timing reaction of government’s tax effort to debt relief provision.

5.4 Timing Effects of Debt Relief

Going back to our graphs, one thing remains indeed to explain; the occurrence of the government’s tax effort as regards decision point’s achievement. Do HIPCs deploy tax efforts once debt relief has been provided, or do they display adjustment efforts before the decision point just to well-behave in front of international institutions in order to be selected for the Enhanced HIPC initiative?

We have seen that the tax effort level is significantly higher in the post-decision point period rather than in the pre-decision point period. However, according to the visual analysis, it looks like the higher level of tax effort in the post-decision point period is mostly due to the sharp increase during the 3 or 4 years preceding the decision point. This anticipatory effect is highly plausible in a setting like the HIPC process. Indeed as explained above, potential eligible countries have to satisfy some criteria before reaching the decision point and benefiting from debt relief. Among these criteria, they have to implement macro-stabilizing program, or at least show to the IMF and the World Bank significant improvements, in particular in their tax systems as underlined in section 2. By consequent, it is likely that the perspective of debt relief under the decision point fosters future HIPCs to deploy more than regular effort. Moreover, these graphs (as well as our estimates for the completion point and the HIPC process’ impacts) let us think that once the country has reached the decision point, which implies future debt cancellations, the country relaxes its previous effort and stabilizes or even worse diminishes its tax effort. Such reaction should therefore be represented by a sharp fall in our tax effort measure just after the decision point, or by a gradual reduction over the years following this debt relief point, which in fine would reveal the moral hazard feature of these debt relief initiatives.

In order to observe such evolution (still relatively to control groups) we can use a different model where, following the study of Papaioannou and Siourounis [2008] which focuses on the anticipatory and transitional effects of democratic transition on economic growth, we divide the whole period in different sub-periods in order to account for timing effects of debt relief under the decision point. We therefore keep 26 HIPCs for which we can have the longer post-decision point period (+10 years). This larger time span allows the division of the event calendar in four sub-periods.

The baseline period that is used as a benchmark for the analysis runs from -10 to -5 (so over the first 6 years of the ”debt relief-calendar”). The short pre-decision point period that enables to observe potential anticipatory effects goes from -4 to -1 (so 4 years). The short-run post-decision point period that just follows the decision point [0; +3] represents the immediate reaction of the government after having reached the decision point. And finally the medium/long-run post-decision point period that runs from +4 to +10, denotes the level of tax effort at the end of the process and beyond (until available data).

The period of 4 years before the decision point has been chosen according to the time horizon of the PRGF,
Table 10: Disaggregated Taxes - Reaction to Debt Relief - Control for Economic Environment

<table>
<thead>
<tr>
<th>Debt Relief Point:</th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
<th>(VI)</th>
</tr>
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<tbody>
<tr>
<td>Dep. variable: Taxes of which</td>
<td>D.P. [-10; +10]</td>
<td>HIPC P. [-6; +6]</td>
<td></td>
<td></td>
<td></td>
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<td>Diff-in-Diff methodology</td>
<td>Direct</td>
<td>Indirect</td>
<td>G&amp;S</td>
<td>Direct</td>
<td>Indirect</td>
<td>G&amp;S</td>
</tr>
<tr>
<td>Narrow Control Group</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Debt Relief Point</td>
<td></td>
<td></td>
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<tr>
<td>Observations</td>
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<td>661</td>
<td>639</td>
<td>449</td>
<td>450</td>
<td>425</td>
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<td>Extended Control Group</td>
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<td>Post-Debt Relief Point</td>
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<tr>
<td>Observations</td>
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<td>458</td>
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<td></td>
</tr>
<tr>
<td>Post-Debt Relief Point</td>
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<td></td>
<td></td>
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<tr>
<td>Observations</td>
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<td>721</td>
<td>711</td>
<td>508</td>
<td>506</td>
<td>493</td>
</tr>
<tr>
<td>Panel C</td>
<td></td>
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<tr>
<td>Post-Debt Relief Point</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
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<tr>
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<td>611</td>
<td>589</td>
<td>418</td>
<td>410</td>
<td>386</td>
</tr>
</tbody>
</table>

All equations are estimated using WITHIN estimators with years dummy in order to control for both country and time fixed effects. In order to save space, we only report coefficients for the Post-Debt Relief point variable, and therefore do not expose those associated to control variables. As explained above, control variables are the same as the ones used in tax effort estimates, naming: the log per capita GDP, the openness rate, the agriculture and resources shares, the log of the population density, the age dependency rate and the share of urban population (Cf. Section 4). Model (7) has been tested for our three different measures of taxes (direct taxes, indirect taxes and goods and services (G&S) taxes, and with respect to our six different control groups (the narrow control group, the extended control group, the African control group, the future HIPC control group (F.HIPC), and the panel B and panel C control groups. F-statistics p-values are not reported here but are all significant at the 1% level. Robust t-statistics based on clustered standard deviation (at the country level) are exposed in parentheses. **p ≤ 0.01, *p ≤ 0.05, *p ≤ 0.1.
which is a short/medium-term program. Moreover, -4 also corresponds for a large share of HIPCs that composed this sample, to 1996\textsuperscript{28} which is the date where for the very first time the international community committed to cancel multilateral debt for low income countries through the initial HIPC initiative. Therefore these 4 years correspond to the average time span of IMF and World Bank macro-stabilizing program, and also cover the period over which some signal effects induced by changes in IFIs’ dogma, through the launch of the 1996’s HIPC initiative, might had led HIPCs to improve their fiscal position in order to join the program later on.

Accounting for these different periods leads to estimate the following model:

\[
TE_{i,t} = \alpha_i + \nu_{i,t} + \beta_1 HIPC_{i,t} \times D_{1,i,t} + \beta_2 HIPC_{i,t} \times D_{2,i,t} + \beta_3 HIPC_{i,t} \times D_{3,i,t} + \epsilon_{i,t}
\]  

Where \(D_{1,i,t}\) is a dummy variable that takes 1 in the first, second, third and fourth years preceding the decision-point \([-4, -3, -2, -1]\); \(D_{2,i,t}\) a dummy variable that takes 1 in the decision-point year \([0]\) as well as in the three subsequent years \([+1, +2, +3]\) and \(D_{3,i,t}\) is a dummy variable taking 1 in all years beyond +4 (with +4 included) relative to the decision point. \(HIPC_{i,t}\) is, as before, a dummy variable equal to 1 for HIPC countries considered under this setting \(26\) and 0 otherwise. Therefore, under such econometric setting \(\beta_1\) denotes the relative anticipatory effect of the decision point (and the incentive of the debt relief prospect for potential eligible countries), \(\beta_2\) represents the relative reaction of HIPCs just after they have reached their decision point, and \(\beta_3\) exposes the relative impact of debt relief on long term level of tax effort.

Table 11 exposes the results. One can clearly see that the bulk of the tax effort deployed by HIPCs is done before the decision point. Indeed, except column (I) that includes unreliable tax effort estimates for Niger, only column (II) shows that relatively to all the control groups, tax effort after the decision point is, in average, higher than the level recorded over the 4 years preceding the decision point. Then, all equations for estimated tax effort measure exhibit a larger coefficient for the interaction term between the HIPC dummy and the period \([-4; -1]\). However, looking at the z-statistics and recalculating the standard errors, we can easily demonstrate that coefficients respectively associated with \(D_2\) and \(D_3\) are not statistically different from the one obtained for \(D_1\). In other words, the difference between the baseline period and the two post-decision point periods is not statistically different from the difference between the baseline period and the period that captures the anticipatory effects. This non-significance of coefficients for \(D_2\) and \(D_3\) as compare to the one for \(D_1\) holds regardless the control group we consider and the estimated tax effort measure we use.

Results therefore strongly suggest that higher tax efforts after the decision point is de facto a legacy from endeavors deployed over the 4 years preceding the decision point attainment. The same is also true (for most of the equations) for results on indirect and goods and services taxes. The bulk of the effort in indirect taxes collection is observed during the anticipatory period. Nevertheless, thanks to this legacy effect, benefiting countries manage to keep a level in the post-debt relief period that is higher than the one recorded in the baseline period.

Considering all these results (both those obtained with the event-study, the difference-in-differences methodology, and the timing effects framework), it is now quite easy to perceive the parallel with the idiom of the donkey and the carrot. Before the decision point the HIPC deploys enough effort to grab the tip of the carrot that it is lusting after, i.e. the debt relief. Once grabbed, the HIPC continues to move forward (all along the interim period) in order to get the rest of conditional debt relief. But, when the HIPC achieves the interim period and meets its completion point, it receives irrevocable and significant debt stock cancellation. In other words, at the completion point, the HIPCs "mops up" the last (quite big) piece of carrot. So after the completion point, there is no more debt relief to get (and actually no need to), and the government can basically stop and in some cases loosen its effort. This final behavior can therefore be reflected in the tax effort convergence toward pre-debt relief period. Therefore, reasons for non-significance of debt relief delivered under the whole HIPC process on HIPCs’ tax effort are twofold. First the pre-HIPC process level of tax effort is strongly boosted by anticipatory effects. And second, the slight fall recorded after the completion point leads to reduce the average level of the post-HIPC process as compare to the level recorded just after the decision point, i.e. during the interim period. These two opposite effects in fine contribute to equalize the average pre-HIPC process level of tax effort with the average post-HIPC process level of tax effort.

However, if we compare the post-HIPC process tax effort level with the level observed in the baseline period, i.e. from -10 to -5, we definitively find an average level of tax effort which is significantly higher in the post-HIPC process period. This suggests that pre-decision point conditionality and prospect of debt relief have significantly helped to improve tax effort in benefiting countries.

\textsuperscript{28}22 countries have indeed reached their decision point in 2000
### Table 11: Timing Effects of Debt Relief on Tax Effort around the Decision Point

<table>
<thead>
<tr>
<th></th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
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<td>PCSE.L</td>
<td>Indirect</td>
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<td>HIPC*D1: (Anticipatory Effect)</td>
<td>0.117*** (2.728)</td>
<td>0.113*** (2.933)</td>
<td>0.103*** (2.635)</td>
<td>0.139*** (2.701)</td>
<td>1.065** (3.277)</td>
<td>1.244*** (3.277)</td>
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<td>HIPC*D2: (Short-Term Pulse)</td>
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<td>0.084*** (2.006)</td>
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<td>1.587** (2.246)</td>
<td>1.702*** (3.268)</td>
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<td>HIPC*D3: (Long-Term Effect)</td>
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<td>0.135*** (3.806)</td>
<td>0.059 (1.556)</td>
<td>0.131*** (2.646)</td>
<td>0.629 (1.062)</td>
<td>1.866*** (4.433)</td>
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<td>1.009*** (2.838)</td>
<td>0.767** (2.360)</td>
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<td>0.070*** (2.774)</td>
<td>1.331*** (2.674)</td>
<td>0.964* (1.753)</td>
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<td>HIPC*D1: (Anticipatory Effect)</td>
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<td>0.080** (2.151)</td>
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<td>0.139*** (3.213)</td>
<td>0.114** (0.0377)</td>
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<td>1.716*** (2.774)</td>
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<td>0.163*** (3.540)</td>
<td>0.854* (1.917)</td>
<td>0.905** (2.520)</td>
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<td>0.148*** (3.723)</td>
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<td>1.424*** (2.729)</td>
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<td>0.224*** (6.133)</td>
<td>0.176*** (3.913)</td>
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<td>0.148*** (3.317)</td>
<td>1.108 (1.626)</td>
<td>2.019*** (4.385)</td>
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<td>HIPC*D1: (Anticipatory Effect)</td>
<td>0.123*** (3.458)</td>
<td>0.119*** (2.930)</td>
<td>0.112*** (3.038)</td>
<td>0.155*** (3.641)</td>
<td>0.945** (2.172)</td>
<td>1.072*** (3.148)</td>
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<tr>
<td>HIPC*D2: (Short-Term Pulse)</td>
<td>0.162*** (3.899)</td>
<td>0.137*** (3.161)</td>
<td>0.167*** (2.755)</td>
<td>0.165*** (4.158)</td>
<td>1.428** (2.028)</td>
<td>1.474*** (3.267)</td>
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<td>HIPC*D3: (Long-Term Effect)</td>
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<td>0.177*** (4.215)</td>
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<td>0.187*** (4.446)</td>
<td>0.647 (1.087)</td>
<td>1.889*** (4.612)</td>
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<td>HIPC*D1: (Anticipatory Effect)</td>
<td>0.109*** (2.993)</td>
<td>0.113*** (4.374)</td>
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<td>0.130*** (3.963)</td>
<td>0.563 (1.411)</td>
<td>0.647 (1.500)</td>
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<td>HIPC*D2: (Short-Term Pulse)</td>
<td>0.173*** (4.794)</td>
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<td>0.203*** (4.528)</td>
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<td>1.008 (1.448)</td>
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<td>0.236*** (4.025)</td>
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<td>0.211*** (3.869)</td>
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<td>1.673*** (2.039)</td>
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<td>739</td>
<td>762</td>
<td>709</td>
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<td>589</td>
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Results of columns (I) to (V) are estimated using the bootstrap procedure whereas those of columns (V) and (VI) are estimated using WITHIN estimators with years dummy. Control variables are included for columns (V) and (VI). F-statistics p-values are not reported here but are all significant at the 1% level. Robust t-statistics (clustered at the country level for columns (V) and (VI)) are exposed in parentheses. **p ≤ 0.01, *p ≤ 0.05, p ≤ 0.1.
6 Conclusion

Using an appropriate measure of government’s willingness to tax, this study shows that the perspective of debt relief under the Enhanced HIPC initiative leads heavily indebted poor countries to deploy substantial endeavors in terms of taxation. Since improvements in tax system and public finances managements are indeed required in order to be qualified for this debt relief initiative, countries seem to judge potential future debt relief as attractive enough to undertake significant reforms, what helps them to levy a relative larger share of their "Tax Capacity" (as compare to the average tax effort level among developing countries). This increase, which appears of having started around 1996 when IFIs announced for the very first time further cancellations on multilateral debt, has allowed HIPCs to reach a higher average level of tax effort after the decision point as compare to the one recorded 6 years before. Furthermore, using the more recent dataset on disaggregated taxes in developing countries to date, it appears that this tax effort has been mainly focused on improving indirect taxes collection namely taxes on goods and services.

However, our study also reveals that as soon as HIPCs become qualified for debt relief under the decision point they stop improving their tax effort. This stagnation (or reduction if we graphically compare to one or two years prior the decision point) is not detrimental for HIPCs government, since the average level of tax effort is still higher than its level 6 years earlier. According to our results, this stagnation appears to last all along the interim period. However, having reached the completion point seems to be accompanied with a relative fall in tax effort. Indubitably, this leads us to find at the end of the Enhanced HIPC process, an average tax effort level among HIPCs that is at the same level as before the initiative starts. How can we explain that? First, given that the completion point marks the end of the HIPC process, and thus of the conditional debt relief provision, HIPCs do not need to exhibit large efforts to IFIs. They therefore do not need to record good performances in term of tax effort except for themselves. In other words, there is no fiscal incentive to well-behave for HIPCs except the perspective of having a performing and inclusive tax system which would be able to support the country’s development over the coming years.

This first interpretation of our results supports the classic idiom of the donkey and the carrot where HIPCs deploy substantial efforts as long as there is enough debt relief to get. Once the whole debt relief package has been provided, incentives to move forward vanish and HIPCs stop their effort. In our case the situation could be seen even more damageable. As regards our results on the whole HIPC process, one could indeed think that HIPCs do not stay unmoving, but move backward once debt relief has been completely and irrevocably granted since, instead of remaining at the level reached for the last debt relief provision, tax effort decreases. This study therefore emphasizes for the very first time the realization of moral hazard effects due to the debt relief initiative design, that unfortunately leads to lose a share of the benefits gained (in terms of tax effort) throughout the process.

Nevertheless, one must keep in mind that although the fall in tax effort recorded at the completion point leads to an average tax effort in the post-HIPC process similar to the one recorded in the pre-decision point phase, the combination of anticipatory effects with sustained high tax effort during the interim period largely offsets the negative impact of the completion point. In other words, tax effort in post-HIPC process is significantly higher than tax effort level recorded over the years preceding the anticipation phase. This finally leads to say that, in overall, the Enhanced HIPC initiative has helped, mostly through conditionality, to increase tax effort in recipient countries relatively to countries that did not benefit from such debt treatment.

An alternative explanation for the slackening in tax effort after the HIPC process (and so the completion point) can also be found in the new potential sources of financing. Now debts have been canceled, HIPCs can rethink their development process with a clean balance sheet. These countries previously excluded from international markets due to their heavy debt burden can indeed have now access to broader and more diversified financing sources. As a matter of fact, some studies underlines that now indebtedness in HIPCs is quite low, new financing opportunities such as borrowing on international and domestic markets are increasingly (Dömeland and Kharas [2009, Presbitero [2009]) used or must be even more solicited in order to finance the development process and reach the MDGs (Addison et al. [2005]). However, even if these countries can resort on these new financial possibilities, it should not be left aside that newly contracted debts on international or domestic markets, which are often associated with higher interest rates and shorter maturity periods than those provided by the IFIs, would inevitably must be reimbursed. By consequent, in order to pay these debts back, countries will have to mobilize domestic resources if they do not want reproduce the same scheme that led them to the debt overhang state. Such improvement in domestic revenues mobilization can only goes through larger government’s efforts in the design of its tax system and in the enforcement of inclusive and rightly defined tax payments.

Finally, according to studies just quoted and some recent sovereign bonds issuance of countries like Senegal\textsuperscript{29},

\textsuperscript{29}Senegal’s sovereign bond issuance raised $500 million in 2011 and another $500 million in 2014.
Côte d’Ivoire\textsuperscript{30}, Zambia\textsuperscript{31} or Ghana\textsuperscript{32}, HIPCs seem to have seen and welcomed these new financing opportunities. But as regards our study, they do not seem to have completely pave the way for efficient and substantial future revenues collection, that will however be absolutely necessary for debt repayments. This study has nevertheless shown that HIPCs were able to deploy substantial and precious fiscal endeavors when they wanted to do so. Future cooperation between HIPCs and IFIs should therefore continue to focus on tax effort improvements in order to get sustainable tax systems, which would provide substantial domestic resources, helping thus HIPCs to break free from IFIs’ financial assistance, and to ultimately, reinforce their sovereignty.

\textsuperscript{30}Côte d’Ivoire managed to raise \$750 million in 2014 (orders were even largely higher, peaking at \$5bn).
\textsuperscript{31}Zambia also raised \$1bn in 2014 through an international bond sale.
\textsuperscript{32}Finally, Ghana in 2007 was the first Sub-Saharan African country (excluding South Africa) to issue bonds on international market. Ghana raised \$750 million at that time and in 2013 raised an extra \$1 bn.
References


Wilson Prichard, Alex Cobham, and Andrew Goodall. The ictd government revenue dataset. 2014.


Appendix

Figure 1: Debt Treatments under the Paris Club and Debt stockpiling

Figure 2: Domestic Tax Revenues Persistence
Figure 3: Average Tax Revenues - Evolution around "Debt Relief Points"

(a) 2000 HIPCs only

(b) 2000 HIPCs only

(c) All HIPCs [-6/+6]

(d) All HIPCs [-6/+6]
Figure 4: Average Tax Effort - Evolution around "Debt Relief Points"

(a) PCSE estimates - 2000 HIPCs only

(b) PCSE estimates - All HIPCs [-6/+6]

(c) PCSE estimates - All HIPCs [-6/+6]

(d) PCSE estimates - All HIPCs [-6/+6]

(e) PCSE estimates - All HIPCs [-10/+10]

(f) Fixed Effects estimates - All HIPCs [-10/+10]
Table 12: Sample of 117 Developing Countries

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HIPC (at least decision point)

HIPC eligible (but pre-decision point)

Non-HIPC

Table 13: Data Source and Availability - 117 Developing Countries [1993-2012]

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<tr>
<td>Imports share</td>
<td>World Development Indicator (2014)</td>
<td>45.06</td>
<td>21.62</td>
<td>2212</td>
<td>3.82</td>
</tr>
<tr>
<td>Log pop. density</td>
<td>World Development Indicator (2014)</td>
<td>4.01</td>
<td>1.22</td>
<td>2300</td>
<td>0.00</td>
</tr>
<tr>
<td>Age dependency</td>
<td>World Development Indicator (2014)</td>
<td>72.76</td>
<td>18.41</td>
<td>2280</td>
<td>0.87</td>
</tr>
<tr>
<td>Urban population</td>
<td>World Development Indicator (2014)</td>
<td>43.52</td>
<td>19.11</td>
<td>2300</td>
<td>0.00</td>
</tr>
</tbody>
</table>
### Table 14: Tax Effort Model and Natural Resources Receipts’ Crowding out Effect

<table>
<thead>
<tr>
<th>Dep. Var: Tax revenues</th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
<th>(VI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimators</td>
<td>PCSE</td>
<td>PCSE.L</td>
<td>LSDV</td>
<td>LSDV.L</td>
<td>SGMM</td>
<td>SGMM</td>
</tr>
<tr>
<td>Tax revenues,(t-1)</td>
<td>0.775***</td>
<td>0.765***</td>
<td>(17.85)</td>
<td>(15.54)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log GDP pc,(t-1)</td>
<td>2.723***</td>
<td>3.636***</td>
<td>(3.274)</td>
<td>(5.532)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Openness rate,(t-1)</td>
<td>0.026***</td>
<td>0.036***</td>
<td>(2.734)</td>
<td>(3.509)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture share</td>
<td>-0.069***</td>
<td>-0.067***</td>
<td>(4.732)</td>
<td>(4.601)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tax natural</td>
<td>-0.082**</td>
<td>-0.083**</td>
<td>(2.480)</td>
<td>(2.433)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log Pop. density</td>
<td>-0.523</td>
<td>2.709</td>
<td>(0.116)</td>
<td>(0.43)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age dependency</td>
<td>-0.053***</td>
<td>0.002</td>
<td>(2.860)</td>
<td>(0.107)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban population</td>
<td>0.046</td>
<td>0.016</td>
<td>0.014</td>
<td>0.019</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>omitted</td>
<td>omitted</td>
<td>-18.32***</td>
<td>-13.50**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Country fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Time fixed effects | Yes | Yes | No | No | Yes | Yes |
| Observations | 2,058 | 1,961 | 2,058 | 1,961 | 1,972 | 1,953 |
| R-squared | 0.943 | 0.948 | 0.818 | 0.821 | 1.972 | 1.953 |
| Number of country | 113 | 113 | 113 | 113 | 114 | 113 |
| F-Statistic (p.value) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Number of instrument | . | . | . | . | 107 | 107 |
| AR(1) Stat (p.value) | . | . | . | . | 0.000 | 0.000 |
| AR(2) Stat (p.value) | . | . | . | . | 0.264 | 0.268 |
| Hansen Stat (p.value) | . | . | . | . | 0.298 | 0.332 |

Tax natural represents direct receipts from natural resources (royalties, oil revenues and, when available, profits of natural resource exploitation firms). Figures have been collected from IMF Staff Report and Article IV. Columns (I) and (II) are estimated using PSCE estimators with panel specific correlation coefficients and with country and time fixed effects. Their related robust z-statistics are exposed in parentheses. Columns (III) and (IV) are estimated using OLS estimators with country fixed effects only. Inclusion of time fixed effects is indeed rejected with a joint p-value superior to 0.3 in both equations. Their related robust t-statistics are exposed in parentheses. Note that using WITHIN estimators leads to the same results and clustering the standard errors at the country level leads to non-significant coefficients for the age dependency ratio only. Finally Columns (V) and (VI) are estimated using two-step system GMM estimators. The lagged dependent variable as well as the openness rate and the agriculture share are in GMM style (instrumented with two lags). According to Roodman [2009] only the Hansen statistics is reported and in both equations, the statistics cannot reject the null hypothesis that instruments are valid. Robust and corrected standard errors (Windmeijer s.e. correction) are exposed in parentheses. **p ≤ 0.01, *p ≤ 0.05, p ≤ 0.1.
Table 15: Trend Comparison between HIPCs and the Narrow Control Group

<table>
<thead>
<tr>
<th>Dep. var. : Tax Effort</th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tax Effort Estimators</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCSE</td>
<td>-0.046</td>
<td>-0.046*</td>
<td>-0.045</td>
<td>-0.045</td>
</tr>
<tr>
<td></td>
<td>(-1.274)</td>
<td>(-1.745)</td>
<td>(-1.187)</td>
<td>(-1.632)</td>
</tr>
<tr>
<td>PCSE.L</td>
<td>.</td>
<td>.</td>
<td>-0.003</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>.</td>
<td>.</td>
<td>(-0.083)</td>
<td>(0.114)</td>
</tr>
<tr>
<td>LSDV</td>
<td>-0.018</td>
<td>-0.015</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td></td>
<td>(-0.460)</td>
<td>(-0.540)</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>LSDV.L</td>
<td>0.014</td>
<td>0.023</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td></td>
<td>(0.324)</td>
<td>(0.742)</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>SGMM</td>
<td>0.039</td>
<td>0.036</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td></td>
<td>(1.048)</td>
<td>(1.020)</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>Outliers (Niger)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Country Fixed Effects</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Observation</td>
<td>143</td>
<td>143</td>
<td>119</td>
<td>119</td>
</tr>
</tbody>
</table>

Trend comparisons are tested using an event-study methodology over the period [-10;-5]. We did not run the trend comparison over the entire pre-debt relief period because of potential incentive effects which might lead to significant increase in tax effort before debt relief is provided (as explained in part 2). We therefore split this 6-years-period in two ([-10;-8] and [-7;-5]) and test the average relative difference (before and after). In other words, we simply test the model (4) expose in part 3 over [-10; -5] and where the variable $Post_{i,t}$ is now a dummy variable that takes 1 for years superior or equal to -7, and 0 otherwise. Column (I) estimates model (4) for all tax effort estimators but without country fixed effects and with Niger which presents over-estimated tax effort indexes when using PCSE estimators. Column (II) tests model (4) with country-fixed effects. Column (III) and (IV) estimate model (4) with tax efforts coming from PCSE first-stage estimates but removing figures for Niger. Results show that, whatever the model we use to estimate tax effort, there is no significant difference in the evolution of tax effort between HIPCs and the "narrow" control group over [-10; -5] which strengthens the decision of having chosen these countries as reference control group. Robust standard errors are exposed in parentheses *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$.

Table 16: Pairwise Correlation Matrix - Tax Effort Models

<table>
<thead>
<tr>
<th>Tax Effort Model</th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
<th>(VI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I)</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(II)</td>
<td>0.893</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(III)</td>
<td>0.897</td>
<td>0.957</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(IV)</td>
<td>0.880</td>
<td>0.969</td>
<td>0.985</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(V)</td>
<td>0.424</td>
<td>0.444</td>
<td>0.446</td>
<td>0.447</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>(VI)</td>
<td>0.453</td>
<td>0.475</td>
<td>0.455</td>
<td>0.465</td>
<td>0.937</td>
<td>1.000</td>
</tr>
</tbody>
</table>

All correlations are statistically significant at the 1% level
Table 17: Alternative Selection Criteria, Alternative Control Groups

<table>
<thead>
<tr>
<th>Panel A &amp; Panel B</th>
<th>Debt-to-Domestic Revenues Ratio sup. 300 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>India</td>
</tr>
<tr>
<td>Armenia</td>
<td>Indonesia</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>Kenya</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>Kyrgyz Republic</td>
</tr>
<tr>
<td>Bhutan</td>
<td>Lao PDR</td>
</tr>
<tr>
<td>Bosnia and Herzegovina</td>
<td>Lesotho</td>
</tr>
<tr>
<td>Cambodia</td>
<td>Moldova</td>
</tr>
<tr>
<td>Eritrea</td>
<td>Myanmar</td>
</tr>
<tr>
<td>Georgia</td>
<td>Nepal</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Panel A: LIC average status (3/5)
Panel B: LIC average status (5/5)

<table>
<thead>
<tr>
<th>Panel C</th>
<th>Debt-to-Exports Ratio sup. 175 % &amp; LIC average status 5/5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>Kenya</td>
</tr>
<tr>
<td>Bhutan</td>
<td>Kyrgyz Republic</td>
</tr>
<tr>
<td>Cambodia</td>
<td>Lao PDR</td>
</tr>
<tr>
<td>Eritrea</td>
<td>Lesotho</td>
</tr>
<tr>
<td>India</td>
<td>Nepal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel D</th>
<th>Debt-to-Exports Ratio sup. 200 % &amp; LIC average status 3/5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>Lao PDR</td>
</tr>
<tr>
<td>Bhutan</td>
<td>Lesotho</td>
</tr>
<tr>
<td>Eritrea</td>
<td>Nepal</td>
</tr>
<tr>
<td>Georgia</td>
<td>Nigeria</td>
</tr>
<tr>
<td>Kyrgyz Republic</td>
<td>Pakistan</td>
</tr>
</tbody>
</table>

Table 18: ICTD Dataset - Disaggregated taxes & data availability - 117 Developing Countries [1993-2012]

<table>
<thead>
<tr>
<th>Variables (in % of GDP)</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Obs.</th>
<th>% missings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indirect Taxes</td>
<td>9.46</td>
<td>4.65</td>
<td>1683</td>
<td>26.83</td>
</tr>
<tr>
<td>of which Taxes on goods and services</td>
<td>5.78</td>
<td>3.18</td>
<td>1629</td>
<td>29.17</td>
</tr>
<tr>
<td>of which Taxes on international trade</td>
<td>3.50</td>
<td>3.67</td>
<td>1627</td>
<td>29.26</td>
</tr>
<tr>
<td>Direct Taxes</td>
<td>4.30</td>
<td>2.77</td>
<td>1672</td>
<td>27.30</td>
</tr>
<tr>
<td>of which Taxes on income</td>
<td>3.99</td>
<td>2.62</td>
<td>1567</td>
<td>31.87</td>
</tr>
<tr>
<td>of which Taxes on profit gains</td>
<td>0.31</td>
<td>0.93</td>
<td>1050</td>
<td>54.35</td>
</tr>
</tbody>
</table>