IMF Working Paper

A Constrained Choice?
Impact of Concessionality Requirements on
Borrowing Behavior

Calixte Ahokpossi, Laurence Allain, and Giovanna Bua

INTERNATIONAL MONETARY FUND

WP/14/176

IMF Working Paper

Strategy, Policy, and Review Department

A Constrained Choice?
Impact of Concessionality Requirements on Borrowing Behavior

Prepared by Calixte Ahokpossi, Laurence Allain, and Giovanna Bua[1]

Authorized for distribution by Peter Allum

September 2014

Abstract

This paper uses the propensity matching score approach to assess the impact of the IMF's debt
limits policy (DLP) on borrowing behavior in countries eligible to borrow from its concessional
lending window. The paper finds that countries under the DLP borrow significantly higher amounts
of concessional resources. However, there is no evidence that the DLP significantly impacts the
level of non-concessional borrowing nor the terms of such borrowing. This result is confirmed by
the heterogeneity analysis, suggesting that the level of development, rather than concessionality
requirements, is the key driver of non-concessional borrowing.

Contents   Page

I. INTRODUCTION

Sovereign debt crises have been recurrent throughout history and often lead to the restructuring of sovereign obligations to give the crisis country room to grow and repay its remaining obligations. The restructuring usually takes the form of reduction of stock of debt (haircut) granted by creditors. Some of the most prominent debt restructuring operations in recent decades are the Brady Bond restructuring (essentially in emerging markets), and the Highly Indebted Poor Countries (HIPC) Initiative and the Multilateral Debt Relief Initiative (MDRI) for low-income countries (LICs).[2]

To prevent the occurrence or reoccurrence of these debt crises, countries have adopted, on their own or through various international commitments (IMF programs, regional convergence criteria, engagement with other multilateral institutions), some rules to guide their borrowing behavior. In this paper, we assess effectiveness of the IMF's debt limits policy (DLP) on borrowing behavior in countries eligible to its concessional lending window (the Poverty Reduction and Growth Trust, PRGT).[3]

The IMF's debt limits policy guides borrowing policy in countries with an economic program supported by a Fund arrangement. A key feature of the policy in countries with access to concessional financing is that it distinguishes loans based on concessionality, i.e., the level of their grant element.[4] Under the DLP, while access to non-concessional borrowing is limited, access to highly concessional borrowing is generally unconstrained;[5] implying that in principle countries could accumulate as much concessional debt as is available to them.

---

[2]The debt relief effort for low-income countries started in 1988 with the *Toronto terms* and the forgiveness of a third of bilateral debt for eligible countries. The Initiative was followed by three consecutive rounds of debt relief, culminating in the forgiveness of 90 percent of bilateral debt under the *Cologne terms*. As these reductions proved to be insufficient, the debt relief effort was extended to multilateral agencies. Multilateral forgiveness began with the HIPC Initiative in 1996 and it continued with the approval of the MDRI in 2005. The HIPC Initiative entailed coordinated action by multilateral organizations and official bilateral creditors to reduce to sustainable levels the external debt burdens of the most heavily indebted poor countries. The MDRI goes further by providing fuller debt relief on multilateral obligations to free up additional resources to help these countries reach the MDGs (IMF, 2013c).

[3]The PRGT is a trust fund that provides concessional resources for poor countries with limited access to international markets. Criteria guiding entry into and graduation from the PRGT can be found in "Eligibility to Use the Fund's Facilities for Concessional Financing".

[4]The grant element is the difference between the face value of the loan and its present value, expressed in percent of the face value. Up to October 2013, to calculate the grant element, the IMF used a variable discount rate linked to commercial interest reference rates (CIRR) calculated by the OECD. Since that date, it uses a fixed discount rate of 5 percent (see *Unification of Discount Rates Used in Debt Sustainability Analysis for Low Income Countries*). For the purposes of the IMF debt limits policy, concessional loans are typically defined as those with a grant element of 35 percent of higher, although the threshold can be higher in countries at high risk of debt distress.

[5]IMF (2013a).

While the financial terms of concessional borrowing are very favorable, a high amount of concessional debt can compromise debt sustainability (IMF 2013a).

In this paper, we analyze the impact of DLP on the level of new borrowing as well as on the terms of borrowing in order to understand the effect of IMF conditionality on borrowing behavior in low-income countries.

Participation in an IMF program is used to proxy the existence of concessionality requirements under the DLP. First, the DLP only applies to countries under an IMF program. Second, the concessionality requirements under the DLP are present in all IMF programs with LICs (hence our focus on countries eligible to receive concessional financing).[6] Third, even though Fund programs encompass a variety of other measures (fiscal, monetary, financial, etc), the DLP is the only one that affects the terms of borrowing; it also affects, in conjunction with fiscal policy, the amounts borrowed, including via limits on non-concessional borrowing.

A challenge in identifying the impact of the DLP on LICs is the potential for endogeneity of IMF program participation. IMF programs are usually concluded in times of economic crises, therefore the conditions of countries that enter and remain under IMF programs are not the same as for those that abstain. If those conditions differ, difference in borrowing behavior might depend not only on the program (being subject to the DLP) itself but also on these initial conditions. Failure to control for these initial conditions would result in a selection bias problem. The literature on the impact of IMF programs has used various methods to deal with the selection problem, from early before–after studies (Reichmann and Stillson, 1978; Connors, 1979; Pastor, 1987, Killick, 1995) to more recent works which use Heckman's (1979) methodology (i.e., Przeworski and Vreeland, 2000), the instrumental variables approach (Barro and Lee, 2005; Easterly, 2005; and Nsouli, Mourmouras, Atoian, 2005), or the method of matching (Atoyan and Conway, 2006; Hardoy, 2003; Bal Gunduz and others, 2013).[7]

---

[6]The only exception being Georgia's 2012 program that did not include a concessionality requirement (IMF 2013a).

[7]All these approaches present pros and cons -relative to the specific context that should be carefully pondered by the analyst. The matching is a consistent estimator of causal parameters under the hypothesis of "selection on observables" (see Cerulli, 2012; Przeworski and Limongi, 1996), hence it results in unbiased estimates only if the decision to enter IMF programs can be accounted by the selection procedure (Przeworski and Limongi, 1996). Nonetheless, it is generally preferred to other estimators as it does not require the identification of any specific parametric relation between the dependent variables and the regressors. On the contrary, the Heckman Selection Model (1979) is suitable—other than under selection of observable—also under "selection on unobservable", but it depends implicitly on auxiliary restrictions such as the distribution of the unobservable. Finally the challenge with the Instrumental Variable (IV) approach, even if suitable for both selection of observable and unobservable without assuming any distributional hypothesis, is in finding variables that affect the probability of program participation but do not affect the outcome variables other than through their impact on participation.

To address the self-selection problem of being under an IMF program, we use the statistical technique known as "propensity score matching" (PSM).[8] In addition to examining the overall effect of the DLP on borrowing behavior, we also investigate whether there is any heterogeneity in its impact, i.e., is whether the treatment varies across members of the population. To this end, we explore the following sources of heterogeneity: level of development (GNI per capita), infrastructure gap, growth prospects and total debt. Our paper is the first study that uses propensity score matching to analyze the impact of the DLP on borrowing behavior.

We find that the level of concessional borrowing is significantly higher in countries under the DLP, suggesting that the presence of an IMF program could play a catalytic role in attracting more concessional resources. We do not find evidence that the DLP significantly impacts the level of non-concessional borrowing (private or otherwise), suggesting that LICs have not been able to attract significant amounts of non-concessional financing, irrespective of the policy constraint. The results also indicate that the terms of borrowing on new loan commitments are not significantly affected by concessionality requirements under the DLP. Finally, the heterogeneity analysis (conducted for robustness check) confirms that terms of borrowing as well as the level of non-concessional borrowing are not affected by the DLP, but are affected by the level of development.

The rest of the paper is organized as follow. Section 2 describes our dataset and the methodology. In section 3, we estimate the average treatment effect of DLP on the treated group, employing a variety of propensity score matching methods. In section 4, we explore the heterogeneity feature of the treatment effect utilizing control function regression approach. Section 5 offers our conclusion.

---

[8]Propensity score matching was first proposed by Rosenbaum and Rubin (1983) and it has been used—with increasing interest—in many non randomized studies (e.g., Dehejia and Wahba, 1999; Hong and Yu, 2008; Ye and Kaskutas, 2009; Wyse, Keesler, and Schneider, 2008; Staff, 2008). In the macroeconomics literature, it has been recently used, to study the effects of the inflation targeting arrangement on macroeconomic performances (see Lin and Ye, 2009; Lin, 2010), the effects of fiscal rules on fiscal behavior in developing countries (Tapsoba, 2012), the economic impacts of foreign capital flows (see Chari, Chen, and Dominguez, 2012) and the impact of different strategies to respond to crisis (Forbes, 2013). Amongst the studies on the impact of IMF Fund-supported program, propensity score matching has been recently used by Atoyan and Conway (2006) Hardoy (2003), Hutchison (2004), and Bal Gunduz and others, (2013). It worth reminding that the PSM has been developed for a micro setting and its application in a macro environment may suffer from some limitations. As we describe more in details in the Section II, the reliability of the PSM results depends on whether or not the conditions for the application of the methodology are met.

II. DATA AND METHODOLOGY

A. Data

Our dataset consists of 70 countries that were eligible to receive concessional financing from the IMF throughout the sample period 1986–2011 (countries are listed in Table 1).[9] Most of the data are drawn from the World Bank's World Development Indicator and the IMF's World Economic Outlook. Following Barro and Lee (2005) and Jorra (2012), we arrange all the data in five-year frequencies; hence our panel covers 70 countries over the five-year periods 1986–91, 1992–96, 1997–2001, 2002–06, 2007–11. Amongst the 70 countries, 57 countries benefited from IDA-only lending and 13 received a mix of IDA and IBRD lending.[10] Also, 39 countries in the sample received debt relief under the HIPC initiative and MDRI. The focus on this specific sample helps address some of the concerns raised by the literature on IMF's engagement. As pointed out by Steinwand and Stone (2008), the heterogeneity of IMF's program weakens the ability to identify a satisfactory selection model of participation in IMF programs. Our focus on countries eligible to receive concessional financing helps create a homogeneous sample while ensuring that the control group provides a good counterfactual for the treatment group.

The dependent variable is a dummy variable that takes the value one if a country is under an IMF program for at least three years in a five years window.[11] This variable was supplied to us by Bal Gunduz and others (2013). The qualifying programs are all IMF financial arrangements available to countries eligible to receive concessional financing—primarily the Extended Credit Facility (ECF) and its predecessors (the Poverty Reduction and Growth Facility (PRGF), the Extended Structural Adjustment Facility (ESAF), and Structural Adjustment Facility (SAF), but also the Stand-By-Arrangement (SBA), the Exogenous Shock Facility (ESF), the Standby Credit Facility (SCF)—as well as the Policy Support Instruments (PSI). The qualifying programs encompass both those with protracted BOP needs as well as those with immediate BOP needs, requiring both adjustment and financing.

We assess borrowing behavior in the presence of the debt limits policy by looking at external public debt along two different dimensions. For each dimension we use different groups of variables:

---

[9]A country is PRGT-eligible, if: (i) its annual per capita income is below the operational IDA cut-off ; and (ii) the sovereign does not have capacity to access international financial markets on a durable and substantial basis (IMF, 2013b).

[10]As of 2011.

[11]Alternatively, we define the treatment as "being under DLP and/or IDA Non Concessional Borrowing Policy" (NCBP), in order to include the debt limits imposed by IDA since 2006. The variable is proxied by a dummy variable that takes value one if a country is under IMF program and/or IDA NCBP for at least three years in a five years window. The two variables overlap almost perfectly, hence no difference is found in the results.

i) Size of borrowing, which is proxied by the total amount of public and publicly guaranteed (PPG) loan commitment and disbursement as a share of GDP. We also look at the sources of PPG debt flows by breaking them down into concessional versus non-concessional loans,[12] official (bilateral and multilateral) loans versus private loans. We treat the largest source of borrowing for most low income countries (IDA loans) as a separate variable;[13]

ii) Terms of borrowing, which are proxied by the average grace period, the average interest rate, the average maturity, and the average grant element on new external debt commitments. Data are draw from the World Bank's Debt Reporting System (DRS).

Summary statistics and description of the variables are provided in Tables 2–5. As depicted in Figures 2 and 3, countries under the DLP show on average a higher level of disbursement of concessional PPG External Debt (as a percent of GDP), a higher average grant element and in general better average financial terms. We do not observe any difference in the level of non-concessional borrowing (as a percent of GDP).

B. Methodology

This simple comparison of the flows of external debt in countries under the DLP and in countries not subject to the DLP is likely to yield biased results, as participation in IMF program (and therefore being subject to the DLP) is endogenous and depends on many factors (Bal Gunduz and others, 2013). To account for this endogeneity, we consider the participation in an IMF program as a *treatment* and refer to countries that have been under IMF program as *treated group* and to the nonprogram countries as the *control group*. Then, the *average treatment effect* for the treated (ATT; Imbens, 2004) is given by:[14]

---

[12]A comprehensive debt data based on the DLP definition of concessionality is not readily available. Instead, we used the data from the World Bank's Debt Reporting System (DRS), which defines concessional debt as loans with an original grant element of 25 calculated discounting future service payments at 10 percent, while the DLP is based on a concessionality threshold of 35 percent grant element calculated using CIRRs discount rate. Our results are however robust to this discrepancy in definition as confirmed by our analysis in Table 8. We computed an alternative grant element using a 5 percent discount rate to get as close as possible the DLP definition of concessionality. The results based on this alternative variable are similar to those based on the grant element taken from the DRS database. We conducted other robustness checks using this alternative variable, and the results are available upon request.

[13]In the current Debt Limit Policy the concessionality ceiling applies to PPG External Debt Commitments. Therefore, we would ideally use as dependent variable the breakdown of PPG External Debt *Commitments*. However, given the lack of data on concessional/non concessional dichotomy for External Debt Commitments, we use 5 year period average of External Debt *Disbursement*, which we expect being a good proxy of 5 year average of External Debt *Commitments*.

[14]A related measure of treatment effect is the ATE at the population level (Imbens, 2004), that is the average treatment effect of moving an entire population from untreated to treated. Applied researchers should decide whether ATT or ATE are of greater interest for their research. ATT might be more appropriate when estimating the impact of a structured program with potentially high barriers to participate. In contrast, when testing the effect of wide spread treatment (i.e., brochures given to patients) ATE might be of greater interest.

$$ATT = E\,[\,Y_{I1}|D_I = 1] - E\,[\,Y_{I0}|D_I = 1] \quad (1)$$

Where D is the dummy variable that identifies a country as being subject to the debt limits policy. Y_{I1} is the value of the outcome variable when country i is "under the Debt Limits Policy" and Y_{I0} if it is not. $[\,Y_{I0}|D_I = 1]$ is the outcome value that would have been observed if country i had not been subject to the DLP, and $[Y_{I1}|D_I = 1]$ is the outcome value actually observed for the same country (subject to the DLP).

Unfortunately, the counterfactual impact of the treatment— $[\,Y_{I0}|D_I = 1]$—is not observed, therefore one has to choose a proper substitute for it in order to estimate an unbiased ATT. To this end, we use a statistical technique known as "propensity score matching" (PSM). It consists of finding in a large group of nonparticipants individuals who are similar to the participants in all relevant characteristics X and pair them. Then, differences in outcomes between the control group and the participants can be attributed to the treatment (DLP in our case). The key assumptions that need to be met to apply PSM are: i) conditional independence assumption (CIA); and ii) common support.

The first condition requires the selection into treatment to be driven only by factors that the researcher can observe. Under this assumption equation (1) becomes:

$$ATT = E\,[\,Y_{I1}|D_I = 1, |X_i\,] - E\,[\,Y_{I0}|D_I = 0|X_i] \quad (2)$$

Where $E\,[\,Y_{I0}|D_I = 1]$ has been replaced by $E\,[\,Y_{I0}|D_I = 0|X_i]$ which is observable.

Since, conditioning on a high number of covariates in X might be complicated (the so called "curse of dimensionality"), Rosenbaum and Rubin (1983) suggest matching on probability score, i.e., the probability of participating in a program given observed characteristics X, instead of matching on X. The second assumption requires that every subject has a non-zero probability to receive a treatment so that for each treated subject, there is a comparable control subject. Rosenbaum and Rubin (1983) demonstrate that under those two assumptions treatment assignment is strongly ignorable and conditioning on propensity score can be used to obtain unbiased average treatment effect estimates and equation (2) can be written as follow:

$$ATT = E\,[\,Y_{I1}|D_I = 1, |p(X_i)] - E\,[\,Y_{I0}|D_I = 0|p(X_i)] \quad (3)$$

Since propensity score matching entails forming matched sets of treated and untreated subjects who share a similar value of propensity score (Rosenbaum and Rubin, 1983), once a matched sample has been formed, the treatment effect can be directly estimated by comparing outcomes between treated and untreated subject in the matched sample.

The methodology involves two steps: the first one is the estimation of the propensity scores, i.e., the probability that a country would have agreed to an IMF program ex-ante, regardless of what the actual outcome was. In the second one, the *propensity scores* are used to match countries that had an IMF program with similar countries (propensity-wise) that did not have an IMF program. This process of "balancing" program and non-program observations by propensity scores controls for systematic differences between the two groups prior the decision whether to participate in a Fund program.[15]

The results of the propensity score matching should be interpret with care. The reliability of the PSM results depends on whether or not the conditions for the application of the PSM methodology are met. As we previously described, PSM relies on two main assumptions: i) Conditional Independence Assumption (CIA); and ii) common support. The first one requires the selection into treatment to be driven only by factors that the researcher can observe; hence it implies that omitting important variables can seriously increase bias in resulting estimates. In order to credibly justify the CIA, it is important to first discuss whether the available empirical evidence casts doubts on its plausibility; and then to identify a selection model broadly accepted by the literature. In other words, a model which properly identifies the likelihood of being under an IMF program is *conditio sine qua non* for the correct use of PSM. The second assumption—the common support—ensures that countries with the same characteristics X have the same positive probability of being both participants and nonparticipants (Heckman, Lalonde, and Smith, 1999).

III.   ESTIMATING AVERAGE TREATMENT EFFECT

A.   Estimating the participation equation (or propensity scores)

We estimate the propensity score by using a probit model with the probability of being under IMF program/DLP as the dependent variable.[16] As independent variables, we use economic and political variables that capture both demand and supply factors and that have been broadly identified by the literature as predictors of participation in IMF programs.[17] We ran the PSM on different selection models using DLP as a dependent variable and we chose the one that guarantees the inclusion of a large number of covariates without increasing the bias

---

[15]The literature proposes different type of estimators to match treated and untreated observations. In this paper we present the result for the *radius matching* and the *kernel matching* because they guaranteed the best balancing for all relevant confounders (as proved by the Absolute Standardized Bias).

[16]Time dummy variables are included in all regressions to account for aggregate time effects.

[17]E.g., Barro and Lee, 2005; Bird and Rowlands, 2007; Broz and Hawes, 2006; Brune, 2004; Dreher, 2006; Edward, 2005; Bal Gunduz and others, 2013; Presbitero and Zazzaro, 2012; Przeworsk and Vreeland, 2000; Vreeland, 2003). A detailed description of our variables and the source of information can be found in Table 2 in Appendix.

(Table 6, column 1 for our baseline model).[18,19] Our estimation is broadly similar to the one by Bal Gunduz and others (2013). Table 6, column 2, reports results of the probit estimates using an alternative dependent variable (being under a Fund program, or being under the World Bank's Non-concessional Borrowing Policy (NCBP)).[20] The results remain almost identical to those of Table 6, column 1.

In general, we assume that i) countries turn to the IMF when their economies face economic challenges and that ii) IMF lending policy in LICs is responding to the degree of their external imbalance, their macroeconomic conditions, their size and institutional and political proximity with the IMF key shareholders. Given this backdrop, we expect Fund assistance to be more likely in countries with fragile macroeconomic conditions, unfavorable structural characteristics, weak institutions, and tighter political and economic links with the IMF.

Starting from countries' macroeconomic conditions, in line with the major evidence in the literature,[21] we find that a shortage of official reserves significantly increases the likelihood of entering a program agreement with the Fund. As regard bilateral aid, we do not find any significant correlation with the dependent variable. The expected sign is ambiguous *a priori*. According to Dreher, Sturm and Vreeland (2009), when the availability of bilateral aid is lower, the pressure to draw on multilateral resources is stronger. Supporting this view, Bal Gunduz and others (2013) find a negative significant relation between the likelihood of an IMF program and aid. On the other hands, Alesina and Dollar (2000) maintain that bilateral foreign assistance is widely used by donors as foreign policy instrument responding to their strategic interests in the recipient countries and can be expected to have a catalytic effect on IMF lending. Our results do not help distinguish between these competing theories. Finally,

---

[18]It is important to point out that our objective here is not to build a statistical model perfectly explaining participation in IMF programs, but to mimic a controlled experiment in the best possible way. To do so, when selecting the variables, we give much attention to the implementation rules proposed by the literature (Caliendo and Kopeining, 2007; Persson, 2001). In particular, according to the Conditional Independence Assumption, the PSM produces bias estimates if variable that affect simultaneously the assignment process and the outcome variables are omitted. By the same token, as pointed out by Persson (2001) omitting variables that affect only the assignment process, but not the outcome variables, have little influence on the results. Secondly, only variables that are unaffected by the participation (or its anticipation) should be included in the model. To ensure this we include variables either calculated at the beginning of the 5-year period or fixed over time.

[19]The result of other models including further control variables are presented in Appendix Table A1. In particular we run the selection model reported in Table1, including additional covariates. We also run a more parsimonious specification including only significant variables (Table A1, column 11).

[20]IDA's NCBP was introduced in July 2006 in response to donor concerns about debt sustainability risks posed by external non-concessional borrowing in grant-eligible and MDRI recipient countries. It aims to prevent countries that benefit from debt relief and grants from rapidly accumulating new non-concessional debt (World Bank, 2006).

[21]Cornelius, 1987; Knight and Santaella, 1997; Vreeland, 2003; Barro and Lee, 2005; Sturm, Berger and De Haan, 2005.

in line with Bal Gunduz and others (2013) we don't find evidence that trading partner growth impacts the likelihood of being under an IMF program.

Consistently with the literature we find that the probability of being under an IMF program is higher in poorer countries and is lower in countries that benefit from higher resource rents (Bal Gunduz and others, 2013).[22] We also find that countries with high levels of inflation were slightly less likely to sign an IMF program. This result, which might be difficult to justify, is partially in line with the literature that find different results depending on the samples and time periods under consideration. In particular, Pop-Eleches (2008) finds a negative relation for Latin America in the period 1990–2001; Biglaiser and DeRouen Jr. (2010) do not find any significant result while Presbitero and Zazzaro (2012) find a positive and significant relation.

The structural characteristics of a country also contribute to explain the likelihood that the country has an IMF program. As expected, landlocked resource-scarce countries have a higher probability of being under an IMF program (Bal Gunduz and others, 2013). We also control for the possibility that the IMF rewards more globalized countries, either because of their closeness to "*Washington Consensus*" prescriptions or because they are more prone to suffer from spillover effect of crises. In line with Presbitero and Zazzaro (2012) and Bal Gunduz and others (2013) we do not find evidence of a significant relation.

Institutional characteristics are shown to increase the probability of being under an IMF program. We find that the World Bank's Country Policy and Institutional Assessment (*CPIA*) is positively and significantly correlated with the dependent variable,[23] while being a democracy is not significantly correlated with the dependent variable. The sign of this relation is not conclusive in the literature. In particular, democracy might impact the dependent variable either way. Autocratic governments are, in fact, less concerned with the popularity of their economic policy decisions and therefore may be more likely to ask for IMF support, but are also less interested in using IMF assistance to spur macroeconomic adjustment programs. Supporting the negative relation, Bird (2004) find that countries with weak state institutions are more likely to borrow from the IMF repeatedly, while Jensen (2004) and Nooruddin and Simmons (2006) do not find any significant relation.

Finally, one of the most robust finding that emerges from the literature on the determinants of IMF lending is that program requests are in part determined by a country's political and economic links with IMF influential shareholders. To capture the country's relationship with

---

[22]Joyce, 1992; Garuda, 2000; Dreher and Vaubel, 2004; Barro and Lee, 2005; Sturm, Berger and De Haan, 2005; Eichengreen, 2006.

[23]This may reflect the fact that the sample includes many good performers, with strong policy environment, typical users of IMF's nonfinancial arrangements.

the IMF, we include the country's size and its IMF quota, which might increase the likelihood of the Fund to intervene (Barro and Lee, 2005; Bal Gunduz and others, 2013; Stone, 2008). We find a positive but not significant relation. This result might be explained by the peculiarity of our sample, composed by countries whose size does not significantly differ.

B. Matching method and results

Before applying the matching methods, we make sure that the common support assumption is met. To this end, we implement the minimum-maximum criterion, by excluding all observations in the control group whose propensity score is smaller than the minimum and larger than the maximum in the treated group.

We used the results of the propensity scores estimated above to match countries under the DLP with countries in the control group using two methodologies. First, the radius matching which matches each country under the DLP with control countries within a certain radius (we used R=0.05 and R=0.1). Second, the kernel matching, which matches each country under the DLP with all control countries weighted proportionally to their closeness to the DLP country.[24] As the matching estimator presents no analytical variance, we compute standard errors by bootstrapping (see Dehejia and Wahba, 1999). We looked at two sets of debt indicators: the volume of borrowing (disbursement and commitment basis) and its financial terms (interest rate, maturity, grace period and grant element).

Table 7 reports the estimated average treatment effect on the treated (ATTs) on all the outcome variables. The results are broadly consistent across matching methods. They indicate that, on average, the total amount of borrowing (disbursement and commitment) is significantly higher in countries under the DLP than it would have been in the absence of the policy. Looking at the components of total borrowing, the results show that the level of concessional borrowing (disbursement and commitment) is significantly higher in countries under the DLP than it would have been in the absence of the policy, while the ATT on the level of non-concessional borrowing is not significant. In line with the finding on concessional borrowing, we also find that countries under the DLP receive higher amounts multilateral and bilateral loans,[25] whereas the level of borrowing granted by private creditors is not statistically different in the two groups. The results also show that the ATT on average

---

[24]We retained the radius matching and the kernel matching because they guaranteed the best balancing for all relevant confounders (as proved by the Absolute Standardized Bias). As pointed out by Heckman, Ichimura and Todd (1997), asymptotically, all PSM estimators should yield the same results but in small sample the choice of the matching algorithm can be important. Pragmatically we should choose the matching method that guarantees the best balancing on the X variables -and hence the highest bias reduction.

[25]Multilateral and bilateral creditors are the main, if not the only, providers of concessional loans.

grant element, average interest rate, average maturity and average grace period is not significant.

In sum, we do not find evidence that DLP significantly impacts the level of non-concessional borrowing (private or otherwise) and the terms of borrowing on new commitment, suggesting perhaps that, over the period covered by our analysis, the policy was not binding as LICs were not able to attract significant amounts of non-concessional financing. Even if beyond the scope of this analysis, this result is in line with previous studies on the catalytic effect of IMF programs on private lending, which indicate that countries with weak fundamentals do not experience catalysis (Mody and Saravia, 2003; Bordo, 2004; Bird and Rowlands, 2007). Also, we find that the level of concessional borrowing (as a percent of GDP) is significantly higher in countries under the DLP, suggesting a possible catalytic role of IMF programs in countries eligible to receive concessional financing. However, the higher level of concessional borrowing in countries under the DLP should be interpreted with caution, as the literature is not unanimous on its rationale. Bird and Rowlands (2007) suggest that IMF programs crowd in lending at favorable terms. However, one could argue that the higher level of donor assistance observed in countries under IMF programs may simply be reflecting the fact that the same factors (GDP per capita, size of the country, etc.) that affect donors' allocation of aid to countries (Kinda and Le Manchec, 2012) simultaneously affect the likelihood of being under the DLP.

Robustness checks

In this section, we explore the robustness of the results to: (i) an alternative selection model; an analysis of the difference in outcome variables instead of their level; and (ii) hidden biases.

The matching samples (treated and control) are affected by the selection model used. To ensure that the inclusion of some insignificant variables in the baseline model (Table 6, column 1) does not bias the results, we re-estimate a parsimonious model including only variables that were significant in the baseline (Table A1, column 11). The results of the matching associated with this model are presented in Table A2. They are broadly in line with the results of the baseline model.

Turning to the analysis of the outcome variables in difference (instead of level), a significant change in the total borrowing commitment under the DLP is observed, however, no significant change in total and concessional disbursements is detected (Table A3). The significant impact of borrowing commitment corroborates the findings above and further points to a catalytic role of Fund program. The lack of significance of the change of disbursement under the DLP perhaps reflects the fact that capacity constraints in receiving countries limits their ability to avail themselves of all resources available (commitment). Another similar explanation could be that concessional disbursements provided as budget

support may be more responsive to IMF programs than project support disbursements (which are more sensitive to capacity constraints).

Hidden bias arising from the omission of important covariates would weaken or invalidate the key assumption behind the PSM, the conditional independence assumption. A specification of the participation equation including a number of highly significant variables should alleviate the hidden bias. In addition, the analysis of the outcome variables in difference (preceding paragraph) should help remove unobserved heterogeneity stemming from time-invariant country-specific factors not controlled for in the participation equation. We also conduct Rosenbaum's sensitivity analysis to test sensitivity of our findings to hidden bias.[26] The results (Table A4) confirm that total commitment as well as concessional disbursement are the least sensitive to hidden bias. The results of the sensitivity analysis should be interpreted with caution.[27] However, taken together with other safeguards explored above, it points to the robustness of our results.

IV. HETEROGENEITY ANALYSIS

The Average Treatment effect estimated above could mask some heterogeneity due to country-specific features,[28] in particular for variables for which no significant ATT was found. In this respect, the analysis presented in this section explores the determinants of terms of borrowing and the amount of non-concessional borrowing. At the same time, it complements the PSM approach of the previous section by assessing whether the counterintuitive lack of impact of DLP on the amount of non-concessional borrowing and on the terms of borrowing was due to heterogeneity that was not accounted for. In particular, we explore four possible sources of heterogeneity: i) level of development (richer LICs have higher access to non-concessional financing); ii) infrastructure gap (countries with large infrastructure gap tend to borrow at higher costs to close the gap); iii) growth prospects (the better the growth prospects the more inclined the country is to borrow at higher cost); and

---

[26]The test consists of manipulating the estimated odds of being under the DLP to see how much it can deviate from 1, the expected odds ratio for a randomized experiment, while results still remain robust. A variable is highly sensitive to hidden bias if conclusions change for Γ just barely larger than 1.

[27]Robins (2002) expressed skepticism about the usefulness of sensitivity analysis as he proved that Rosenbaum's Γ fit the criteria of a paradoxical measure: its magnitude increases as the analyst decreases the amount of hidden bias by measuring some of the unmeasured covariates. As such, this measure could be useful only if experts could provide a plausible and logically coherent range of Γ.

[28]In this paper we refer to heterogeneity as "how the effect of treatment varies across members of the population". As pointed out by Jann (2010), a basic paradigm of the literature on casual models is that there can be individual heterogeneity in treatment effects. Surprisingly, however, not much attention is usually paid to the explicit analysis of the heterogeneity of treatment effects in applied studies. In fact because all statistical quantities of interest can be computed only at the group level, the researcher necessarily "ignores" within-group individual level heterogeneity (Xie and others, 2012).

iv) total debt as a percent of GDP (higher level of debt burden may discourage non-concessional lending). Following Lin and Ye (2009) and Tapsoba (2012) we apply a control function regression approach and run a simple OLS within the common support previously identified.[29] The regression is defined as follows:

$$Y_{it} = \alpha + \beta DLP_{it} + \gamma Pscore_{it} + \theta X_{it} + \omega DLP_{it} * X_{it} + \varepsilon_{it}$$

Our dependent variables are the average grant element and average non-concessional borrowing (as a percent of GDP). We focus on the average grant element instead of other terms of borrowing as it is a continuous variable that summarizes interest, maturity and grace period. DLP_{it} is the dummy variable indicating whether country i was subject to the DLP at time t, $Pscore_{it}$ is the propensity score estimated in our selection model, X_{it} are the possible sources of heterogeneity, and finally the interaction term. The parameter ω captures the difference of the treatment impact due to X_{it}.

Table 8 presents the regression estimates using the average grant element as the dependent variable. The results confirm the finding of the previous section: for all specifications of the model, after controlling for the likelihood of being under the DLP (*Pscore*), there is no significant difference between the DLP countries and the control group (Table 8, column 1 and 2). We also find that the level of development is negatively correlated with the grant element (Table 8 column 3) suggesting that richer LICs (those with higher GNI) receive less favorable financing terms. This is line with the lending policy of most development partners, who offer their most generous lending terms to the poorest countries.

One of the most frequent complaints from LICs that are subject the Fund's DLP is that the policy is restrictive because the limited amount of concessional resources available to them constrains their ability to invest in public infrastructure. We postulate that countries with higher infrastructure gaps would tend to borrow more on non-concessional terms, so as to close their infrastructure gap. We proxy infrastructure by the number of telephone line per 100 people and we find that the coefficient is negative and significant (Table 8, column 4),[30] suggesting a positive relation between infrastructure gap and average grant element (smaller infrastructure gap results in a lower grant element).[31] This result could reflect the fact that the

---

[29]Among other methodologies for program evaluation, Wooldrige (2002) suggests the use an OLS regression that includes the propensity score as control variable in the outcome regression. One of the main drawbacks of this estimator is that the variation in the first-stage probit estimates is ignored when computing the standard error of the treatment effect.

[30]5-year period average.

[31]We tried a better proxy (infrastructure gap as measured by roads paved as a percent of total roads), but because of limited coverage of the variable, our sample size was significantly reduced, rendering the results questionable.

infrastructure gap is highly correlated with GDP per capita (Table 5), which is a key determinant of concessional resources allocation. This explanation is confirmed in Table 8, column 5: once we control for GNI per capita, the infrastructure gap becomes insignificant.

We also explored whether growth prospects affect borrowing behavior. If a country's growth prospects are better than previously expected for any reason (discovery of natural resources or ambitious new investment plan), non-concessional borrowing may increase to meet investment needs or in anticipation of higher income in the future. As a result, one would expect improving growth prospects to result in worsening borrowing terms. We proxy growth prospects by a variable that compared different vintages of WEO projections and we do not find any significant results (Table 8, column 6).[32]

Finally we test whether higher debt burdens may discourage non-concessional lending. In particular we explore the hypothesis that total debt, expressed as a percent of GDP, is positive correlated with the average grant element. We do not find any evidence of such a relation (Table 8, column 7).

Columns 8 and 9 display new results that repeat earlier regressions, but using values at the beginning of the 5-year period (instead of average values) for potentially endogenous variables. We find that above conclusions are unaltered.

Table 9 presents the estimations using average non-concessional borrowing (as a percent of GDP) as the dependent variable. The results reinforce those of the previous section. After controlling for the likelihood of being under the DLP, there is no significant difference between the DLP countries and the control group (Columns 1 and 2). In column 3 we analyze the heterogeneity of the treatment effect across different levels of development. GNI per capita is found to be positively and significantly correlated with non-concessional borrowing (as a percent of GDP) while DLP is not. This confirms previous evidence that countries turn to larger level of non-concessional borrowing when their economies grow richer, rather than because of the absence of a borrowing constraint under an IMF program.

Columns 3 through 7 use infrastructure gap, prospect growth and total debt, respectively, as source of heterogeneity. Columns 8 and 9 repeat the same regressions, but using values at the beginning of the 5-year period for potentially endogenous variables. The results confirm those of the previous table and suggest that the impact of the DLP on the volume of non-concessional borrowing is not significant and does not vary across different members of the population. The significance of the infrastructure gap, as proxied by the number of telephone

---

[32]To measure growth prospects, we calculate the growth rate of 5-years average GDP projections taken from WEO, based on the WEO projections at the beginning of the projection period.

line per 100 people (Column 8), is also in line with previous findings and reinforces the hypothesis that a higher level of development attracts non-concessional lending.

V. CONCLUSION

In this paper, we analyze the effectiveness of the IMF's debt limits policy (DLP) on borrowing behavior in countries eligible to borrow from the IMF's concessional window. This paper is the first paper that analyzes the impact of the DLP on borrowing behavior using propensity score matching to address the self-selection problem of being under IMF program.

We find that the level of concessional borrowing (as a percent of GDP) is significantly higher in countries under the DLP, suggesting either a possible catalytic role of Fund program in attracting concessional financing (multilateral and official bilateral creditors), or that factors that determine the presence of a Fund program also influence donors' allocation of their concessional resources to LICs.

We do not find evidence that the DLP significantly impacts either the level of non-concessional borrowing or the terms of such borrowing (interest rate, grace period, maturity and grant element). This suggests that LICs do not accumulate non-concessional loans more rapidly when not subject to the DLP. We also show that the DLP does not exert a significant effect on private creditors lending, suggesting that the policy does not discourage private creditors, perhaps because poor countries are not able to attract private lenders in the first place. Even if beyond the scope of this analysis, this result, which is in line with previous studies on the catalytic effect of the IMF programs on private lending, indicates that countries with weak fundamentals do not experience catalysis.

Finally the heterogeneity analysis suggests that countries turn to higher levels of non-concessional borrowing as their economies grow richer, not because of the absence of constraints on borrowing under the DLP. From a policy perspective, our results suggest that the absence of the concessionality requirements under the Fund's debt limits policy is unlikely to result in a major shift in financing toward non-concessional borrowing, especially in the poorest low-income countries.

While our study indicates that by itself, the presence of debt limits in IMF programs has no impact on non-concessional borrowing behavior, it does not exclude the possibility that it could have an impact in specific circumstances. For example, the 2009 reform introduced a substantial break from previous debt limits design by tailoring it to country circumstances (capacity and debt vulnerability in particular). Future work could take a closer look at debt dynamics since the reform to see whether the impact of the DLP on non-concessional borrowing has increased.[33] Another possible avenue of further research could examine

---

[33]The coverage of the post-2009 period in our sample is limited.

whether there is an overuse of concessionality requirements in LIC programs that dilutes their impact. As noted in IMF (2013a), debt limits are quasi-universal in LICs programs while there are less ubiquitous in GRA programs, where they generally complement fiscal targets. A blanket use of debt limits in LIC programs could be redundant with fiscal conditionality, potentially masking the impact of the DLP on specific countries or in specific circumstances. A granular study of the interaction of debt limits and fiscal conditionality could investigate whether concessionality requirements do matter for non-concessional borrowing in situations where the DLP truly complement the fiscal targets.

Appendix 1. Figures

Figure 1. PPG External Debt Disbursement (Percent of GDP)
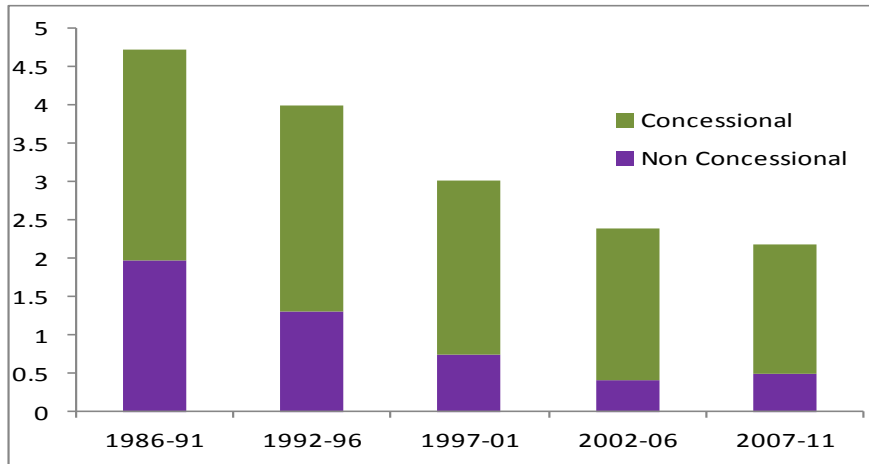
Sources: World Development Indicators (WDI); and authors' calculations.

Figure 2.1. Concessional Debt Disbursement (Percent of GDP)
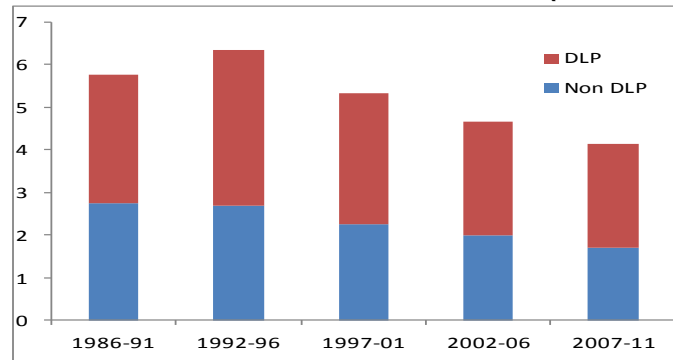
Sources: World Development Indicators (WDI); and authors' calculations.

Figure 2.2. Non Concessional Debt Disbursement (Percent of GDP)
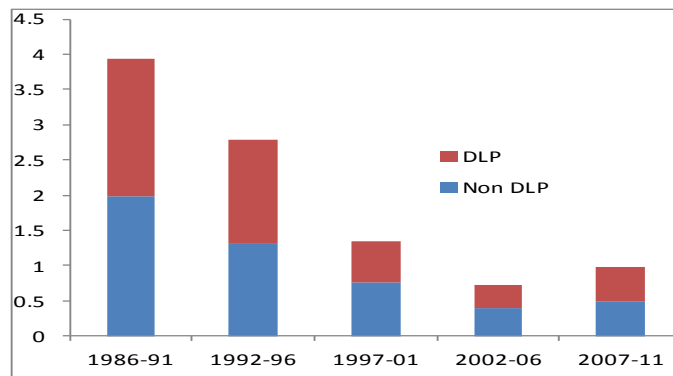
Sources: World Development Indicators (WDI); and authors' calculations.

Figure 3. Average Financial Terms
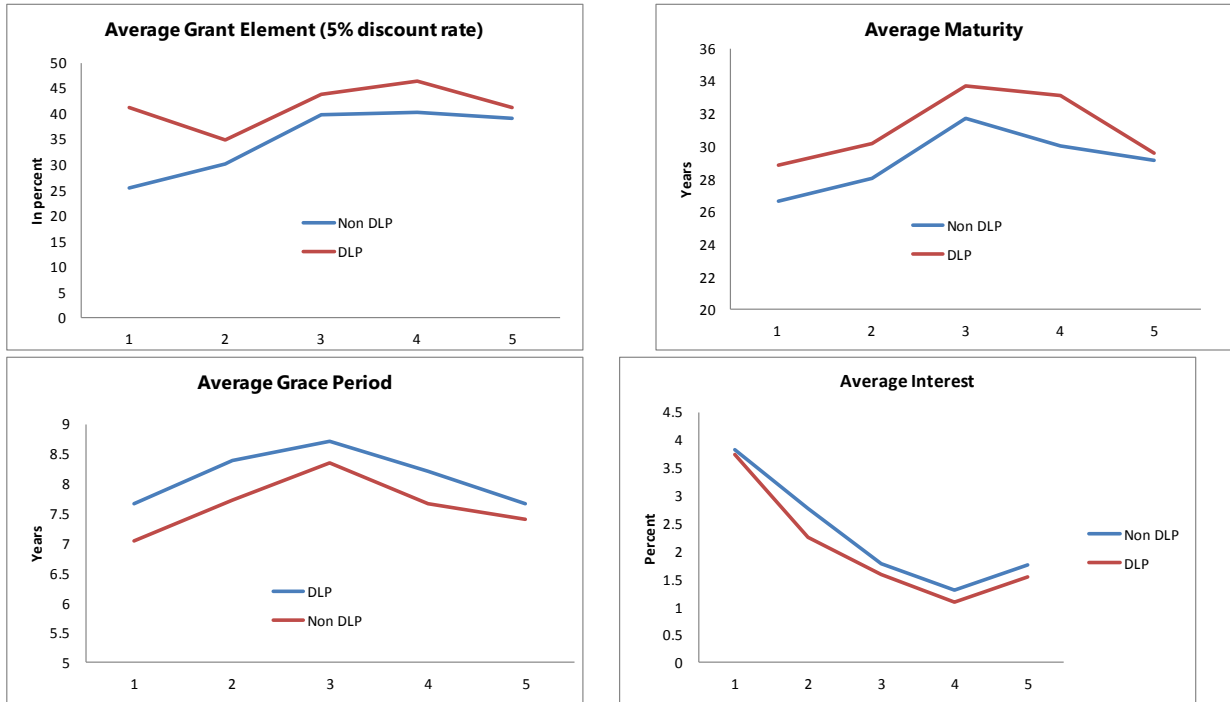
Sources: World Development Indicators (WDI); and authors' calculations.

Appendix 2. Tables
Table 1. List of Countries

Country	Region	IDA	HIPC	Country	Region	IDA	HIPC
Afghanistan, I. S. of	South Asia	1	1	Madagascar	Sub-Saharan Africa	1	1
Armenia	Europe & Central Asia	0	0	Malawi	Sub-Saharan Africa	1	1
Bangladesh	South Asia	1	0	Maldives	South Asia	1	0
Benin	Sub-Saharan Africa	1	1	Mali	Sub-Saharan Africa	1	1
Bhutan	South Asia	1	0	Mauritania	Sub-Saharan Africa	1	1
Bolivia	Latin America & Caribbean	0	1	Moldova	Europe & Central Asia	1	0
Burkina Faso	Sub-Saharan Africa	1	1	Mongolia	East Asia & Pacific	0	0
Burundi	Sub-Saharan Africa	1	1	Mozambique	Sub-Saharan Africa	1	1
Cambodia	East Asia & Pacific	1	0	Myanmar	East Asia & Pacific	1	0
Cameroon	Sub-Saharan Africa	1	1	Nepal	South Asia	1	0
Cape Verde	Sub-Saharan Africa	0	0	Nicaragua	Latin America & Caribbean	1	1
Central African Republic	Sub-Saharan Africa	1	1	Niger	Sub-Saharan Africa	1	1
Chad	Sub-Saharan Africa	1	1	Nigeria	Sub-Saharan Africa	1	0
Comoros	Sub-Saharan Africa	1	1	Papua New Guinea	East Asia & Pacific	0	0
Congo, Democratic Republic of	Sub-Saharan Africa	1	1	Rwanda	Sub-Saharan Africa	1	1
Congo, Republic Of	Sub-Saharan Africa	1	1	Samoa	East Asia & Pacific	1	0
Cote d'Ivoire	Sub-Saharan Africa	1	1	Sao Tome & Principe	Sub-Saharan Africa	1	1
Djibouti	Middle East & North Africa	1	0	Senegal	Sub-Saharan Africa	1	1
Dominica	Latin America & Caribbean	0	0	Sierra Leone	Sub-Saharan Africa	1	1
Eritrea	Sub-Saharan Africa	1	1	Solomon Islands	East Asia & Pacific	1	0
Ethiopia	Sub-Saharan Africa	1	1	Somalia	Sub-Saharan Africa	1	1
Gambia	Sub-Saharan Africa	1	1	St. Lucia	Latin America & Caribbean	0	0
Georgia	Europe & Central Asia	0	0	St. Vincent and the Grenadines	Latin America & Caribbean	0	0
Ghana	Sub-Saharan Africa	1	1	Sudan	Sub-Saharan Africa	1	1
Grenada	Latin America & Caribbean	0	0	Tajikistan	Europe & Central Asia	1	0
Guinea	Sub-Saharan Africa	1	1	Tanzania	Sub-Saharan Africa	1	1
Guinea-Bissau	Sub-Saharan Africa	1	1	Togo	Sub-Saharan Africa	1	1
Guyana	Latin America & Caribbean	1	1	Tonga	East Asia & Pacific	1	0
Haiti	Latin America & Caribbean	1	1	Uganda	Sub-Saharan Africa	1	1
Honduras	Latin America & Caribbean	1	1	Uzbekistan	Europe & Central Asia	0	0
Kenya	Sub-Saharan Africa	1	0	Vanuatu	East Asia & Pacific	1	0
Kyrgyz Republic	Europe & Central Asia	1	0	Vietnam	East Asia & Pacific	0	0
Lao People Dem. Rep.	East Asia & Pacific	1	0	Yemen, Republic Of	Middle East & North Africa	1	0
Lesotho	Sub-Saharan Africa	1	0	Zambia	Sub-Saharan Africa	1	1
Liberia	Sub-Saharan Africa	1	1	Zimbabwe	Sub-Saharan Africa	0	0

Table 2. Description of Variables

Outcome Variables		
Variables	**Description**	**Sources**
Size of borrowing		
COMMEXP_GDP	Commitments PPG (as % of GDP)	WDI
COMMIDA_GDP	Commitments PPG IDA (as % of GDP)	WDI
COMMPR_GDP	Commitments PPG Private Creditors (as % of GDP)	WDI
DPPG_GDP	Disbursements PPG (as % of GDP)	WDI
DPPGCON_GDP	Disbursements PPG concessional external debt (PPG) (as % of GDP)	WDI
DPPGNOCON_GDP	Disbursements PPG non concessional external debt(PPG) (as % of GDP)	WDI
DPPGIDA_GDP	Disbursements PPG IDA (as % of GDP)	WDI
DPPGBIL_GDP	Disbursements PPG bilateral (as % of GDP)	WDI
DPPGMUL_GDPP	Disbursements PPG multilateral (as % of GDP)	WDI
DPRV_GDP	Disbursements PPG Private Creditors (as % of GDP)	WDI
Term of borrowing		
GRCPERCO	Average grace period on new external debt commitments (years)	WDI
GRCELCO	Average grant element on new external debt commitments (%)	WDI
GRCELCO_5	Average grant element on new external debt commitments' based on 5% discount rate	WDI
GRCELC~10	Average grant element on new external debt commitments' based on 10% discount rate	Author calculation
INTCOM	Average interest on new external debt commitments (%)	WDI
MTR	Average maturity on new external debt commitments' private (years)	WDI

Selection model		
Variables	**Description**	**Sources**
Dependent variable		
DLP	Countries subjected to Debt Limit Policy: the dummy takes value one if the country is under IMF program for at least three years in a five years window	Bal Gunduz and others, (2013)
DLPNCBP	Country subjected to Debt Limit Policy and/or IDA Non Concessional Borrowing Policy (NCBP)", in order to include the debt limits imposed by IDA since 2006. The dummy takes value one if a country is under IMF program and/or IDA NCBP for at least three years in a five years window	IMF
Geographic and institutional characteristics		
politicalglobalization	Globalization index	KOF Institute
landlocked	1 if landlocked	CEPII
democracy	Dummy variable takes value 1 if the regime qualifies as democratic.	Cheibub, J. A., Gandhi J., and Vreeland J.R. (2010)
cpia	World Bank's CPIA Index measures the quality ofpolicies and institutions in the country	IMF
External demand conditions		
grostar	Trading partner real GDP growth	WEO
Country's relation with the Fund		
quota_gdp	Logarithm of the IMF quota	IMF
SIZE	Logarithm of GDP (constant 2005 PPP)	WDI
UNGA	Voting inline with G7, definition accoding to Kegley and Hook	Dreher, Axel and Jan-Egbert Sturm (2012)
Initial macroeconomic buffer		
AIDGDPI	Initial aid/GDP (at the beginning of each five-years period)	WDI
RESIN	Initial reserves in months of import (at the beginning of each five-years period)	VE-LIC database
Country income and macroeconomic conditions		
INFLCPI	Inflation, average consumer prices (annual percent change)	WEO
GNIPC	Logarithm of GNI per capita (current US$)	WDI
resource_rents	Resource Rent as a share of GDP	WDI
CURRACC	Current account deficit (as % of GDP)	WDI
TDPPG_GDP	Total Public Debt PPG (as % of GDP)	WDI
GDPGR	Gross domestic product, constant prices (annual percent change)	WDI
DEF_GDP	General Government fiscal deficit (as % of GDP)	WEO

Heterogeneity analysis		
Variables	**Description**	**Sources**
IDA	Dummy variable which takes value 1 if the country is IDA only (time variant) BEGINNING OF 5 YEARS PERIOD	IMF
i_TLPPLP	Telephone lines per 100 people BEGINNING OF 5 YEARS PERIOD	WDI
PROJGR	Growth rate of GDP projection BEGINNING OF 5 YEARS PERIOD	WEO
TDPPG_GDP	Total Public Debt PPG (as % of GDP) BEGINNING OF 5 YEARS PERIOD	WDI
av5_i_TLPPLP	Telephone lines per 100 people (five years average)	WDI
av5_PROJGR	Growth rate of GDP projection (five years average)	WEO
av5_TDPPG_GDP	Total Public Debt PPG (as % of GDP) - five years average	WDI

Table 3. Summary Statistics

Outcome Variables						
Variable	Mean	Std. Dev.	Min	Max	Obs.	Countries
Commitments PPG (as % of GDP)	5.319	3.866	0.000	25.926	319	68
Commitments PPG IDA (as % of GDP)	1.513	1.512	0.000	7.195	296	68
Commitments PPG Private Creditors (as % of GDP)	0.433	1.019	0.000	7.847	322	68
Disbursements PPG (as % of GDP)	4.279	2.693	0.040	13.066	323	69
Disbursements PPG concessional external debt (PPG) (as % of GDP)	3.324	2.230	0.040	10.924	323	69
Disbursements PPG non concessional external debt(PPG) (as % of GDP)	0.923	1.360	0.000	8.050	323	69
Disbursements PPG IDA (as % of GDP)	1.339	1.185	0.000	5.576	327	69
Disbursements PPG bilateral (as % of GDP)	1.070	1.115	0.000	6.644	325	69
Disbursements PPG multilateral (as % of GDP)	2.791	1.871	0.005	8.881	322	69
Disbursements PPG Private Creditors (as % of GDP)	0.320	0.623	0.000	3.521	325	69
Average grace period on new external debt commitments (years)	7.654	1.799	2.335	10.892	324	70
Average grant element on new external debt commitments (%)	60.672	14.482	17.040	81.000	324	70
Average grant element on new external debt commitments' based on 10% discount rate	63.707	13.482	23.334	82.722	310	67
Average grant element on new external debt commitments' based on 5% discount rate	36.855	15.286	-9.809	60.800	310	67
Average interest on new external debt commitments (%)	1.991	1.317	0.150	7.156	321	70
Average maturity on new external debt commitments' private (years)	29.404	7.126	10.070	42.285	325	70

All outcome variables are 5 years period average.

Selection Model						
Variable	Mean	Std. Dev.	Min	Max	Obs.	Countries
Political globalization	44.605	16.895	13.804	84.551	323	68
Landlocked	0.353	0.479	0.000	1.000	340	68
Democracy	0.342	0.475	0.000	1.000	342	70
Trading partner real GDP growth	4.085	1.849	-0.655	9.468	337	68
Logarithm of the IMF quota	4.051	2.805	0.571	15.882	309	67
Initial aid/GDP (at the beginning of each five-years period)	12.776	9.803	0.574	50.360	306	67
Initial reserves in months of import (at the beginning of each five-years period)	3.419	2.368	0.033	13.336	302	66
Inflation, average consumer prices (annual percent change)	11.772	18.820	-6.243	165.707	276	67
Logarithm of GNI per capita (current US$)	6.236	0.784	4.868	8.470	307	69
Resource Rent as a share of GDP	7.241	9.580	0.000	56.217	313	67
Size	21.411	1.282	18.978	24.597	311	66
CPIA	3.094	0.715	1.000	4.630	319	70
Current account deficit (as % of GDP)	-7.278	8.557	-42.894	11.990	267	67
Total Public Debt PPG (as % of GDP)	88.051	68.558	17.311	492.711	295	67
Gross domestic product, constant prices (annual percent change)	3.434	5.971	-29.100	21.713	255	66
IDA	0.797	0.403	0.000	1.000	350	70
General Government fiscal deficit (as % of GDP)	-0.030	0.041	-0.157	0.094	210	67
UNGA	0.360	0.130	0.000	0.583	336	70

All indipendent variables are calculated at the beginning of 5 years period, unless otherwise indicated.

Heterogeneity Analysis						
Variable	Mean	Std. Dev.	Min	Max	Obs.	Countries
IDA	0.797	0.403	0.000	1.000	350	70
Logarithm of GNI per capita (current US$)	6.236	0.784	4.868	8.470	307	69
Telephone lines per 100 people BEGINNING OF 5 YEARS PERIOD	3.262	5.318	0.100	27.100	332	69
Growth rate of GDP projection BEGINNING OF 5 YEARS PERIOD	19.830	53.978	-26.976	377.568	255	70
Total Public Debt PPG (as % of GDP) BEGINNING OF 5 YEARS PERIOD	88.051	68.558	17.311	492.711	295	67
Telephone lines per 100 people (five years average)	3.593	5.738	0.080	28.420	334	69
Growth rate of GDP projection (five years average)	24.977	56.738	-21.550	373.687	311	70
Total Public Debt PPG (as % of GDP) - five years average	87.624	71.699	18.042	524.142	310	67

Table 4. Summary Statistics by Group

Outcome Variables

Variable	DLP = 0					DLP = 1				
	Mean	Std.	Min	Max	Obs.	Mean	Std.	Min	Max	Obs.
Commitments PPG (as % of GDP)	5.027	4.095	0.000	25.926	186	5.779	3.518	0.194	22.248	127
Commitments PPG IDA (as % of GDP)	1.200	1.443	0.000	7.195	189	1.987	1.479	0.000	6.214	127
Commitments PPG Private Creditors (as % of GDP)	0.505	1.117	0.000	7.847	189	0.347	0.873	0.000	6.652	127
Disbursements PPG (as % of GDP)	4.125	2.849	0.040	13.066	189	4.532	2.477	0.263	11.668	128
Disbursements PPG concessional external debt (PPG) (as % of GDP)	2.979	2.248	0.040	10.924	189	3.829	2.131	0.192	10.087	128
Disbursements PPG non concessional external debt(PPG) (as % of GDP)	1.092	1.516	0.000	8.050	189	0.702	1.082	0.000	5.176	128
Disbursements PPG IDA (as % of GDP)	1.136	1.219	0.000	5.576	193	1.660	1.049	0.000	4.657	128
Disbursements PPG bilateral (as % of GDP)	1.095	1.108	0.000	5.087	191	1.022	1.085	0.000	6.644	128
Disbursements PPG multilateral (as % of GDP)	2.527	1.906	0.005	8.881	189	3.203	1.768	0.075	8.712	127
Disbursements PPG Private Creditors (as % of GDP)	0.373	0.699	0.000	3.521	191	0.256	0.495	0.000	2.653	128
Average grace period on new external debt commitments (years)	7.362	1.947	2.335	10.566	191	8.099	1.409	3.930	10.892	127
Average grant element on new external debt commitments (%)	57.369	15.751	17.040	81.000	191	65.652	10.550	18.268	79.718	127
Average grant element on new external debt commitments' based on 10% discount rate	60.390	14.708	23.334	81.467	185	68.616	9.552	23.361	82.722	125
Average grant element on new external debt commitments' based on 5% discount rate	33.136	16.745	-9.809	60.800	185	42.358	10.724	7.633	60.622	125
Average interest on new external debt commitments (%)	2.289	1.449	0.200	6.174	189	1.551	0.953	0.150	7.156	126
Average maturity on new external debt commitments' private (years)	27.850	7.425	10.070	42.285	192	31.767	5.692	15.506	41.288	127

Selection Model

Variable	DLP = 0					DLP = 1				
	Mean	Std.	Min	Max	Obs.	Mean	Std.	Min	Max	Obs.
Political globalization	41.109	16.414	13.804	84.551	197	50.072	16.231	20.955	84.121	126
Landlocked	0.283	0.452	0.000	1.000	212	0.469	0.501	0.000	1.000	128
Democracy	0.328	0.471	0.000	1.000	204	0.391	0.490	0.000	1.000	128
Trading partner real GDP growth	4.062	1.890	-0.655	9.468	209	4.122	1.787	-0.135	8.140	128
Logarithm of the IMF quota	4.004	2.826	0.571	15.595	182	4.118	2.785	0.814	15.882	127
Initial aid/GDP (at the beginning of each five-years period)	11.803	10.503	0.574	50.360	180	14.167	8.555	1.821	48.809	126
Initial reserves in months of import (at the beginning of each five-years period)	3.268	2.583	0.033	13.336	176	3.630	2.021	0.087	9.668	126
Inflation, average consumer prices (annual percent change)	13.827	23.546	-4.476	165.707	154	9.305	9.747	-6.243	45.485	117
Logarithm of GNI per capita (current US$)	6.357	0.782	4.942	8.470	174	6.031	0.717	4.868	8.345	127
Resource Rent as a share of GDP	8.462	11.185	0.000	56.217	186	5.453	6.177	0.000	35.092	127
Size	21.292	1.409	18.978	24.597	184	21.621	1.015	19.277	24.298	125
CPIA	2.985	0.773	1.000	4.630	186	3.292	0.531	1.453	4.380	126
Current account deficit (as % of GDP) - 5 years average	-7.487	8.292	-34.738	9.220	161	-7.650	6.974	-35.374	6.673	122
Current account deficit (as % of GDP)	-7.148	9.058	-42.894	11.990	146	-7.411	8.003	-37.621	8.713	119
Total Public Debt PPG (as % of GDP) - 5 years average	93.200	80.627	18.820	460.740	181	81.349	56.811	18.042	524.142	124
Total Public Debt PPG (as % of GDP)	91.222	79.647	18.293	492.711	168	85.627	50.512	17.311	296.212	122
Gross domestic product, constant prices (annual percent change) - 5 years average	2.687	4.001	-13.560	11.864	189	4.778	2.144	-0.020	12.074	124
Gross domestic product, constant prices (annual percent change)	2.688	6.666	-29.100	17.926	143	4.555	4.787	-12.674	21.713	108
IDA	0.759	0.428	0.000	1.000	212	0.844	0.365	0.000	1.000	128
General Government fiscal deficit (as % of GDP)	-0.036	0.060	-0.303	0.113	118	-0.015	0.138	-0.150	1.254	96
UNGA	0.352	0.131	0.000	0.658	204	0.397	0.123	0.000	0.722	128

Heterogeneity Analysis

Variable	DLP = 0					DLP = 1				
	Mean	Std.	Min	Max	Obs.	Mean	Std.	Min	Max	Obs.
IDA	0.759	0.428	0.000	1.000	212	0.844	0.365	0.000	1.000	128
Telephone lines per 100 people BEGINNING OF 5 YEARS PERIOD	3.569	5.758	0.100	27.100	203	2.589	4.281	0.100	20.320	119
Growth rate of GDP projection BEGINNING OF 5 YEARS PERIOD	21.812	53.996	-26.716	320.722	142	18.158	55.702	-26.976	377.568	106
Total Public Debt PPG (as % of GDP) BEGINNING OF 5 YEARS PERIOD	91.222	79.647	18.293	492.711	168	85.627	50.512	17.311	296.212	122
Telephone lines per 100 people (five years average)	3.793	5.926	0.130	28.420	202	3.037	5.087	0.080	27.380	122
Growth rate of GDP projection (five years average)	21.262	51.070	-21.550	331.783	188	32.305	66.088	-13.262	373.687	115
Total Public Debt PPG (as % of GDP) - five years average	93.200	80.627	18.820	460.740	181	81.349	56.811	18.042	524.142	124

Table 5. Correlation of Variables

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
politicalglobalization	1	1																	
landlocked	2	0.0286	1																
democracy	3	0.0025	-0.1571*	1															
grostar	4	-0.0147	0.0614	0.0321	1														
quota_gdp	5	-0.0735	0.0415	-0.0514	-0.1350*	1													
AIDGDPI	6	-0.1833*	0.0446	-0.0789	-0.0852	0.3651*	1												
RESIN	7	0.0821	0.1482*	0.0442	0.0843	-0.0657	0.0606	1											
INFLCPI	8	0.0304	0.101	-0.1855*	0.0197	0.3436*	0.1692*	-0.2052*	1										
GNIPC	9	-0.1831*	-0.3461*	0.3469*	0.0423	-0.2337*	-0.3245*	-0.0159	-0.2185*	1									
resource_rents	10	0.1325*	0.0592	-0.0892	0.1046	0.0165	-0.066	0.0973	0.0701	-0.1145*	1								
SIZE	11	0.5783*	0.0674	-0.1121	0.0353	-0.2357*	-0.3804*	-0.0454	0.1341*	-0.2456*	0.2444*	1							
cpia4	12	0.0724	0.0277	0.2218*	-0.1677*	-0.2078*	0.0367	0.1910*	-0.1903*	0.2610*	-0.1558*	0.0072	1						
CURRACC	13	0.0772	0.1664*	-0.2035*	0.0811	-0.0476	-0.0806	0.1327	-0.0461	-0.1954*	0.1964*	0.2166*	-0.1028	1					
TDPPG_GDP	14	0.0140	-0.0763	-0.1603*	-0.0929	0.4717*	0.2992*	-0.1727*	0.2732*	-0.3509*	0.1359	-0.0484	-0.3176*	-0.1729*	1				
GDPGR	15	0.0097	-0.0178	0.0966	0.2713*	-0.3078*	0.0057	0.0723	-0.1982*	0.0918	0.0278	0.0321	0.2623*	-0.0352	-0.1802*	1			
IDA	16	0.1323	0.0009	-0.3511*	0.0176	0.1636*	0.2669*	0.1146	0.0885	-0.4680*	-0.0789	-0.0192	-0.2034*	0.2197*	0.1041	-0.0527	1		
DEF_GDP	17	0.0675	0.0057	-0.0689	0.1351	-0.0367	-0.1476	0.2039*	-0.1616	0.0182	0.1942*	0.0277	0.0396	0.0082	-0.1897*	0.0853	0.0341	1	
UNGA	18	0.2530*	-0.0928	0.0961	-0.0037	-0.1359	-0.0285	0.0133	-0.0786	0.1299	-0.1026	0.1588*	0.2868*	0.0038	-0.1479	0.1544	0.0193	-0.0058	1

Note: * $p<0.05$

Heterogeneity analysis

		1	2	3	4
GNIPC	1	1			
i_TLPPLP	2	0.6440*	1		
PROJGR	3	-0.014	-0.0088	1	
TDPPG_GDP	4	-0.3509*	-0.2146*	-0.0526	1

Note: * $p<0.05$

Table 6. Selection Model

Dependent Variable:	IMF's Debt Limit Policy	IMF's Debt Limit Policy or IDA Non-Concessional Borrowing Policy
	(1)	(2)
landlocked	0.512**	0.430*
	(0.228)	(0.231)
politicalglobalization	-0.002	-0.003
	(0.008)	(0.008)
democracy	0.134	0.148
	(0.218)	(0.222)
growth of trading partners	0.033	0.026
	(0.061)	(0.062)
IMF quota	0.037	0.045
	(0.051)	(0.052)
Aid-to-GDP	0.024	0.028*
	(0.016)	(0.016)
Initial Reserves	-0.113**	-0.135**
	(0.050)	(0.052)
2.period dummy	-0.219	-0.232
	(0.356)	(0.358)
3.period dummy	0.669**	0.697**
	(0.337)	(0.339)
4.period dummy	0.641*	0.723**
	(0.358)	(0.361)
5.period dummy	1.274***	1.518***
	(0.398)	(0.409)
CPI Inflation	-0.018**	-0.020**
	(0.008)	(0.009)
GNI per capita	-0.510***	-0.555***
	(0.197)	(0.202)
Resource rents	-0.037**	-0.037**
	(0.015)	(0.015)
Size	0.149	0.175
	(0.129)	(0.131)
CPIA	0.538***	0.560***
	(0.194)	(0.197)
Constant	-2.279	-2,529
	(3.438)	(3.486)
Observations	226	226
Pseudo R(squared	0.248	0.271
N	226	226

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7. Propensity Score Matching

	Radius matching		Kernel matching
	r=0.05	r=0.1	
Size of borrowing			
Disbursements PPG (as % of GDP)	0.77 **	0.60	0.79 **
	(0.387)	(0.386)	(0.389)
Disbursements PPG concessional external debt (as % of GDP)	0.72 **	0.59 *	0.71 **
	(0.33)	(0.338)	(0.33)
Disbursements PPG non-concessional external debt (as % of GDP)	0.05	0.00	0.07
	(0.161)	(0.161)	(0.159)
Disbursements PPG IDA (as % of GDP)	0.32 *	0.31 *	0.31 *
	(0.189)	(0.181)	(0.18)
Disbursements PPG bilateral (as % of GDP)	0.21 *	0.17	0.23 *
	(0.128)	(0.119)	(0.125)
Disbursements PPG multilateral (as % of GDP)	0.60 *	0.48	0.59 **
	(0.321)	(0.332)	(0.305)
Disbursements PPG Private Creditors (as % of GDP)	-0.04	-0.06	-0.03
	(0.093)	(0.088)	(0.102)
Commitments PPG (as % of GDP)	1.56 ***	1.39 ***	1.60 ***
	(0.536)	(0.55)	(0.531)
Commitments PPG IDA (as % of GDP)	0.52 **	0.47 *	0.51 **
	(0.256)	(0.262)	(0.252)
Commitments PPG Private Creditors (as % of GDP)	0.08	0.07	0.09
	(0.122)	(0.13)	(0.964)
Term of borrowing			
Average grace period on new external debt commitments (years)	0.25	0.15	0.22
	(0.259)	(0.242)	(0.268)
Average grant element on new external debt commitments (%)	0.77	0.92	0.48
	(1.726)	(1.585)	(1.661)
Average grant element on new external debt commitments (%) _10% discount rate	0.58	1.09	0.24
	(1.724)	(1.376)	(1.614)
Average grant element on new external debt commitments (%) _5% discount rate	0.68	1.54	0.24
	(2.014)	(1.905)	(2.129)
Average interest on new external debt commitments (%)	-0.11	-0.18	-0.12
	(0.284)	(0.138)	(0.149)
Average maturity on new external debt commitments' (years)	0.73	0.97	0.54
	(0.968)	(0.911)	(0.933)

Notes: An Epanechnikov kernel is used for kernel regression matching. Bootstrapped standard errors are reported in parentheses.
They are based on 500 replications of the data.

Table 8. Heterogeneity Analysis - Determinants of Grant Element

Dependent Variable: Average Grant Element (with 5% discount rate)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Propensity score		21.665***	10.291**	18.986***	9.188**	20.948***	23.283***	19.199***	22.483***
		(4.704)	(4.191)	(4.720)	(4.420)	(4.771)	(4.934)	(4.775)	(4.873)
Debt Limit Policy Dummy (DLP)	7.643***	2.870	-8.121	3.077	2.309	2.116	2.827	2.332	2.716
	(2.404)	(1.843)	(12.879)	(2.106)	(1.884)	(2.041)	(3.417)	(2.089)	(3.321)
Logarithm of GNI per capita			-8.387***		-9.173***				
			(1.844)		(1.856)				
DLP x (Logarithm of GNI per capita)			1.718						
			(2.112)						
Telephone lines per 100 people - five years average				-0.488*	0.250				
				(0.265)	(0.258)				
DLP x (Telephone lines per 100 people - five years average)				-0.060	0.025				
				(0.338)	(0.312)				
Growth rate of GDP projection - five years average						0.004			
						(0.023)			
DLP x (Growth rate of GDP projection - five years average)						0.044*			
						(0.026)			
Total public debt - % of GDP - five year average							0.045		
							(0.037)		
DLP x (Total public debt - % of GDP - five year average)							-0.003		
							(0.042)		
Telephone lines per 100 people - beginning of 5 years period								-0.748***	
								(0.228)	
DLP x (Telephone lines per 100 people - beginning of 5 years period)								0.211	
								(0.323)	
Total public debt - % of GDP - beginning of 5 years period									0.034
									(0.036)
DLP x (Total public debt - % of GDP - beginning of 5 years period)									-0.003
									(0.037)
Constant	35.849***	27.040***	85.514***	30.590***	90.319***	26.960***	22.987***	30.941***	24.147***
	(2.283)	(3.658)	-12.045	-3.876	(11.826)	-3.697	-4.474	-3.903	(4.662)
Observations	190	190	190	180	180	176	187	180	186
R-squared	0.07	0.171	0.314	0.198	0.297	0.199	0.191	0.236	0.182

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9. Heterogeneity Analysis - Determinants of Non-Concessional Borrowing

Dependent Variable: Average Non-concessional Borrowing (as % of GDP)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Propensity score		-1.975***	-1.240**	-1.510***	-1.332**	-1.779***	-2.052***	-1.555***	-2.101***
		(0.519)	(0.511)	(0.52)	(0.512)	(0.487)	(0.543)	(0.525)	(0.545)
Debt Limit Policy Dummy (DLP)	-0.407*	0.028	1.262	-0.019	-0.005	-0.057	0.431	0.069	0.519
	(0.221)	(0.207)	(1.678)	(0.223)	(0.227)	(0.209)	(0.363)	(0.219)	(0.384)
Logarithm of GNI per capita			0.578**		0.167				
			(0.249)		(0.173)				
DLP x (Logarithm of GNI per capita)			-0.195						
			(0.279)						
Telephone lines per 100 people - five years average				0.035	0.021				
				(0.027)	(0.028)				
DLP x (Telephone lines per 100 people - five years average)				0.025	0.023				
				(0.041)	(0.040)				
Growth rate of GDP projection - five years average						-0.002			
						(0.001)			
DLP x (Growth rate of GDP projection - five years average)						0			
						(0.002)			
Total public debt - % of GDP - five year average							0.004		
							(0.004)		
DLP x (Total public debt - % of GDP - five year average)							-0.005		
							(0.004)		
Telephone lines per 100 people - beginning of 5 years period								0.067**	
								(0.026)	
DLP x (Telephone lines per 100 people - beginning of 5 years period)								-0.005	
								(0.044)	
Total public debt - % of GDP - beginning of 5 years period									0.004
									(0.004)
DLP x (Total public debt - % of GDP - beginning of 5 years period)									-0.006
									(0.004)
Constant	1.042***	1.845***	-2.166	1.409***	0.322	1.804***	1.566***	1.366***	1.642***
	(0.203)	(0.368)	(1.586)	(0.371)	(1.107)	(0.368)	(0.444)	(0.378)	(0.446)
Observations	190	190	190	180	180	176	187	180	186
R-squared	0.025	0.134	0.211	0.147	0.151	0.15	0.142	0.196	0.144

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Appendix 3. Auxiliary Tables

Table A1. Selection Model - Alternative Specifications

Dependent Variable: Debt Limit Policy	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
landlocked	0.577**	0.536**	0.486**	0.469**	0.531**	0.497**	0.477**	0.758***	0.652**	0.469**	0.439**
	(0.240)	(0.241)	(0.233)	(0.233)	(0.233)	(0.247)	(0.235)	(0.199)	(0.272)	(0.232)	(0.217)
politicalglobalization	-0.002	0	-0.002	0.001	-0.004	-0.003	-0.001	0.005	0.002	-0.005	
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.01)	(0.009)	
democracy	0.087	0.064	0.155	0.118	0.167	0.064	0.090	0.068	0.167	0.171	
	(0.238)	(0.239)	(0.221)	(0.219)	(0.221)	(0.233)	(0.228)	(0.221)	(0.269)	(0.224)	
growth of trading partners	0.030	0.028	0.036	0.006	0.041	0.058	0.034	0.011	0.006	0.034	
	(0.066)	(0.065)	(0.062)	(0.063)	(0.063)	(0.067)	(0.062)	(0.058)	(0.079)	(0.064)	
IMF quota	0.041	0.049	0.038	0.043	0.040	0.047	0.042	0.021	-0.003	0.061	
	(0.052)	(0.053)	(0.052)	(0.052)	(0.052)	(0.056)	(0.052)	(0.049)	(0.074)	(0.054)	
Aid-to-GDP	0.025	0.023	0.022	0.018	0.024	0.026	0.023	0.046***	0.049**	0.022	
	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.018)	(0.016)	(0.013)	(0.023)	(0.016)	
Initial Reserves	-0.111*	-0.103*	-0.122**	-0.101*	-0.120**	-0.091*	-0.110**	-0.072	-0.082	-0.119**	-0.105**
	(0.058)	(0.059)	(0.052)	(0.052)	(0.052)	(0.053)	(0.050)	(0.047)	(0.058)	(0.052)	(0.048)
2.period dummy	-0.293	-0.253	-0.209	-0.263	-0.26		-0.191	-0.413	-0.985*	-0.219	-0.237
	(0.366)	(0.366)	(0.358)	(0.361)	(0.362)		(0.358)	(0.339)	(0.593)	(0.359)	(0.345)
3.period dummy	0.631*	0.619*	0.682**	0.549	0.638*	0.920***	0.672**	0.386	0.187	0.650*	0.579*
	(0.349)	(0.350)	(0.339)	(0.347)	(0.342)	(0.342)	(0.336)	(0.310)	(0.532)	(0.35)	(0.332)
4.period dummy	0.758**	0.801**	0.656*	0.455	0.612*	0.858**	0.636*	0.460	0.302	0.698*	0.552*
	(0.374)	(0.377)	(0.359)	(0.381)	(0.364)	(0.341)	(0.357)	(0.335)	(0.536)	(0.375)	(0.333)
5.period dummy	1.176***	1.178***	1.238***	1.090***	1.198***	1.510***	1.327***	0.850**	0.809	1.320***	0.979***
	(0.433)	(0.430)	(0.406)	(0.414)	(0.409)	(0.408)	(0.408)	(0.352)	(0.581)	(0.418)	(0.341)
CPI Inflation	-0.019	-0.015	-0.017**	-0.016*	-0.018**	-0.018**	-0.018**	-0.016**	0.007	-0.019**	-0.012
	(0.011)	(0.011)	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)	(0.007)	(0.012)	(0.009)	(0.008)
GNI per capita	-0.587***	-0.539**	-0.564***	-0.526***	-0.514**	-0.434**	-0.575***		-0.462*	-0.539***	-0.668***
	(0.212)	(0.212)	(0.203)	(0.201)	(0.203)	(0.222)	(0.222)		(0.24)	(0.205)	(0.148)
Resource rents	-0.037**	-0.040**	-0.038**	-0.035**	-0.038**	-0.040**	-0.039**	-0.039***	-0.031*	-0.041**	-0.034***
	(0.018)	(0.019)	(0.016)	(0.015)	(0.016)	(0.017)	(0.015)	(0.015)	(0.017)	(0.016)	(0.013)
Size	0.182	0.142	0.124	0.083	0.147	0.208	0.138	0.276**	0.087	0.183	
	(0.137)	(0.136)	(0.132)	(0.132)	(0.132)	(0.131)	(0.131)	(0.113)	(0.165)	(0.136)	
CPIA	0.543**	0.575***	0.554***	0.495**	0.550***	0.523**	0.519***		0.653**	0.538***	0.586***
	(0.211)	(0.212)	(0.197)	(0.199)	(0.198)	(0.245)	(0.196)		(0.288)	(0.199)	(0.178)
Current acct. deficit (%of GDP)_5year-average	-0.026										
	(0.020)										
Total Public Debt (% of GDP)_5-year average			0.000								
			(0.003)								
GDP Growth_5year average				0.091**							0.079**
				(0.042)							(0.038)
Current account deficit (% of GDP)		-0.009									
		(0.016)									
Total Public Debt (% of GDP)					0.001						
					(0.002)						
GDP Growth						-0.024					
						(0.026)					
IDA							-0.226	0.056			
							(0.357)	(0.283)			
Government fiscal deficit (% of GDP)									2.507		
									(3.509)		
UNGA										0.292	
										(0.88)	
Constant	-2.639	-2.202	-1.399	-0.891	-2.225	-4.229	-1.421	-6.932***	-1.686	-2.818	1.998*
	(3.724)	(3.697)	(3.555)	(3.502)	(3.563)	(3.876)	(3.702)	(2.408)	(4.311)	(3.581)	(1,058)
Observations	210	204	223	223	221	195	226	232	162	221	236
Pseudo R(squared	0.267	0.255	0.246	0.267	0.244	0.238	0.249	0.202	0.279	0.259	0.249
N	210	204	223	223	221	195	226	232	162	221	236

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A2. Propensity Score Matching - with Parsimous Participation Equation

	Radius matching		Kernel
	r=0.05	r=0.1	matching
Size of borrowing			
Disbursements PPG (as % of GDP)	0.621	0.754 *	0.552
	(0.424)	(0.392)	(0.414)
Disbursements PPG concessional external debt (as % of GDP)	0.602 *	0.715 **	0.566
	(0.354)	(0.343)	(0.348)
Disbursements PPG non-concessional external debt (as % of GDP)	0.019	0.038	-0.014
	(0.186)	(0.17)	(0.191)
Disbursements PPG IDA (as % of GDP)	0.286	0.426 **	0.253
	(0.197)	(0.183)	(0.182)
Disbursements PPG bilateral (as % of GDP)	0.083	0.079	0.079
	(0.135)	(0.125)	(0.128)
Disbursements PPG multilateral (as % of GDP)	0.589 *	0.723 **	0.544
	(0.321)	(0.294)	(0.334)
Disbursements PPG Private Creditors (as % of GDP)	0.047	-0.045	-0.066
	(0.119)	(0.104)	(0.121)
Commitments PPG (as % of GDP)	1.085 **	1.267 **	0.974 *
	(0.528)	(0.529)	(0.541)
Commitments PPG IDA (as % of GDP)	0.235	0.471 *	0.170
	(0.287)	(0.254)	(0.32)
Commitments PPG Private Creditors (as % of GDP)	0.060	0.074	0.044
	(0.148)	(0.124)	(0.16)
Term of borrowing			
Average grace period on new external debt commitments (years)	0.000	0.173	-0.004
	(0.236)	(0.22)	(0.263)
Average grant element on new external debt commitments (%)	0.365	1.142	0.450
	(1.585)	(1.584)	(1.683)
Average grant element on new external debt commitments (%) _10% discount rate	0.940	1.401	1.031
	(1.627)	(1.472)	(1.674)
Average grant element on new external debt commitments (%) _5% discount rate	1.613	2.078	1.708
	(2.045)	(1.848)	(1.975)
Average interest on new external debt commitments (%)	-0.142	-0.184	-0.146
	(0.168)	(0.138)	(0.166)
Average maturity on new external debt commitments' (years)	0.457	0.925	0.520
	(0.903)	(0.895)	(0.888)

Notes: An Epanechnikov kernel is used for kernel regression matching. Bootstrapped standard errors are reported in parentheses.
They are based on 500 replications of the data.

Table A3. Propensity Score Matching on the change of outcome variables

	Radius matching		Kernel matching
	r=0.05	r=0.1	
Size of borrowing			
Disbursements PPG (as % of GDP)	-0.090	-0.130	-0.053
	(0.178)	(0.207)	(0.157)
Disbursements PPG concessional external debt (as % of GDP)	-0.064	-0.106	-0.027
	(0.177)	(0.197)	(0.147)
Disbursements PPG non-concessional external debt (as % of GDP)	1.981	2.154	2.052
	(2.337)	(2.113)	(2.214)
Disbursements PPG IDA (as % of GDP)	0.177	0.128	0.183
	(0.189)	(0.192)	(0.184)
Disbursements PPG bilateral (as % of GDP)	1558.547	1558.598	1558.588
	(1559.996)	(1566.375)	(1621.875)
Disbursements PPG multilateral (as % of GDP)	0.192	0.188	0.203
	(0.179)	(0.178)	(0.173)
Disbursements PPG Private Creditors (as % of GDP)	-0.482	-0.714	-0.358
	(1.048)	(1.146)	(0.893)
Commitments PPG (as % of GDP)	0.315 ***	0.309 ***	0.316 ***
	(0.101)	(0.104)	(0.114)
Commitments PPG IDA (as % of GDP)	0.235 **	0.170	0.234 **
	(0.111)	(0.127)	(0.117)
Commitments PPG Private Creditors (as % of GDP)	2.497	2.506	2.537
	(3.194)	(2.841)	(3.217)

Notes: An Epanechnikov kernel is used for kernel regression matching. Bootstrapped standard errors are reported in parentheses. They are based on 500 replications of the data.

Table A4. Rosenbaum Sensitivity Analysis for Hidden Selection Bias

	Γ parameter	Probability
Disbursements PPG (as % of GDP)	1.3	0.038
Disbursements PPG concessional external debt (as % of GDP)	1.4	0.042
Disbursements PPG IDA (as % of GDP)	1.2	0.035
Disbursements PPG bilateral (as % of GDP)	1.0	0.186
Disbursements PPG multilateral (as % of GDP)	1.3	0.032
Commitments PPG (as % of GDP)	1.7	0.032
Commitments PPG IDA (as % of GDP)	1.2	0.032

Source: IMF staff calculations.

Note: Γ is a measure of how much hidden bias can be present, i.e., how much Γ can deviate from 1, before the results of the study begin to change.

REFERENCES

Alesina, A., and Dollar D., 2000, "Who Gives Foreign Aid to Whom and Why?" *Journal of Economic Growth*, Vol. 5(1); pp. 33–63.

Arslanalp S., and Henry, P. B., 2004, "Helping the Poor to Help Themselves: Debt Relief or Aid," NBER Working Papers 10230, National Bureau of Economic Research, Inc.

Atoyan, R., and Conway, P., 2006, "Evaluating the Impact of IMF Programs: A Comparison of Matching and Instrumental-variable Estimators," Review of International Organizations, Vol. 1(2); pp. 99–124.

Bal Gunduz Y., Ebeke C., Kaltani L., and Mumssen C., 2013, "IMF-Supported Programs in Low Income Countries: Economic Impact over the Short and Longer Term," IMF Working Paper 13/273 (Washington).

Bal Gunduz Y., and Crystallin M., 2014, "Do IMF Programs Catalyze Donor Assistance to Low-Income Countries?" IMF Working Paper (forthcoming).

Barro, R. J., and Lee, J. W., 2005, "IMF-Programs: Who is Chosen and What are the Effects?" *Journal of Monetary Economics*, 52(7); pp. 1245–69.

Biglaiser, G., and DeRouen Jr. K., 2010, "The effects of IMF programs on U.S. Direct Investment in the Developing World," Review of International Organizations, 5; pp.73–95.

Bird, G., and Rowlands, D., 2007, "The IMF and the Mobilisation of Foreign Aid," *Journal of Development Studies*, *Taylor and Francis Journals*, Vol. 43(5); pp. 856–70.

———, 2007, "The Analysis of Catalysis: IMF Programs and Private Capital Flows," School of Economics Discussion Papers 0107, School of Economics, University of Surrey.

———, 2001, "IMF Lending: How Is It Affected by Economic, Political and Institutional Factors?" *Journal of Policy Reform*, 4, pp. 243–270.

Bird, G., Hussain, M., and Joyce, J. P., 2004, "Many Happy Returns? Recidivism and the IMF," *Journal of International Money and Finance*, 23, pp. 231–51.

Bordo, M., Mody A., and Oomes N., 2004, "Keeping Capital Flowing: The Role of the IMF International Finance," Wiley Blackwell, Vol. 7(3); pp. 421–50, December.

Broz, J. L., and Hawes, M. B., 2006, *"U.S. Domestic Politics and International Monetary Fund Policy,"* eds. by D. G. Hawkins, D. A. Lake, D. L. Nielson, and M. J. Tierney,

Delegation and Agency in International Organizations, pp; 77–106, (Cambridge: Cambridge University Press).

Brune, N., Garrett, G., and Kogut, B., 2004, "The International Monetary Fund and the Global Spread of Privatization," IMF Staff Papers, 51, pp. 195–219 (Washington: International Monetary Fund).

Bulow, J., 2002, "First World Governments and Third World Debt," Brookings Papers on Economic Activity, Economic Studies Program, The Brookings Institution, Vol. 33(1), pp. 229–56.

Caliendo, M., and Kopeinig S., 2007, "Some Practical Guidance for the Implementation of Propensity Score Matching," *Journal of Economic Surveys*, 22; pp. 31–72.

Cerulli G., 2012, "An Assessment of the Econometric Methods for Program Evaluation and a Proposal to Extend the Difference-in-Differences Estimator to Dynamic Treatment," Econometrics: New Developments, Book Chapter (Nova Publishers: New York).

Chari, A., Chen, W., and Dominguez, K., 2012, "Foreign Ownership and Firm Performance: Emerging Market Acquisitions in the United States," IMF Economic Review, Vol. 60 (1), pp. 1–42 (Washington: International Monetary Fund).

Cheibub, J. A., Gandhi J., and Vreeland J. R, 2010, "Democracy and Dictatorship Revisited," Public Choice, Vol. 143, No. 2–1, pp. 67–101.

Cohen D., 1993, "Low Investment and Large LDC Debt in the 1980s," American Economic Review, 83 (3), pp. 437–49.

Connors, T. A., 1979, "The Apparent Effects of Recent IMF Stabilization Programs," International Finance Discussion Papers 135, Board of Governors of the Federal Reserve System.

Cornelius, P., 1987, "The Demand for IMF Credits by Sub-Saharan African Countries," Economics Letters 23(1); pp. 99–102.

Dehejia, R. H., and S. Wahba, 1999, "Causal Effects in Nonexperimental Studies: Re-evaluation of the Evaluation of Training Programs," *Journal of the American Statistical Association*, 94; pp. 1053–62.

Dreher, A., 2006, "IMF and Economic Growth: The Effects of Programs, Loans, and Compliance with Conditionality," World Development, 34, pp. 769–88.

Dreher, A., and Vaubel R., 2004, "Do IMF and IBRD Cause Moral Hazard and Political Business Cycles? Evidence from Panel Data," Open Economies Review 15(1); pp. 5–22.

Dreher, A., Sturm J., and Vreeland J. R., 2009, "Global Horse Trading: IMF Loans for Votes in the United Nations Security Council," European Economic Review 53(7), pp. 742–57.

Dreher, A. and Sturm J-E., 2012, "Do IMF and World Bank Influence Voting in the UN General Assembly?" Public Choice, Vol. 151, No. 1–2, pp. 363.

Easterly, W., 2005, "What Did Structural Adjustment Adjust? The Association of Policies and Growth with Repeated IMF and World Bank Adjustment Loans," *Journal of Development Economics*, 76(1), pp. 1–22.

Edwards, M. S., 2005, "Investor Responses to IMF Program Suspensions: Is Noncompliance Costly?" Social Science Quarterly, Vol. 86, pp. 857–73.

Eichengreen, B. J., Gupta, P., and Mody, A., 2006, "Sudden Stops and IMF-supported Programs," IMF Working Paper 06/101 (Washington: International Monetary Fund).

Forbes, K., and Klein M., 2013, "Pick Your Poison: The Choices and Consequences of Policy Responses to Crisis," 14th Jacques Polak Annual Research Conference.

Garuda, G., 2000, "The Distributional Effects of IMF Programs: A Cross-Country Analysis," World Development 28(6); pp.1031–51.

Hardoy, I., 2003, "Effect of IMF Programmes on Growth: A Reappraisal using the Method Matching," in Paper presented at the European Economic Association, (Stockholm, 20–24 August).

Heckman, J., 1979, "Sample Selection Bias as a Specification Error," Econometrica, 471, pp. 153–61.

Heckman, J., H. Ichimura, and Todd P., 1997, "Matching As an Econometric Evaluation Estimator: Evidence from Evaluating A Job Training Program," Review of Economic Studies 64; Vol. 605–54.

Heckman, J., R. LaLonde, and J. Smith, 1999, *"The Economics and Econometrics of Active Labor Market Programs,"* ed. by O. Ashenfelter, and D. Card, in "Handbook of Labor Economics," Vol. III, pp. 1865–2097 (Elsevier: Amsterdam).

Hong, G., and Yu, B., 2008, "Effects of Kindergarten Retention on Children's Social-Emotional Development: An Application of Propensity Score Method to Multivariate Multi-Level Data," Special Section on New Methods in Developmental Psychology, 44(2), pp. 407–21.

Hutchison, M., 2004, "Selection Bias and the Output Costs of IMF Programs Economic Policy," Research Unit (EPRU), University of Copenhagen, Department of Economics.

International Development Association and International Monetary Fund, 2006, "Heavily Indebted Poor Countries (HIPC) Initiative and Multilateral Debt Relief Initiative (MDRI), Status of Implementation, August 21." Available via internet: http://www.imf.org/external/np/pp/eng/2006/082106.pdf

Imbens, G. W., 2004, "Nonparametric Estimation of Average Treatment Effects under Exogeneity: A Review," Review of Economics and Statistics, Vol. 86; pp. 4–29.

International Monetary Fund, 2013a, "Review of the Policy on Debt Limits in Fund-Supported Programs," (Washington)

———, 2013b, "Eligibility to Use the Fund's Facilities for Concessional Financing" (Washington).

———, 2013c, "The Multilateral Debt Relief Initiative," The International Monetary Fund Factsheet. (Washington).

Jann, B., 2010, "Heterogeneous Treatment-Effect Analysis," German Stata Users' Group Meetings, Stata Users Group. Available via internet: http://EconPapers.repec.org/RePEc:boc:dsug10:03

Jensen, N. M., 2004, "Crisis, Conditions, and Capital: The Effect of International Monetary Fund Agreements on Foreign Direct Investment Inflows," *Journal of Conflict Resolution*, Vol. 48, pp. 194–210.

Jorra, M., 2012, "The Effect of IMF Lending on The Probability of Sovereign Debt Crises," *Journal of International Money and Finance*, Elsevier, Vol. 314, pp. 709–25.

Joyce, J. P., 1992, "The Economic Characteristics of IMF Program Countries," Economics Letters 38(2); pp. 237–42.

Killick, T., 1995, "IMF Programmes in Developing Countries: Design and impact," (London: Routledge).

Kinda, T., and Le Manchec M., 2012, "Heterogeneity in the Allocation of External Public Financing: Evidence from Sub-Saharan African Post-MDRI Countries," Applied Economics Letters, pp. 1–5.

Knight, M., and Santaella J.A., 1997, "Economic Determinants of IMF Financial Arrangements," *Journal of Development Economics* 54(2); pp. 405–36.

Krugman, P., 1988, "Financing versus Forgiving a Debt Overhang," *Journal of Development Economics*, 29(2), pp. 253–68.

Lin, S., 2010, "On the International Effects of Inflation Targeting," The Review of Economics and Statistics, Vol. 92 (1), pp. 195–99.

Lin, S., and Ye, H., 2007, "Does Inflation Targeting Really Make A Difference? Evaluating the Treatment Effect of Inflation Targeting In Seven Industrial Countries," *Journal of Monetary Economic*, Elsevier, Vol. 54 (8), pp. 2521–33, (November).

———, 2009, "Does Inflation Targeting Make a Difference in Developing Countries?" *Journal of Development Economics*, Vol. 89 (1), pp. 118–23.

Mody A., and Saravia D., 2003, "Catalyzing Capital Flows: Do IMF-Supported Programs Work as Commitment Devices?" IMF Working Paper, 03/100, (Washington: International Monetary Fund.)
.
Nannicini, T., 2007, "Simulation-Based Sensitivity Analysis For Matching Estimators," *The Stata Journal 7*, No. 3, pp. 340–50.

Nooruddin, I., and Simmons, J. W., 2006, "The Politics of Hard Choices: IMF Programs and Government Spending," International Organization, Vol. 60, pp. 1001–33.

Nsouli, S., Mourmouras, A., and Atoian, R., 2005, *"Institutions, Program Implementation, and Macroeconomic Performance,"* eds. by A. Mody, and A. Rebucci, in "IMF-supported Programs: Assessing Program Design, Implementation, and Effectiveness. IMF."

Pastor, M., 1987, "The International Monetary Fund and Latin America: Economic Stabilization and Class Conflict," Westview Press, Boulder.

Persson, T., 2001, "Currency Unions and Trade: How Large Is the Treatment Effect?" Economic Policy, Vol. 16, No. 33, pp. 433–48.

Pop-Eleches, G., 2008, "From Economic Crisis to Reform: IMF Programs in Latin America and Eastern Europe," Princeton University Press.

Presbitero, A., and Zazzaro, A., 2012, "IMF Lending in Times of Crisis: Political Influences and Crisis Prevention," World Development, Vol. 40 (10), pp. 1944–69.

Przeworski, A., and Limongi, F., 1996, "Selection, Counterfactuals and Comparison," University of Chicago, Mimeo.

Przeworski, A., and Vreeland, J. R., 2000, "The Effect of IMF Programs on Economic Growth," *Journal of Development Economics*, Vol. 62, pp. 385–421.

Reichmann, T. M., Stillson, R. T., 1978, "Experience with Programs of Balance of Payments Adjustment: Stand-By Arrangements in the Highest Tranches," 1963–72, IMF Staff Paper 25, pp. 292–310 (Washington: International Monetary Fund).

Rosenbaum, Paul R., and Donald B. Rubin, 1983, "The Central Role of the Propensity Score in Observational Studies for Causal Effects," Biometrika, Vol. 70 1, pp. 41–55.

Sachs, J. D., 1989, *"The Debt Overhang of Developing Countries,"* eds. by G. Calvo, R. Findlay, P. Kouri, and J. Braga de Macedo in "Debt Stabilization and Development. Essays in Memory of Carlos Diaz-Alejandro," pp. 80–102 (Oxford: Basil Blackwell).

Staff, J., Patrick, M. E., Loken, E., and Maggs, J. L., 2008, "Teenage Alcohol Use and Educational Attainment," *Journal of Studies on Alcohol and Drugs*, Vol. 69, pp. 848–58.

Steinwand, M., and Stone R., 2008, "The International Monetary Fund: A Review of the Recent Evidence," Review of International Organizations, Vol. 3, pp. 123–49.

Stone, R. W., 2008, "The Scope of IMF Conditionality: How Autonomous is the Fund?" Manuscript, University of Rochester in press.

Sturm, Jan-Egbert; Helge B.; and De Haan J., 2005, "Which Variables Explain Decisions on IMF Credit? An Extreme Bounds Analysis," Economics and Politics 172; pp.177–213.

Tapsoba, R. 2012, "Do National Numerical Fiscal Rules Really Shape Fiscal Behaviours in Developing Countries? A Treatment Effect Evaluation," Economic Modelling, Vol. 29 (4), pp. 1356–69.

Vreeland, J. R. 2003. "The IMF and Economic Development," (Cambridge: Cambridge University Press).

Wooldridge J., 2002, "Econometric Analysis of Cross Section and Panel Data," The MIT Press (Cambridge: Massachusetts; London: England).

World Bank, 2006, "IDA Countries and Non-Concessional Debt: Dealing with the Free-Rider Problem," In IDA14 Grant-Recipient and Post-MDRI countries (Washington).

Wyse, A. E., Keesler, V., and Schneider, B., 2008, "Assessing the Effects of Small School Size on Mathematics Achievement: A Propensity Score-Matching Approach," Teachers College Record, Vol. 110, pp. 1879–1900.

Xie, Y., Brand, J., and Jann, B., 2012, "Estimating Heterogeneous Treatment Effects with Observational Data," American Sociological Association.

Ye, Y., and Kaskutas, L. A., 2009, "Using Propensity Scores to Adjust For Selection Bias When Assessing the Effectiveness of Alcoholics Anonymous in Observational Studies," Drug and Alcohol Dependence, Vol. 104, pp. 56–64.