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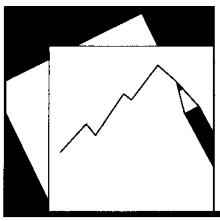

IMF Working Paper

Does conditionality in IMF-supported programs promote revenue reform?

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INTERNATIONAL MONETARY FUND

 WP/14/206

IMF Working Paper

Fiscal Affairs Department

Does conditionality in IMF-supported programs promote revenue reform?

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November 2014

Abstract

This paper studies whether revenue conditionality in Fund-supported programs had any impact on the revenue performance of 126 low- and middle-income countries during 1993-2013. The results indicate that such conditionality had a positive impact on tax revenue, with strongest improvement felt on taxes on goods and services, including the VAT. Revenue conditionality matters more for low-income countries, particularly those where revenue ratios are below the group average. Moreover, revenue conditionality appears to be more effective when targeted to a specific tax. These results hold after controlling for potential endogeneity, sample selection bias, and when revenues are adjusted for economic cycle.

JEL Classification Numbers: *C33; E62; F33; H2*

Keywords: Tax revenue; structural conditionality

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I. INTRODUCTION

Fiscal adjustment has been an important element of IMF-supported programs.[2] Experience shows that expenditure reductions have generally been achieved while increases in revenues have fallen short in relation to program targets (IEO, 2003). This is despite the fact that reform of the tax system—including both tax policy and revenue administration measures—has been frequently subjected to conditionality, to support the implementation of needed structural tax measures.

Conditionality typically covers both the design of IMF-supported programs—that is, the macroeconomic and structural policies—and the specific tools used to monitor progress toward the goals outlined by the country in cooperation with the IMF. All conditionality under an IMF-supported program must be critical to the achievement of macroeconomic program goals. The member country has primary responsibility for selecting, designing, and implementing the policies that will make the IMF-supported program successful. The program's objectives and policies depend on country circumstances, but the overarching goal is always to restore or maintain balance of payments viability and macroeconomic stability, while setting the stage for sustained, high-quality growth and, in low-income countries, for reducing poverty.

Until the early 1980s, IMF conditionality largely focused on macroeconomic policies. Subsequently, the complexity and scope of structural conditions increased, reflecting the IMF's growing involvement in low-income and transition economies, where severe structural problems hampered economic stability and growth. Over the years, program conditionality has become better tailored to individual country needs, more streamlined, and focused on core areas of IMF expertise (IMF, 2012). Programs have also adapted flexibly to changing economic circumstances, which has helped to achieve program objectives, and, at the same time, sought to safeguard social spending (particularly in low-income countries).

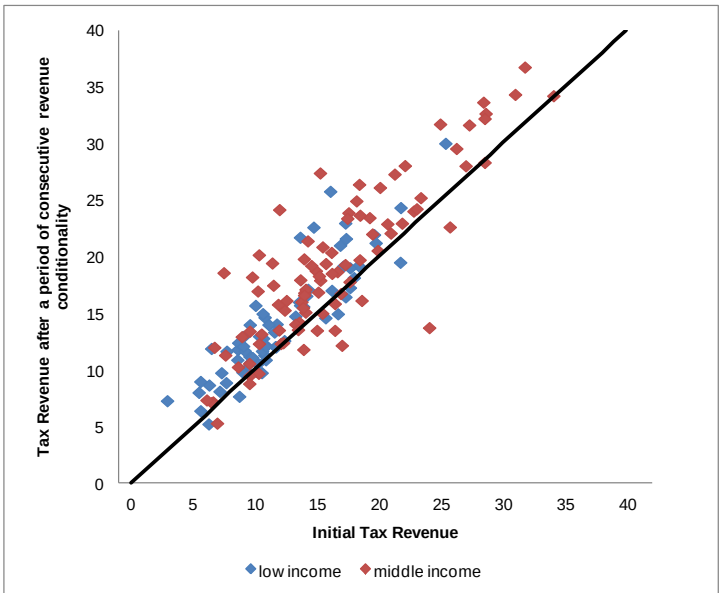
Conditionality can take different forms, including prior actions (PA), quantitative performance criteria (QPC), indicative targets (IT), or structural benchmarks (SB). Prior actions are measures that a country agrees to take before the IMF's Executive Board approves financing or completes a review. They ensure that the program has the necessary foundation to succeed. Quantitative performance criteria are specific and measurable conditions that have to be met to complete a review. Indicative targets are used to supplement QPCs for assessing programs. Structural benchmarks are reform measures that are critical to achieve program goals and are intended to assess program implementation during a review.

Over the last 20 years, some form of revenue conditionality has been included in the 441 approved IMF-supported programs. This revenue conditionality has supported the

[2] The average targeted fiscal adjustment in 133 IMF-supported programs was 1.7 percent of GDP during the period 1993-2001 (IEO, 2003).

implementation of structural tax measures in a country's reform program.[3] In recent years, the use of revenue conditionality has increased. This partly reflects greater reliance on IMF's technical assistance and the desire of countries to implement this technical advice in the context of IMF-supported programs.[4]A quick glance at the data suggests that revenue conditionality in IMF-supported programs appears to have been associated with higher revenue collection in low- and middle-income countries. Figure 1 displays tax-to-GDP ratios in countries where tax reform was supported by a period of at least two consecutive years of revenue conditionality. In more than 75 percent of such cases, the tax-to-GDP ratio increased as compared to the year prior to the inclusion of the revenue conditionality.

Figure 1. Tax Revenue and IMF Revenue Conditionality
(Before and after a period of consecutive conditionality, 1993-2013)



Source: Authors' calculations; data from GFS and MONA database, IMF.

One would expect an IMF-supported program to contribute to improving revenue collection, regardless of revenue conditionality. This is because the government should be strengthening revenue collection as part of the agreed fiscal adjustment in the context of the IMF-supported program, so as to give a positive signal to creditors and investors (Przeworsky and Vreeland, 2000). Even in the absence of a Fund-supported program, higher revenue collection would be needed to help deal with a severe fiscal crisis. A first key question then is whether there is a role for revenue conditionality in strengthening revenue collection.

[3] An example of structural tax revenue reforms with a positive revenue impact is the move to replace harmful trade taxes with broad-based consumption taxes (Baunsgaard and Keen, 2010).

[4] Arezki et al.(2012) find that IMF technical assistance and training support structural reforms in the context of IMF supported programs.

Table 1 shows average annual changes in tax revenue for 1994-2013 for low- and middle-income countries. Revenue collection appears to have grown faster in countries with IMF-supported programs that included revenue conditionality. Tax revenue increased faster in this group of countries as compared to the sample as a whole, and in particular faster than countries without revenue conditionality either with an IMF-supported program or no IMF-supported program. This result is particularly strong for low-income countries in which average annual revenue growth in IMF-supported program countries that included revenue conditionality is more than twice the observed revenue growth for the sample as a whole as well as for countries with no revenue conditionality.

Table 1. Tax Revenue Performance and IMF Revenue Conditionality
(Average annual changes, in percent of GDP, 1994-2013)

	1994-2013	1994-98	1999-03	2004-08	2009-13
All countries	0.13	0.03	0.29	0.34	-0.36
IMF Program with Revenue Conditionality	0.30	0.16	0.46	0.24	0.20
IMF Program without Revenue Conditionality	0.02	-0.22	0.40	0.21	-0.52
No IMF Program	0.12	0.11	0.15	0.41	-0.45
Middle Income Countries					
IMF Program with Revenue Conditionality	0.33	-0.11	0.65	0.16	0.38
IMF Program without Revenue Conditionality	-0.09	-0.16	0.38	0.28	-1.66
No IMF Program	0.10	0.14	0.14	0.41	-0.57
Low Income Countries					
IMF Program with Revenue Conditionality	0.36	0.51	0.18	0.33	0.12
IMF Program without Revenue Conditionality	0.14	-0.36	0.29	0.14	0.31
No IMF Program	0.01	-0.02	0.15	0.05	0.43

The second key question relates to the design of revenue conditionality in IMF-supported programs. And in particular the extent to which revenue conditionality has focused more on broad-based consumption taxes—such as the VAT—or income taxes, and their overall contribution to revenue. The recent work (Arnold, 2011; OECD, 2010) suggests a growth-hierarchy amongst taxes that favors broad-based consumption taxes for not discouraging savings and investment. Income taxes are believed to have the most adverse effects on growth as they interfere directly with economic decisions—in particular, labor force participation. Thus, an analysis of revenue conditionality in IMF-supported programs can help better understand the contribution of IMF-supported programs to economic growth (Dicks-Mireaux et al., 2000; Przeworsky and Vreeland, 2000). The final issue is whether the design of revenue conditionality—focusing on tax policy or tax administration; specific or more general in nature—makes a difference to revenue collection.

There are limited studies that have analyzed the impact of IMF-supported programs on overall fiscal outcomes.[5] Most prominently, Bulir and Moon (2003) studied fiscal developments in 112 countries during the 1990s and Cho (2009) in 93 developing countries during 1951-2000 and found that IMF-supported programs had no effect on revenue collections. By contrast, Brun, Chambas and Laporte (2010) concluded that IMF-supported programs had a positive impact on total revenues in sub-Saharan Africa during 1984-2007. However, there is no recent econometric assessment of the extent to which, conditional on other revenue-relevant developments, revenue conditionality contained in IMF-supported programs have affected tax revenue collection—including its main components—nor of the underlying design factors of conditionality that may contribute to higher revenues.

This paper analyzes the impact of revenue conditionality in IMF-supported programs on tax revenue collection in 126 low- and middle-income countries over the period 1993-2013. In doing so, it specifically addresses the questions raised above by using a newly assembled and broad (unbalanced) panel dataset on tax revenue—including all main tax components—and takes advantage of a database on IMF-supported programs that includes detailed information on revenue conditionality. The essence of the empirical strategy is to examine first the relationship between IMF-supported programs (with or without revenue conditionality) and tax revenue performance as compared to countries with no IMF-supported program. Second, the impact of revenue conditionality in IMF-supported programs is assessed on tax revenue, by looking at potentially differential effects on various types of taxes. Robustness tests are performed to account for differential characteristics in the design of revenue conditionality, to better understand potential differences related to the country's income level, or initial conditions, as well as the strength of institutions. Finally, cyclically adjusted revenues are considered to account for the effect of the economic cycle on revenues.

The paper is organized as follows. Section II describes the dataset, presents the empirical specification and estimation strategy. The results are presented in Section III, with further robustness analysis in Section IV. A summary of the results and policy implications are presented in Section V.

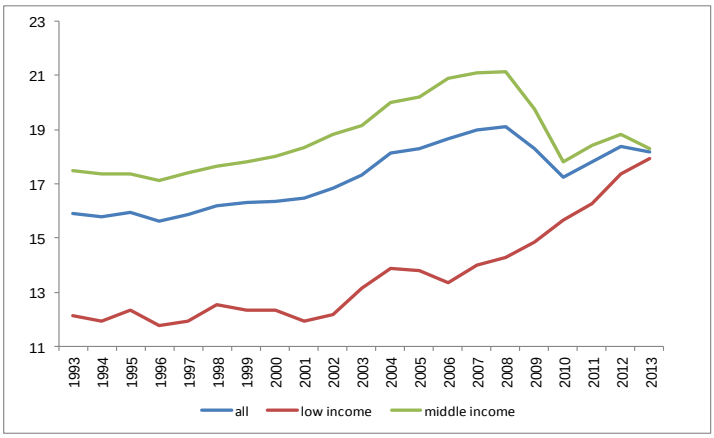
[5] Most of the literature has focused instead on the effects of IMF-supported programs on the balance of payments (Reichmann and Stillson, 1978; Bird, 1996); on inflation (Edwards and Santaella, 1993, Killick, 1995); on social spending (Clements, Gupta, and Nozaki, 2013); on economic growth (see Przeworkski and Vreeland, (2000) for a review of the literature); and on sovereign risk (Jorra, 2012)); and on the effect of IMF conditionality on trade openness (Wei and Zhang, 2010). See also Dreher (2009) for a review of conditionality in IMF-supported programs and a discussion on its effectiveness.

II. DATA AND METHODOLOGY

A. Data

The dataset comprises an unbalanced panel of 126 low- and middle-income countries over the period 1993-2013. Data on tax revenues are drawn from the three sources: the IMF's *Government Finance Statistics* (GFS), the IMF's *World Economic Outlook* (WEO), and the Organization for Economic Co-operation and Development (OECD)'s *Revenue Statistics in Latin America*. To ensure consistency, only one data source is used for a given tax series/country over the entire sample period. . These data comprise besides total tax revenue, taxes on goods and services[6], VAT, taxes on corporate profits (CIT), the personal income tax (PIT), and taxes on international transactions (Trade), all expressed relative to GDP. Full details of the dataset and summary statistics are provided in Appendix A. Figure 2 illustrates average tax revenue performance for all countries in the sample, showing an average increase in tax revenue collection by about 2 percentage points of GDP, over the sample period. Until 2008, revenue collection in middle-income countries increased by around 3 percentage points of GDP, on average, about 1 percentage point of GDP more than in low-income countries. After 2008, however, low-income countries were able to strengthen revenue collection further, whereas in middle-income countries, the effects of the global financial crisis resulted in lower tax-to-GDP ratios. This translated into almost a convergence between the two groups of countries in observed tax-to-GDP ratios.

Figure 2. Average Tax Revenue in Low- and Middle-Income Countries
(In percent of GDP, 1993-2013)



Source: Authors' calculations; data from GFS and country documents, IMF.

Data on IMF-supported programs as well as on revenue conditionality included in IMF-supported programs are taken from the IMF's Monitoring of Fund Arrangements (MONA) database, as explained in the Appendix. Revenue conditionality has supported structural

[6] Includes VAT, excise taxes, and other consumption-related taxes.

reform, taking mostly the form of structural benchmarks (80 percent). Only about 20 percent of conditionality took the form of prior actions reflecting structural revenue measures that a country agreed to undertake before the IMF's Executive Board approved financing or completed a program review.

Revenue conditionality may be either quantitative (e.g., increasing the VAT rate to 18 percent) or structural (e.g., submitting a legislation to parliament for introducing a VAT). At the same time, revenue conditionality can be related to tax policy or tax administration reform. Finally, revenue conditionality can be specific or general. Specific revenue conditionality can be identified with a tax type and is associated with a specific revenue target (e.g., increase the tax-free threshold under the personal income tax by a certain amount).[7] General conditionality, in contrast, cannot be linked to a specific tax type and its main objective is usually either to support the initial steps in a wide-ranging tax reform (such as, submission to cabinet of a tax reform proposal) or to strengthen aspects of the revenue administration (e.g., adopt a new IT system in the revenue agency).
The incidence of revenue conditionality in IMF-supported programs is represented by binary variables (including for total tax, and for each of the main taxes) that equal one if a country in a given year had an IMF-supported program with met[8] revenue conditionality and zero otherwise. In cases in which revenue conditionality cannot be linked to a specific tax (general conditionality), it is assumed that the revenue conditionality applies to all taxes in that specific year. In most cases, the first lag of the revenue conditionality dummy is considered, to account for delayed reaction of tax revenue to the tax measure implied in the conditionality. This is particularly relevant in cases where the revenue conditionality was added during a program review that took place late in the year.[9]

A large number of developing countries have implemented IMF-supported programs in the past twenty years. Since 1993, 96 of the 126 countries in the sample had such a program for at least 1 year. The number of years a given country had a program varied substantially. Over the entire sample, about 43 percent of the time countries had IMF-supported programs (Table A1 in the Appendix). IMF-supported programs were more frequent in low-income countries (about 63 percent).

Revenue conditionality has been an important component of IMF-supported programs. This is because many countries, particularly low- and middle-income ones, are seeking to raise more revenues by strengthening their tax systems. The demand for public services and infrastructure in these countries is growing rapidly and domestic resource mobilization remains the major source for funding them in a sustainable manner. As a result, since 1993, over 1,500 revenue conditionalities were met in the 441 newly approved IMF-supported programs. Over the entire sample period, about 20 percent of the time countries included

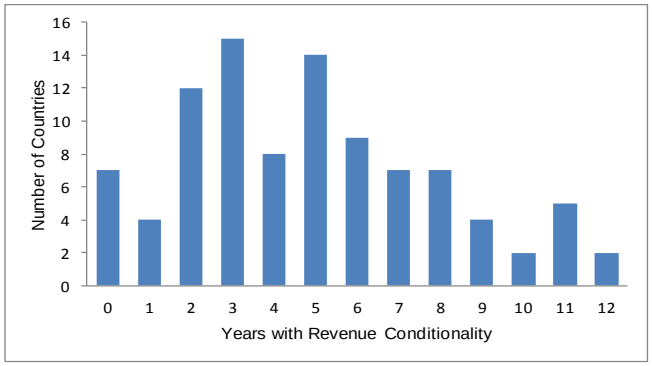
[7] Specific conditionality can also target revenue administration (such as, create a large VAT taxpayers unit).

[8] If the revenue conditionality was not met, the dummy variable takes the value zero, as it implies that the tax reform was not pursued and would then be equivalent to not having revenue conditionality in the first place.

[9] While our preferred specification includes the lagged variable, inclusion of the contemporaneous effect is not qualitatively different in the results.

some type of revenue conditionality (Table A1 in the Appendix). Excluding non-IMF-supported program countries, this figure goes up to 50 percent. Figure 3 shows the number of years in which a Fund-supported program included revenue conditionality. On average, countries had 5 years with revenue conditionality, which means those IMF-supported programs included revenue conditionality in at least 5 occasions over the sample period (there might be more than one revenue conditionality in a given year, for example applying to different taxes). In addition, countries had on average, 3 years of consecutive revenue conditionality over the sample period.

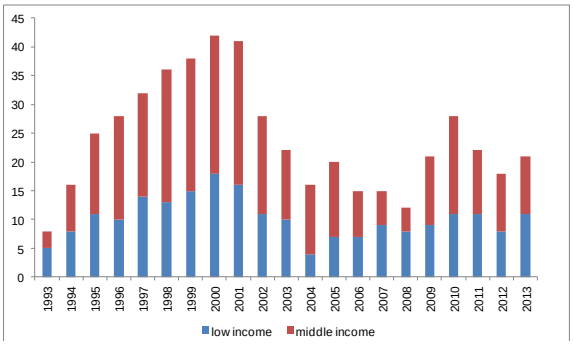
Figure 3. Years with Revenue Conditionality
(By country, 1993-2013)



Source: Authors' calculations; data from MONA Database, IMF.

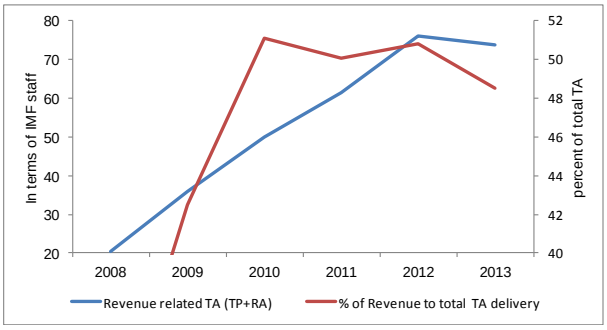
The number of countries that included revenue conditionality in IMF-supported programs has varied over time. It increased during the 1990s—reflecting the structural nature of IMF-supported programs in the former transition economies (Figure 4). As a result, more than 40 countries with an IMF-supported program included at least one revenue condition by 2000. Subsequently, revenue conditions fell in the early 2000s with streamlining of conditionality in Fund-supported programs (IMF, 2005). However, there was a resurgence of revenue conditionality after 2008, presumably reflecting challenges in implementing tax reforms and the need to shore up revenues in the aftermath of the global financial crisis. While during the 1990s, middle-income countries made up the bulk of the IMF-supported programs with revenue conditionality (about 60 percent), more recently low-income countries have increasingly included revenue conditionality (about 50 percent since 2006). As noted earlier, the increase in revenue conditionality has coincided with expanding Fund technical assistance (TA) since 2008 (Figure 5). It appears that countries are using revenue conditionality to monitor the implementation of their tax reforms.

Figure 4. Countries with Revenue Conditionality in IMF Supported Programs
(By year and income level, 1993-2013)



Source: Authors' calculations; data from MONA Database, IMF.

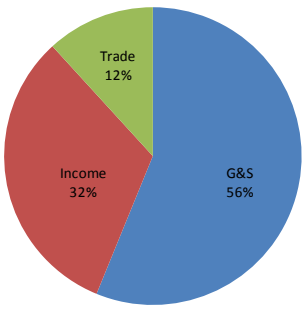
Figure 5. IMF Technical Assistance (TA) in the Revenue Area
(TA Delivery in Staff Years and Percent of Total TA)



Source: Fiscal Affairs Department, IMF.
Note: TA in the revenue area includes tax policy (TP) and revenue administration (RA).

Figure 6 shows that the bulk of the revenue conditionality in IMF-supported programs has focused on taxes on goods and services (56 percent), followed by conditionality on taxes on income (32 percent), and on international transactions (12 percent).

Figure 6. Share of IMF Revenue Conditionality
(By main taxes)



Source: Authors' calculations, data from MONA Database, IMF.

B. Empirical specification and estimation

The impact of revenue conditionality in IMF-supported programs on tax revenues is explored by estimating equations of the form:

$$T_{it} = \delta T_{it-1} + \beta D_{it-1} + \zeta' X_{it} + \alpha_i + \mu_t + \varepsilon_{it} \qquad (1)$$

where *T* denotes tax revenues in country *i = 1,…,N* at time *t = 1,…,L*, expressed relative to GDP, in logs, *D* is a dummy variable for revenue conditionality in IMF-supported programs (equal to 1 if an IMF-supported program with country *i* includes revenue conditionality in year *t-1* and 0 otherwise). *X* is a vector of controls, and country and time-specific effects are also included. The lagged dependent variable allows for sluggish response in the tax base to changes in tax rates. Eq.(1) is estimated separately for total tax revenue (Total Tax), as well as revenues from taxes on goods and services (G&S), the value-added tax (VAT), taxes on income (Income), taxes on corporate profits (CIT), the personal income tax (PIT), and tax on international transactions (Trade).

The control variables in *X* are drawn from previous studies on the determinants of tax-to-GDP ratios (Ghura, 1998) and tax effort (see, for example, Sen Gupta, 2007; Baunsgaard and Keen, 2010; Pessino and Fenochietto, 2010). In particular, the overall development of the economy, measured by GDP per capita, is expected to show a positive correlation with revenue reflecting a growing demand for public services with rising income per capita, and because of a higher degree of economic and institutional sophistication. A higher share of agriculture in value-added is expected to be negatively associated with revenue because agriculture is harder to tax. The degree of trade openness, measured as the sum of the shares of imports and exports in GDP, can present either sign. Rodrik (1998) argues that more open countries are vulnerable to risks and, given the need for social insurance, therefore tend to have bigger governments. Moreover, since trade taxes are easier to collect, especially in developing countries, a positive relationship between trade openness and revenues can be expected. However, higher trade openness could be the result of trade liberalization through tariff reductions. This would be consistent with a negative relationship between trade openness and revenue. Other control variables include inflation, which may have revenue effects through both unindexed tax systems and the generation of seigniorage; and the level of external indebtedness, which reflects the need to generate revenue to service debt.

Eq. (1) is estimated using a system-Generalized Method of Moments (GMM) model,[10] allowing for an unbiased estimate of all variables, including the coefficient on the lagged dependent variable. The system-GMM takes Eq.(1) in differences and levels as a system, using lagged changes as instruments in the latter, and lagged levels as instrument for changes in the former. This estimator is best suited for situations with "small T, large N" panels as is the case in this paper with T=21 years and N=126 countries.

[10] The Blundell and Bond (1998) system-GMM estimator is used instead of Arellano and Bond (1991) difference-GMM estimator since the first one has much better finite sample properties in terms of bias and root mean squared error than the later; the results are not qualitatively different.

Of major concern in this literature is the treatment of endogeneity of IMF revenue conditionality as IMF loans tend to be extended in response to economic imbalances (Conway, 2003). As such, countries with a low tax-to-GDP ratio—reflecting the underlying macroeconomic and structural weaknesses—may need to request IMF support to strengthen their fiscal position, thereby creating a potential problem of reverse causality. System-GMM models are well-suited to address cases in which independent variables are not strictly exogenous, meaning they are correlated with past and possibly current realizations of the error (Roodman, 2009a). Using second and deeper lags of the potentially endogenous variables (and their differences) make them predetermined, meaning not correlated with the error term.

Also of concern is the possibility of sample selection bias associated with participation in an IMF-supported program. With regard to tax revenues, countries that have an IMF-supported program may not be directly comparable to those without one because the former must address macroeconomic imbalances that will influence fiscal policy and the ability of the government to collect taxes. This creates a potential selection bias problem. We address this issue by following the literature on the macroeconomic effect of IMF-supported programs (Barro and Lee, 2005) that relies on identifying suitable instruments to isolate the effects of IMF loan programs on tax revenue. In the system-GMM equations, we instrument the IMF revenue conditionality variable with three variables: international reserves in months of imports, the change in the bilateral exchange rate to US dollar, and the overall fiscal balance. These variables are well correlated with the IMF program variable.[11] To test the validity of the instruments we present not only the Hansen statistic, but also the Sargan statistic, which is less vulnerable to instrument proliferation (Roodman, 2009b).[12] We also include the difference-in-Hansen test of exogeneity of the instruments (Bond, Hoeffler, and Temple, 2001). Finally, due to the presence of heteroskedasticity in the data, robust standard errors are presented. Generally, the diagnostics performed on the estimations below are satisfactory, with a tolerable value for the Hansen/Sargan tests, and with the Arellano-Bond (1991) test for first and second order serial correlation (M1 and M2) suggesting that the former is present but the later is not, which is consistent with the underlying assumptions. The difference-in-Hansen p-values imply that we cannot reject the hypothesis that the subset of instruments used is indeed exogenous.

As an alternative to the GMM results, Appendix B presents the results for alternative models. The first one takes fixed effects models for comparability, including in addition Heckman's (1976, 1979) proposed two-stage estimation procedure using the inverse Mills ratio to take

[11] Appendix B presents a probit regression for the probability of a country to have an IMF-supported program, which confirms further the validity of the chosen instruments. As mentioned earlier, we have also controlled for GDP per capita and the level of external indebtedness, both potentially indicating economic problems that could explain participation in an IMF-supported program.

[12] Both statistics are only shown in cases where there appears to be a potential issue with instrument proliferation. The Hansen statistic's p-value should be high enough to reject correlation between the instruments and the errors but not too high because it weakens confidence in the test. The Sargan test, in contrast, is less vulnerable to instrument proliferation, but not robust to heteroskedasticity.

account of possible selection bias. The presence of the lagged dependent variable in Eq.(1)—with empirics showing significant serial correlation in its absence—may however create difficulties for the fixed effects estimator, with dynamic panel bias from the correlation between the lagged dependent variable and the fixed effect, and bias from any serial correlation in the error term. By taking Eq.(1) in differences, and instrumenting also the lagged dependent variable with its past levels, these issues are addressed with a system-GMM. As a second alternative to GMM and fixed effects estimators, we use the inverse probability weight regression-adjustment method to deal with potential sample selection bias (Hirano et al., 2003).

III. MAIN RESULTS

A. Tax Revenue in IMF-supported Programs

Prior to analyzing the impact of revenue conditionality on tax revenue, it is important to determine the impact of IMF-supported programs on tax revenue, independently of revenue conditionality. As mentioned earlier, some countries have had an IMF-supported program without a revenue conditionality attached to it. This subsection thus reports the results of estimating Eq.(1) for the effect of IMF-supported programs on total tax revenue, whether IMF-supported programs include revenue conditionality or not. The main hypotheses to be tested are then the following:

H1: IMF-supported program vs. No IMF-supported program
H2: IMF-supported program without revenue conditionality vs. No IMF-supported program
H3: IMF-supported program with revenue conditionality vs. No IMF-supported program

Table 2, Columns 1 presents the results for H1, showing that IMF-supported programs have not had a significant impact on tax revenue. This result is in line with previous findings by Bulir and Moon (2003) and Cho (2009). Column 2 presents the results for H2-H3 by adding dummies for the impact of IMF-supported programs with or without revenue conditionality. While a significant and strong impact of IMF-supported programs on tax revenue is found in cases in which revenue conditionality was part of the program, no statistically significant impact is found for cases in which the program does not include revenue conditionality.

The estimated coefficient implies that IMF-supported program with revenue conditionality could raise tax revenue by about 0.7 percentage points of GDP. These result suggests that the existence of an IMF-supported program is a necessary but not sufficient condition for improving tax revenue, with the revenue conditionality actually helping countries strengthen their revenue mobilization.

Table 2. IMF-supported program and Tax Revenue

	(1)	(2)
Tax, lagged	0.6749***	0.6981***
	(0.1117)	(0.1135)
IMF Program, lagged	0.0471	
	(0.0302)	
IMF Program with revenue conditionality, lagged		0.0539**
		(0.0241)
IMF Program, without revenue conditionality, lagged		0.0391
		(0.0261)
Trade Openness	0.0002	0.0010
	(0.0009)	(0.0007)
Inflation	-0.0073**	-0.0066**
	(0.0036)	(0.0033)
GDP Per Capita (log)	0.1113***	0.0964***
	(0.0348)	(0.0350)
Agriculture share in Value-Added	0.0048	0.0024
	(0.0031)	(0.0024)
External Debt	-0.0004	-0.0001
	(0.0009)	(0.0006)
M1 (p value)	0.001	0.001
M2 (p value)	0.454	0.457
Hansen-Over-identification (p value)	0.674	0.405
Diff-in-Hansen-test of exogeneity (p value)	0.250	0.792
Observations	1851	1851
Number of instruments	74	110
Number of countries	122	122

Notes:
a/ Dependent variable is total tax revenue, relative to GDP. Full set of year dummies in all regressions. Robust standard errors, in parenthesis; ***(**,*) indicate significance at 1(5, 10) percent.
b/ One step, robust, with instruments based on first lag of differences in tax and IMF Conditionality in levels equation, and second lags of their levels in the differenced equation.

B. Revenue Conditionality on Tax Revenue

We now turn to the broad analysis of the impact of revenue conditionality on total tax revenue and its main components. The question here is whether revenue conditionality in IMF-supported programs has a positive impact on revenue collection as compared to countries with no revenue conditionality. Countries with no revenue conditionality in a given year are those that had no IMF-supported program (as reported in Table 2, columns 3-4), as well as countries that had an IMF-supported program without revenue conditionality.

Table 3 reports the results for total tax revenue (Column 1), as well as four of its components: taxes on goods and services (Column 2), of which VAT (Column 3), taxes on income[13] (Column 4), and tax on international trade (Column 5). In general, we do find

[13] Further disaggregation for taxes on corporate profits (CIT) and on personal income (PIT) was performed with no qualitatively difference compared to total taxes on income. The results are not presented to preserve space.

support for the underlying hypothesis that revenue conditionality contained in IMF-supported programs has a positive impact on tax revenue. The effect of revenue conditionality on tax revenue is found to be positive and significant for the total as well as for taxes on goods and services, which includes VAT. The estimated coefficient on total tax revenue implies that IMF revenue conditionality could raise tax revenue by about ½ a percentage point of GDP in a given year, with half of this revenue gain (about a ¼ of a percentage point of GDP) explained by the positive impact on taxes on goods and services. Given that countries on average had five years of IMF-supported programs with revenue conditionality, it implies a revenue gain of about 2 ½ percentage points of GDP over the sample period.

Table 3. IMF Revenue Conditionality on Tax Revenues

	(1)	(2)	(3)	(4)	(5)
	Total Tax	G&S	VAT	Income	Trade
Tax, lagged	0.6847***	0.8189***	0.9073***	0.8646***	0.9083***
	(0.1179)	(0.0489)	(0.0609)	(0.0677)	(0.0400)
IMF Conditionality, lagged	0.0310**	0.0503***	0.0483**	-0.0141	-0.0410
	(0.0154)	(0.0209)	(0.0218)	(0.0222)	(0.0281)
Trade Openness	0.0012	0.0011	-0.0001	0.0010	0.0026**
	(0.0009)	(0.0012)	(0.0009)	(0.0014)	(0.0013)
Inflation	-0.0058*	0.0564	0.0511	-0.0684	0.0712
	(0.0033)	(0.1728)	(0.2203)	(0.1509)	(0.1231)
GDP Per Capita (log)	0.0991***	-0.0043	-0.0893	-0.0328	-0.0323
	(0.0368)	(0.0408)	(0.0595)	(0.0557)	(0.0423)
Agriculture share in Value-Added	0.0011	0.0008	-0.0141**	-0.0063	-0.0011
	(0.0023)	(0.0031)	(0.0059)	(0.0044)	(0.0045)
External Debt	0.0003	-0.0001	-0.0002	0.0005	-0.0004
	(0.0009)	(0.0003)	(0.0006)	(0.0011)	(0.0005)
M1 (p value)	0.001	0.000	0.000	0.000	0.000
M2 (p value)	0.450	0.203	0.177	0.838	0.650
Hansen-Over-identification (p value)	0.212	0.544	0.753	0.755	0.813
Diff-in-Hansen-test of exogeneity (p value)	0.416	0.489	0.794	0.233	0.624
Observations	1851	1599	629	1718	1582
Number of instruments	75	113	71	76	113
Number of countries	122	109	81	114	109

Notes:

a/ Dependent variable is total tax revenue, and revenue from taxes on goods and services, VAT, income, and trade, respectively, relative to GDP. Full set of year dummies in all regressions. Robust standard errors, in parenthesis; ***(**,*) indicate significance at 1(5, 10) percent.

b/ One step, robust, with instruments based on first lag of differences in tax and IMF Conditionality in levels equation, and second lags of their levels in the differenced equation.

Alternatively, the lagged dependent variable captures the additional tax revenue gains over time for years with consecutive revenue conditionality. Taking this into account and recalling that countries had on average 3 years of consecutive revenue conditionality over the sample

period, it implies a revenue gain of a full percentage point of GDP by the third year of consecutive revenue conditionality, with ¾ of the gain explained by taxes on goods and services.[14] Also noteworthy, during the period of an IMF-supported program, three revenue conditionalities were met, on average, which suggests that a revenue gain of about 1 percentage point of GDP can be expected over the duration of a program.

The highly significant impact of IMF revenue conditionality on taxes on goods and services—in particular on VAT—could be explained by the large share of revenue conditionality attached to these taxes as discussed in Section II. Besides their large contribution to tax revenue, the superiority of broad-base consumption taxes has been highlighted, not only in terms of efficiency and welfare gains (Keen and Ligthart, 2001) but also in terms of helping strengthening the tax administration, thus improving tax collection in the aggregate. The result on the VAT, in particular, also confirms previous empirical results on the positive relationship between the adoption of a VAT—which has been found to be positively correlated with having an IMF-supported program—and improvements in tax revenue collection (Keen and Lockwood, 2010).

All in all, this result suggests that revenue conditionality has supported the development of growth-enhancing tax instruments (Arnold et al., 2011; Acosta-Ormaechea and Yoo, 2012). A proportional tax—such as the value added tax—on all consumption, however, can have negative distributional impact. This effect is usually mitigated by exempting a few sensitive food and other items under the VAT, and adopting a turnover threshold that confers a competitive advantage to smaller and presumably less well-off traders who serve relatively poor customers; this is tantamount to a de facto exemption (Jenkins, Jenkins, and Kuo, 2006). Moreover, if revenues from the VAT finance increase social expenditures then the net distributional outcome can be progressive (Muñoz and Cho, 2004). Empirical evidence for 140 countries shows that IMF-supported programs have a positive effect on social spending (on health and education) in low-income countries (Clements, Gupta, and Nozaki, 2013).

The effect of revenue conditionality on taxes on income and on international trade is not statistically significant. In contrast to taxes on goods and services, the focus of conditionality on taxes on income has been less frequent due to their relatively low contribution to tax revenue.[15] The result can also be explained by the proliferation of tax incentives (including excessive allowances on the personal income tax or corporate income tax holidays, etc.) (Zee, Stotsky, and Ley, 2002). As for taxes on international transactions (trade taxes), the result is expected as trade liberalization has been generally supported by revenue conditionality to replace harmful trade taxes with broad-based consumption taxes (Baunsgaard and Keen, 2010), and as such, no impact—or even a negative impact—of revenue conditionality on trade tax should be expected.

[14] Alternatively, the impact of revenue conditionality on structural revenue performance can be analyzed by using a dummy on revenue conditionality that equals one during and after each IMF-supported program. The results of this are qualitatively similar to those presented in the text and the coefficients imply revenue gains very close to those computed by the third year after the program started.

[15] Except perhaps for the tax on corporate profits in low income countries, for which its share in total revenue can still be significant (IMF, 2013).

Attention focuses now on identifying the differential impact on tax revenue from conditionality related to tax policy as opposed to tax administration measures; as well as the impact on revenue from the different taxes subjected to specific as opposed to more general revenue conditionality in IMF-supported programs, as defined in Section II above. Table 4 presents the results for conditionality on tax policy and tax administration, whereas Table 5 presents the results for the main taxes subjected to specific versus general conditionality.

Concerning the impact on tax revenue from conditionality on tax policy and tax administration, the estimated coefficients in Table 4 suggest that conditionality on tax policy has almost the same impact on revenue as conditionality on tax administration, the only difference being that the coefficient on VAT for conditionality on tax policy is more significant. The estimated coefficients are similar to those presented in Section III, implying a revenue gain of about ½ percentage point of GDP. The consistency between total tax revenue and the different taxes improves here, with the estimated coefficient on goods and services explaining the full revenue gain, and the VAT explaining more than half of this. This result also suggests that the impact on revenue collection can indeed be substantial when both types of revenue conditionality are present in a given year, which confirms that tax policy and tax administration complement each other in a successful tax reform.

Table 4. Tax Policy vs. Tax Administration Revenue Conditionality on Tax Revenues

	(1)	(2)	(3)	(4)	(5)
	Total Tax	G&S	VAT	Income	Trade
Tax, lagged	0.7004***	0.3051***	0.4750***	0.8613***	0.9092***
	(0.1027)	(0.0631)	(0.0965)	(0.0542)	(0.0362)
Conditionality on tax policy, lagged	0.0266*	0.0888**	0.0822**	0.0019	0.0154
	(0.0152)	(0.0380)	(0.0427)	(0.0256)	(0.0322)
Conditionality on tax administration, lagged	0.0275*	0.0816**	0.0765*	-0.0055	-0.0416
	(0.0165)	(0.0381)	(0.0438)	(0.0237)	(0.0257)
M1 (p value)	0.002	0.004	0.001	0.000	0.000
M2 (p value)	0.428	0.471	0.382	0.893	0.547
Hansen-Over-identification (p value)	0.436	0.291	0.920	0.477	0.473
Diff-in-Hansen-test of exogeneity (p value)	0.289	0.170	0.775	0.349	0.087
Observations	1850	1703	629	1718	1702
Number of instruments	108	109	95	108	109
Number of countries	122	114	81	114	115

Notes:

a/ Dependent variable is total tax revenue, and revenue from taxes on goods and services, VAT, income, and Trade, respectively, relative to GDP. Full set of controls and year dummies in all regressions. Robust standard errors, in parenthesis; ***(**,*) indicate significance at 1(5, 10) percent.

b/ One step, robust, with instruments based on first lag of differences in tax and IMF Conditionality in levels equation, and second lags of their levels in the differenced equation.

Concerning the impact of specific versus general conditionality, the estimated coefficients for "general" IMF revenue conditionality in Table 5 are almost identical to those presented in Section III, with a positive and statistically significant impact on taxes and goods and

services and the VAT. When considering the impact of "specific" revenue conditionality, however, two main differences arise: First, specific revenue conditionality also has a positive and statistically significant impact on taxes on income, which appears to be explained by a positive impact on taxes on corporate profits (CIT). Second, the size of the tax revenue gain is slightly larger, which is mostly explained by the now added effect on the CIT. While the estimated coefficient on total tax revenue implies a revenue gain of about 0.6 percentage points of GDP, half of this (0.3 percentage points of GDP) is explained by the positive impact on taxes on goods and services, and half by the impact on the CIT. The revenue gain differential with respect to the overall sample—and in particular with respect to more general revenue conditionality—is expected and explained by the clearer link that exists between the revenue target and the specific conditionality added to help attain this target.

Table 5. IMF Specific vs. General Revenue Conditionality on Tax Revenues

	(1)	(2)	(3)	(4)	(5)
	G&S	VAT	Income	CIT	Trade
Tax, lagged	0.7703***	0.9071***	0.8359***	0.7775***	0.8719***
	(0.0549)	(0.0537)	(0.0673)	(0.0866)	(0.0429)
Specific Conditionality, lagged	0.0645*	0.0723*	0.0923**	0.1412***	-0.0440
	(0.0383)	(0.0458)	(0.0407)	(0.0521)	(0.0695)
General Conditionality, lagged	0.0477**	0.0478**	0.0245	-0.0815	-0.0190
	(0.0223)	(0.0210)	(0.0779)	(0.0945)	(0.0924)
M1 (p value)	0.000	0.000	0.000	0.000	0.000
M2 (p value)	0.273	0.152	0.737	0.067	0.639
Hansen-Over-identification (p value)	0.872	0.891	0.765	0.820	0.872
Diff-in-Hansen-test of exogeneity (p value)	0.683	0.308	0.653	0.587	0.756
Observations	1684	620	1699	1442	1683
Number of instruments	112	89	72	103	93
Number of countries	113	80	113	107	114

Notes:

a/ Dependent variable is total tax revenue, and revenue from taxes on goods and services, VAT, income, and Trade, respectively, relative to GDP. Full set of controls and year dummies in all regressions. Robust standard errors, in parenthesis; ***(**,*) indicate significance at 1(5, 10) percent.

b/ One step, robust, with instruments based on first lag of differences in tax and IMF Conditionality in levels equation, and second lags of their levels in the differenced equation.

Turning now to consider explicitly the potential sample selection bias problem by including alternative instruments to the system-GMM model as explained in Section II.B.[16] The results in Table 6 are qualitatively identical to those presented in Table 3 above with a significantly positive effect of IMF revenue conditionality on total tax revenue, as well as on taxes on goods and services. After instrumenting for the probability of being in an IMF program, the

[16] Alternatively, selection bias can be addressed using the Inverse Mills Ratio with FE models or inverse probability weight regression-adjustment methods (Appendix B).

impact of revenue conditionality on tax revenue increases, which is reflected in larger estimated coefficients.[17]

Table 6. IMF Revenue Conditionality on Tax Revenues with Alternative Instruments

	(1)	(2)	(3)	(4)	(5)
	Total Tax	G&S	VAT	Income	Trade
Tax, lagged	0.7636***	0.8292***	0.7268***	0.8717***	0.9122***
	(0.0857)	(0.0388)	(0.1136)	(0.0580)	(0.0288)
IMF Conditionality, lagged	0.0615**	0.1296*	0.0885**	0.0911	-0.0880
	(0.0303)	(0.0732)	(0.0410)	(0.0797)	(0.0886)
Trade Openness	0.0016***	0.0007	-0.0002	0.0006	0.0036***
	(0.0005)	(0.0010)	(0.0005)	(0.0010)	(0.0013)
Inflation	-0.0001	-0.0127	0.0048	-0.0057	-0.0285
	(0.0037)	(0.0522)	(0.0024)	(0.0360)	(0.0184)
GDP Per Capita (log)	0.0634**	-0.0060	-0.0579	0.0088	0.0043
	(0.0301)	(0.0419)	(0.0429)	(0.0494)	(0.0402)
Agriculture share in Value-Added	-0.0040**	-0.0014	-0.0067**	-0.0031	0.0038
	(0.0017)	(0.0034)	(0.0033)	(0.0044)	(0.0034)
External Debt	-0.0003	0.0001	-0.0001	0.0001	-0.0006
	(0.0003)	(0.0003)	(0.0004)	(0.0006)	(0.0005)
M1 (p value)	0.003	0.000	0.000	0.000	0.000
M2 (p value)	0.267	0.387	0.188	0.809	0.483
Hansen-Over-identification (p value)	0.471	0.877	0.451	0.682	0.720
Diff-in-Hansen-test of exogeneity (p value)	0.602	0.649	0.768	0.554	0.698
Observations	1851	1703	629	1718	1683
Number of instruments	113	114	70	113	112
Number of countries	122	114	81	114	114

Notes:

a/ Dependent variable is total tax revenue, and revenue from taxes on goods and services, VAT, income, and trade, respectively, relative to GDP. Full set of year dummies in all regressions. Robust standard errors, in parenthesis; ***(**,*) indicate significance at 1(5, 10) percent.

b/ One step, robust, with instruments based on first lag of differences in tax, international reserves (in months of imports, lagged), the exchange rate to the US dollar(percent change, lagged), and the overall fiscal balance (in percent of GDP, lagged), and second lags of their levels in the differenced equation.

[17] The robustness of this methodology can also be tested by explicitly analyzing differences in sub-sample periods, in particular those of global economic crises in which demand for IMF-supported programs have increased (for example, 2007-2013). As expected, once we instrument for the probability of being in an IMF-supported program, no statistically significant difference between alternative periods is found.

IV. FURTHER ANALYSIS

A number of robustness analyses are presented in this section.[18] A first robustness check consists of trying to identify any differential effect of revenue conditionality on tax revenue based on the level of development of the country under an IMF-supported program, or the strength and quality of the country's institutions. Table 7 presents the results for low-income countries (Column 1), and countries that are eligible for IMF PRGT concessional financing (Column 2), as well as middle-income countries (Column 3) considered separately.[19] Table 7, Columns 4-5 present the results for countries grouped on the basis of the ICRG ranking of corruption, which is taken as a proxy for the strength of a country's institutions. For the analysis, countries with strong institutions are those with a score equal or above 3, whereas countries with weak institutions are those with a score below 3.[20]

The estimated coefficients on revenue conditionality for low- and middle-income countries, as well as for those eligible for concessional financing are both significantly positively related to tax revenue. The main difference between the different groups of countries is on the size of the potential revenue gain which is somewhat larger for low-income countries and those eligible for concessional financing (½ a percentage point of GDP compared to about 0.4 percentage points of GDP for middle-income countries) in the first period after the program started, but significantly larger over the longer term. Total tax revenue could potentially increase by 1½ percentage points of GDP in low-income countries by the third year after the program started as opposed to about 1 percentage point of GDP in middle-income countries. This result shows how revenue conditionality in IMF-supported programs can be instrumental in helping low-income countries address implementation challenges and capacity constraints in the adoption of tax reforms.

[18] In addition, we have also included a dummy variable for oil exporter countries to capture potential negative influence of natural-resource revenues on domestic tax effort (Benedek et al., 2014). Alternatively, we have also used non-resource tax revenue only as in Crivelli and Gupta, 2014. The results being qualitatively identical to those in Table 3 are omitted to preserve space.

[19] Low-and middle-income countries are classified according to the World Bank criterion. 72 countries are now eligible for concessional lending, which the IMF provides via the Poverty Reduction and Growth Trust (PRGT). It currently carries a zero interest rate on its loans. Eligibility for PRGT lending is based on a member country's annual per capita income and ability to access international financial markets on a sustainable basis. Concessional support credit lines under the PRGT include the Extended Credit Facility (ECF) and the Standby Credit Facility (SCF). Middle-income countries have been supported mainly under Standby Arrangements (SBA), but also under the Extended Fund Facility (EFF), the Flexible Credit Line (FCL), and the Precautionary and Liquidity Line (PLL). Prior to 2001, low-income countries received support under Extended Structural Adjustment (ESAF) facility and Poverty Reduction and Growth Facility (PRGF).

[20] This grouping is almost equivalent to considering the 50th percentile of the distribution with less and more corrupt countries, respectively, also on the basis of the ICRG ranking of corruption.

Table 7. By income level and strength of institutions

	(1)	(2)	(3)	(4)	(5)
	Low income	Concessional financing	Middle income	Strong Institutions	Weak Institutions
Tax, lagged	0.9626***	0.9641***	0.7599***	0.8914***	0.8791***
	(0.0819)	(0.0695)	(0.0163)	(0.0201)	(0.0436)
IMF Conditionality, lagged	0.0421**	0.0325**	0.0248*	0.0413*	0.0060
	(0.0230)	(0.0158)	(0.0148)	(0.0245)	(0.0167)
M1 (p value)	0.003	0.000	0.002	0.030	0.000
M2 (p value)	0.211	0.681	0.684	0.637	0.120
Hansen-Over-identification (p value)	0.318	0.527	0.153	0.700	0.875
Diff-in-Hansen-test of exogeneity (p value)	0.156	0.104	0.052	0.246	0.337
Observations	610	1034	1470	1291	789
Number of instruments	45	42	46	79	78
Number of countries	37	63	89	87	85

Notes:

a/ Dependent variable is total tax revenue, relative to GDP. Full set of year dummies in all regressions. Robust standard errors, in parenthesis; ***(**,*) indicate significance at 1(5, 10) percent.

b/ One step, robust, with (collapsed for low- and middle-income) instruments based on first lag of differences in tax, and IMF Conditionality, in levels equation, and second lags of their levels in the differenced equation.

As for the analysis on the impact of revenue conditionality on revenue when considering the strength of a country's institutions, Table 7 (Columns 4-5) shows a clear indication that revenue conditionality in IMF-supported programs will potentially have the largest impact on countries with the strongest institutions or lowest corruption. While the estimated coefficient for countries with strong institutions is larger than that for the full sample, the impact of revenue conditionality on tax revenue of those countries with weak institutions is not statistically significant. This result confirms earlier results on the importance of institutions for fiscal policy implementation in low-income countries (Lledo and Poplawski-Ribeiro, 2013).

A further robustness check consists in analyzing the differential impact of IMF revenue conditionality once initial conditions are accounted for. For this purpose, the sample is split to include countries above and below the average tax-to-GDP ratio, as well as countries in the 25^{th} percentile with the lowest and highest tax-to-GDP ratio, respectively, which is equivalent to tax revenue approximately lying below 10 percent of GDP and above 20 percent of GDP, respectively. The underlying hypothesis is that countries with a relatively low tax revenue collection may rely more on revenue measures supported by revenue conditionality to close potential fiscal gap as opposed to countries where the tax effort is already high.

The results in Table 8 show a relatively small difference in the revenue gain (about 0.1 percentage points of GDP) associated with IMF revenue conditionality for countries with tax-

to-GDP ratios below the average.[21] The difference is, however, much more pronounced for countries with the lowest and highest tax-to-GDP ratios. While the revenue gain associated with revenue conditionality in the first group of countries is about 0.6 percentage points of GDP in the first year after the program started—and about 1½ percentage points of GDP by the third year after the program started— there appears to be no significant impact on countries that already face the highest tax revenue ratio (above 20 percent of GDP).

Table 8. Initial conditions: measured by tax-to-GDP ratio

	(1)	(2)	(3)	(4)
	Below average	Below 10 percent	Above average	Above 20 percent
Tax, lagged	0.7205***	0.8456***	0.8269***	0.9836***
	(0.2043)	(0.0261)	(0.0634)	(0.0158)
IMF Conditionality, lagged	0.0454**	0.0657*	0.0284**	0.0363
	(0.0245)	(0.0381)	(0.0135)	(0.0320)
M1 (p value)	0.025	0.004	0.000	0.002
M2 (p value)	0.197	0.485	0.160	0.034
Hansen-Over-identification (p value)	0.487	0.998	0.661	0.651
Sargan-Over-identification (p value)	---	0.054	---	---
Diff-in-Hansen-test of exogeneity (p value)	0.451	0.414	0.411	0.407
Observations	752	297	1319	580
Number of instruments	80	72	78	76
Number of countries	77	45	107	68

Notes:

a/ Dependent variable is total tax revenue, relative to GDP. Full set of year dummies in all regressions. Robust standard errors, in parenthesis; ***(**,*) indicate significance at 1(5, 10) percent.

b/ One step, robust, with instruments based on first lag of differences in tax, and IMF Conditionality, in levels equation, and second lags of their levels in the differenced equation.

A final robustness test consists of identifying changes in tax-to-GDP ratios that are not related to the current state of the economy when analyzing the impact of revenue conditionality in IMF-supported programs, that is, the component of tax revenue that does not respond systematically to output conditions, but is instead the consequence of exogenous political processes or extraordinary non-economic circumstances. This analysis is particularly relevant in the context of IMF-supported programs that are usually negotiated in the context of large macroeconomic imbalances and lower-than potential economic growth.

[21] While the estimated coefficient for countries below the average tax-to-GDP ratio almost doubles that for countries above the average, the base for the computed revenue gain is also much lower for the first group of countries (with a tax-to-GDP ratio of 10.6 percent of GDP) compared to the second group (about 19.1).

Following Fatas and Mihov (2003, 2006), cyclically-adjusted tax revenue (and components) are obtained by estimating for each country equations of the form:

$$T_{it} = \delta T_{it-1} + \beta \Delta Y_{it} + \zeta' Z_{it} + \alpha_i + \varepsilon_{it} \qquad (2)$$

where *T* is tax revenue (and components), expressed relative to GDP, *ΔY* is real GDP growth, and *Z* is a set of controls.[22] In order to control for possible endogeneity of tax revenue with respect to GDP, the instrumental variables (IV) estimator is applied, where *ΔY(-1)* and *ΔY(-2)* are used as instruments.[23] The residuals of Eq. (2) for each country represent the discretionary component of tax revenue and enter estimating Eq. (1) as the dependent variable. The results in Table 9 are qualitatively similar to those in Section III with a highly significant and positive impact of revenue conditionality on total tax revenue as well as for taxes on goods and services and VAT.

Table 9. Cyclically-adjusted Tax Revenue

	(1)	(2)	(3)	(4)	(5)
	Total Tax	G&S	VAT	Income	Trade
Tax, lagged	0.6515***	0.8152***	0.9380***	0.8342***	0.9154***
	(0.1065)	(0.0527)	(0.0536)	(0.0498)	(0.0411)
IMF Conditionality, lagged	0.0462***	0.0704***	0.0446**	-0.0109	0.0076
	(0.0170)	(0.0196)	(0.0235)	(0.0178)	(0.0250)
M1 (p value)	0.000	0.000	0.000	0.000	0.000
M2 (p value)	0.491	0.506	0.252	0.762	0.291
Hansen-Over-identification (p value)	0.281	0.396	0.672	0.634	0.233
Diff-in-Hansen-test of exogeneity (p value)	0.242	0.577	0.468	0.513	0.123
Observations	2061	1906	641	1939	1912
Number of instruments	77	77	71	77	77
Number of countries	126	115	82	115	116

Notes:

a/ Dependent variable is the cyclically-adjusted measure of total tax revenue, and revenue from taxes on goods and services, VAT, income, and trade, respectively, relative to GDP. Full set of year dummies in all regressions. Robust standard errors, in parenthesis; ***(**,*) indicate significance at 1(5, 10) percent.

b/ One step, robust, with instruments based on first lag of differences in tax and IMF Conditionality in levels equation, and second lags of their levels in the differenced equation.

[22] Control variables include the current inflation rate to ensure that the results are not driven by high inflation episodes and a linear time trend.

[23] Overidentifying restriction tests (notably Wooldridge's 1995 score test) do not reject the validity of the selected instruments.

V. CONCLUDING REMARKS

In recent years, the number of revenue-related structural benchmarks in Fund-supported programs has increased. This form of conditionality is agreed with the authorities and monitored by IMF staff, but is not a precondition for the continuation of the program. The question is whether this form of revenue conditionality has a positive impact on the revenue performance of a country. The evidence to-date has been mixed. This paper revisits the issue by using more up-to-date and detailed data for 126 low- and middle-income countries during 1993-2013. The analysis extends beyond total tax revenues by disaggregating data by tax types. Since much of the conditionality tends to be related to a specific tax, the paper analyzes its impact on different taxes.

The results are revealing. Revenue conditionality indeed matters. It matters more in low-income countries than in the middle-income countries, particularly those countries where revenue ratios are below the group average. It has the maximum impact on taxes on goods and services as well as the VAT—a tax which is relatively more friendly towards promoting growth. These results hold even after revenues are adjusted for economic cycle. Once conditionality is targeted to a specific tax, it affects its performance and this holds for all taxes, including income taxes. Unfortunately, in countries where corruption is high, revenue conditionality makes no difference to revenue performance.

APPENDIX A: DATA

The countries in the sample are the following:

Low-income countries: Bangladesh, Benin, Burkina Faso, Burundi, Cambodia, Central African Rep., Chad, Comoros, Congo, Dem. Rep. of, Eritrea, Ethiopia, The Gambia, Ghana, Guinea, Guinea-Bissau, Haiti, Kenya, Kyrgyz Republic, Lao People's Democratic Republic, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Sierra Leone, Solomon Islands, Tajikistan, Tanzania, Togo, Uganda, Zambia, Zimbabwe

Middle-income countries: Albania, Algeria, Angola, Antigua and Barbuda, Argentina, Armenia, Azerbaijan, Belarus, Belize, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Cameroon, Cape Verde, Chile, China, P.R.: Mainland, Colombia, Republic of Congo, Costa Rica, Côte d'Ivoire, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Fiji, Gabon, Georgia, Grenada, Guatemala, Guyana, Honduras, India, Indonesia, I.R. of Iran, Jamaica, Jordan, Kazakhstan, Kiribati, Lebanon, Lesotho, Libya, Lithuania, Macedonia FYR, Malaysia, Maldives, Mauritius, Mexico, Moldova, Mongolia, Morocco, Namibia, Nicaragua, Nigeria, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Russian Federation, Samoa, Senegal, Seychelles, South Africa, Sri Lanka, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Sudan, Suriname, Swaziland, Syrian Arab Republic, São Tomé and Príncipe, Thailand, Tonga, Tunisia, Turkey, Ukraine, Uruguay, Uzbekistan, Vanuatu, Rep. Bol. Venezuela, Vietnam, Republic of Yemen

Data on total tax revenue, taxes on goods and services, VAT, income tax revenue, and trade tax revenue are taken from three different sources: the IMF's Government Financial Statistics (GFS) database, the IMF's World Economic Outlook (WEO) database, and the Organization for Economic Co-operation and Development (OECD) Revenue Statistics in Latin America database, relative to GDP. To ensure consistency, only one source is used for a given tax series/country over the sample period. Data for the construction of the dummy variables on IMF-supported programs as well as on revenue conditionality are taken from the IMF's Monitoring of Fund Arrangements (MONA) Database. Among the economic descriptors for conditionality in the MONA database, considered in this paper are those related to revenue conditionality, which are: revenue measures and revenue administration. In addition, only revenue conditionality that was met at the time of the test date is considered. For IMF-supported programs, the dummy takes the value 1 if the country has a program in the year t and zero otherwise. The starting year of a program is defined as the year in which it was approved. The end year is the year in which the program expired. For revenue conditionality, the dummy takes the value 1 if the country has a program that contains revenue conditionality for a given tax in year t and zero otherwise, as discussed in Section II. In cases in which revenue conditionality cannot be identified with a specific tax in year t (general conditionality), it is assumed that the revenue conditionality applies for each and all of the taxes in that country.

Share of agriculture in aggregate value added, taken from the World Bank's World Development Indicators (WDI) database. Trade Openness is calculated as imports plus

exports in percent of GDP, taken from the IMF's International Financial Statistics (IFS) database. Per capita GDP is calculated in constant (2000) U.S. dollars, taken from the WDI database, expressed in logs. Inflation is the annual change in the CPI, taken from the IFS database. International reserves, nominal foreign exchange rate to the US dollar is taken from the IMF's IFS database. The overall fiscal balance, in percent of GDP, is taken from the WDI database. Foreign debt, relative to GDP, is taken from the WDI database. The ICRG corruption scores, produced by Political Risk Services Group, are assessments by staff and relate to actual and potential corruption in the following forms: excessive patronage, nepotism, job reservations, 'favor-for-favors', secret party funding and suspiciously close ties between politics and business. The scores range from 0 to 6, where 0 indicates the highest potential risk of corruption and 6 indicates the lowest potential risk for any country. Table A1 summarizes the data.

Appendix Table A1. Descriptive Statistics

	Obs.	Mean	Std. Dev.	Min.	Max.
Total Tax Revenue, percent of GDP	3444	15.30	1.62	0.34	61.39
Low-income countries	1038	11.85	1.75	0.34	36.54
Middle-income countries	2406	17.09	1.57	1.14	61.39
Tax on Goods and Services (G&S), percent of GDP	2051	4.76	2.19	0.10	58.26
Value-added tax (VAT), percent of GDP	908	4.02	2.09	0.10	19.30
Income Tax, percent of GDP	3050	3.68	2.14	0.04	50.60
Tax on corporate profits, percent of GDP	2538	1.91	2.30	0.03	24.70
Personal Income tax, percent of GDP	1648	1.36	2.44	0.00	13.30
Trade Tax Revenue, percent of GDP	2404	2.61	2.54	0.05	41.50
IMF Program variable	2647	0.44	0.50	0.00	1.00
Low-income countries	777	0.63	0.48	0.00	1.00
Middle-income countries	1870	0.35	0.48	0.00	1.00
Revenue conditionality variable on total tax	2647	0.19	0.39	0.00	1.00
Low-income countries	777	0.28	0.45	0.00	1.00
Middle-income countries	1870	0.15	0.36	0.00	1.00
Revenue conditionality variable on G&S	2642	0.17	0.37	0.00	1.00
Revenue conditionality variable on VAT	2646	0.16	0.37	0.00	1.00
Revenue conditionality variable on Income tax	2642	0.15	0.36	0.00	1.00
Revenue conditionality variable on Trade tax	2621	0.14	0.35	0.00	1.00
Specific revenue conditionality variable	2643	0.06	0.24	0.00	1.00
General revenue conditionality variable	2639	0.13	0.34	0.00	1.00
Agriculture Value-added, percent of GDP	2379	20.55	14.62	1.33	93.98
Trade Openness, percent of GDP	3779	76.65	39.94	0.31	375.61
GDP per capita, 2000 USD	3828	94.46	421.70	0.05	9181.38
Inflation, in percent	3935	0.53	6.49	-1.25	244.11
Foreign Debt, percent of GDP	3856	59.73	75.06	0.00	1847.62
ICRG Corruption Score	2414	2.42	0.97	0.00	6.00
International Reserves, in months of imports	2556	8.24	56.72	0.00	136.49
Nominal Foreign Exchange Rate to the US Dollar	4284	460.30	1797.38	0.00	24770
Overall Fiscal Balance, percent of GDP	2596	-2.58	5.95	-46.23	125.44

APPENDIX B: ALTERNATIVE MODELS

Fixed Effects Models

This section reports the results using a fixed effects model. To account for the potential selection bias, we include the so-called inverse Mills ratio as additional control variable in the regressions. This is derived in a first stage from a probit regression of the IMF-supported program on the instrumental variables used described in Section II.B, which are mainly driven from the literature (Barro and Lee, 2005). The result for the probit regression (Table A2) shows that the instrumental variables are well correlated with the IMF program variable.

Appendix Table A2. Result of probit regressions to generate inverse Mills ratio

IMF Program, lagged	2.5803***
	(0.0815)
Overall fiscal balance, lagged	-0.0040
	(0.0066)
International reserves, lagged	-0.0464***
	(0.0139)
Exchange rate, lagged change	1.0655***
	(0.3861)
GDP per capita, lagged change	-1.4599*
	(0.8417)
Constant	-1.1388***
	(0.0893)
Observations	1873
R-squared	0.5461

Notes:
a/ Dependent variable is IMF Program. Standard errors, in parenthesis; ***(**,*) indicate significance at 1(5, 10) percent.

The fixed effects estimations show very similar results to those presented in Section III, with a statistically significant positive relationship between IMF revenue conditionality and total tax revenue (Appendix Table A3). The same result holds for taxes on goods and services and the VAT, and for the different model specifications that include the inverse Mills ratio as additional control variable. The main difference with the GMM estimations is in the size of the estimated coefficients, which are smaller. However, as it was the case with GMM, once we correct for sample selection bias, the estimated coefficient appears to be again larger for total tax revenue, but almost identical for taxes on goods and services and VAT.

Appendix Table A3. IMF Revenue Conditionality on Tax Revenues – Fixed Effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Total Tax	Total Tax	G&S	G&S	VAT	VAT	Income	Income	Trade	Trade
Tax, lagged	0.5613***	0.5724***	0.7209***	0.7302***	0.6406***	0.5694***	0.6817***	0.6687***	0.8002***	0.7798***
	(0.0672)	(0.0789)	(0.0397)	(0.0555)	(0.0955)	(0.1199)	(0.0369)	(0.0480)	(0.0267)	(0.0293)
IMF Conditionality, lagged	0.0176**	0.0203*	0.0382***	0.0310**	0.0129**	0.0128**	0.0016	0.0162	-0.0116	0.0091
	(0.0078)	(0.0111)	(0.0128)	(0.0034)	(0.0046)	(0.0076)	(0.0129)	(0.0167)	(0.0155)	(0.0162)
Trade Openness	0.0014***	0.0012***	0.0006	0.0007	0.0018	0.0023**	0.0022***	0.0023***	0.0010*	0.0003
	(0.0003)	(0.0003)	(0.0005)	(0.0007)	(0.0011)	(0.0010)	(0.0005)	(0.0006)	(0.0005)	(0.0006)
Inflation	-0.0014	-0.0064***	-0.0030	0.0501	-0.0009	-0.1084	0.0132	-0.0527	-0.0149	0.0638
	(0.0031)	(0.0001)	(0.0048)	(0.1049)	(0.0958)	(0.1679)	(0.0092)	(0.0672)	(0.0119)	(0.1084)
GDP Per Capita (log)	0.1915***	0.1687***	-0.0957	-0.1212	0.2152**	-0.0039	0.1477	0.2223*	0.0656	0.0826
	(0.0561)	(0.0665)	(0.0643)	(0.0847)	(0.1104)	(0.0923)	(0.1007)	(0.1280)	(0.0809)	(0.0925)
Agriculture share in Value-Added	-0.0002	0.0009	-0.0033**	-0.0030*	-0.0003	0.0015	-0.0014	0.0017	0.0006	0.0007
	(0.0020)	(0.0027)	(0.0016)	(0.0018)	(0.0034)	(0.0049)	(0.0021)	(0.0027)	(0.0020)	(0.0024)
External Debt	0.0001	0.0006**	0.0001	0.0001	-0.0002	-0.0001	-0.0002	-0.0001	-0.0002	0.0001
	(0.0002)	(0.0003)	(0.0001)	(0.0003)	(0.0008)	(0.0008)	(0.0003)	(0.0004)	(0.0002)	(0.0004)
Inverse Mills ratio		0.0119		-0.0066		-0.0090		0.0089		-0.0018
		(0.0102)		(0.0091		(0.0110)		(0.0104)		(0.0126)
Constant	-0.2737	-0.1954	1.2522**	1.4179**	-1.1489	0.6045	-0.6403	-1.2654	-0.4841	-0.3696
	(0.4140)	(0.4805)	(0.4986)	(0.6633)	(0.8836)	(0.7934)	(0.7461)	(0.9601)	(0.5933)	(0.6606)
Observations	1850	1457	1703	1382	629	574	1718	1398	1683	1361
Number of countries	122	114	114	107	81	76	114	107	114	107
R-squared	0.6791	0.7196	0.8759	0.8545	0.8070	0.8632	0.7700	0.7191	0.9150	0.9217

Notes:

a/ Dependent variable is total tax revenue, and revenue from taxes on goods and services, VAT, income, and trade, respectively, relative to GDP. Full set of year dummies in all regressions. Robust standard errors, in parenthesis; ***(**,*) indicate significance at 1(5, 10) percent.

Inverse probability weight regression-adjustment method

To address potential sample selection bias in the revenue conditionality variable we alternatively propose an inverse probability weight regression-adjustment method to calculate average treatment effects as in Hirano et al., 2003; Angrist et al., 2013; and Acemoglu et al., 2004.[24]

The inverse probability adjustment estimator uses a saturated first-stage logit model to predict treatment probability (the probability of being in an IMF-supported program) based on observables, getting as close as possible to a quasi-randomized experiment. This first stage prediction is called the policy propensity score. For this first stage, we have used as observable variables the same that we used to calculate the Inverse Mills Ratio for the fixed effects method. The second stage outcome regression then corrects for the allocation bias in situations where the outcome also depends on observables, but is in every other respect exactly the same specification used in the linear-projection specifications.

Using the two-stage estimator, Table A4 shows that revenue conditionality has a positive contemporaneous effect on tax revenue collection as well as positive effect on tax revenue collection over the longer-term.

Appendix Table A4. IMF Revenue Conditionality on Tax Revenues – Inverse Probability Weighting Method

Treatment-effects estimation	Change in Total Tax Revenue, in percent of GDP			
	Year 0	Year 1	Year 2	Year 3
ATE, Tax Conditionality	0.0175**	0.0195***	0.0123*	0.0169**
	(0.0075)	(0.0077)	(0.0077)	(0.0082)
Observations	1610	1563	1512	1461

Notes:

a/ Robust standard errors, in parenthesis; ***(**,*) indicate significance at 1(5, 10) percent. First stage uses logit, with international reserves (in months of imports, lagged), the exchange rate to the US dollar(percent change, lagged), the overall fiscal balance (in percent of GDP, lagged), and GDP per capita (lagged change) as observables.

[24] For a survey of this and related estimators see Imbens (2004).

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