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IMF-Supported Programs in Low Income Countries:
Economic Impact over the Short and Longer Term

Christian Mumssen, Yasemin Bal Gündüz, Christian Ebeke, and Linda Kaltani

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IMF-Supported Programs in Low Income Countries: Economic Impact over the Short and Longer Term[1]

Prepared by Christian Mumssen, Yasemin Bal Gündüz, Christian Ebeke, and Linda Kaltani

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Abstract

This paper studies the short and longer-term impact of IMF engagement in Low-Income Countries (LICs) over nearly three decades. In contrast to earlier studies, we focus on a sample composed exclusively of LICs and disentangle the different effects of IMF longer-term engagement and short-term financing using a propensity score matching approach to control for selection bias. Our results indicate that longer-term IMF support (at least five years of program engagement per decade) helped LICs sustain economic growth and boost resilience by building fiscal buffers. Interestingly, the size of IMF financing has no significant impact on economic growth, possibly pointing to the prominent role of IMF policy advice and institutional capacity building in the context of longer-term engagement. We also present evidence that the short-term IMF engagement through augmentations of existing programs or short-term and emergency facilities is positively associated with a wide range of macroeconomic outcomes. Notably, the IMF financial support has the greatest impact on short-term growth when LICs are faced with substantial macroeconomic imbalances or exogenous shocks.

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ABBREVIATIONS AND ACRONYMS

CFFs	Compensatory Financing Facilities
CPIA	Country Policy and Institutional Assessment
ECF	Extended Credit Facility
EFFs	Extended Fund Facilities
ENDA	Emergency Natural Disaster Assistance
EPCA	Emergency Post-Conflict Assistance
ESAF	Enhanced Structural Adjustment Facility
ESF	Exogenous Shocks Facility
FDI	Foreign Direct Investment
GEE	General Evaluation Estimator
GMM	Generalized Method of Moments
HAC	High Access Component
HIPC	Heavily Indebted Poor Countries
IEO	Independent Evaluation Office
LICs	Low-Income Countries
MDRI	Multilateral Debt Relief Initiative
MICs	Middle-Income Countries
ODA	Official Development Assistance
PITF	Political Instability Task Force
PRGF	Poverty Reduction and Growth Facility
PSI	Policy Support Instrument
PSM	Propensity Score Matching
RCFs	Rapid Credit Facilities
SAF	Structural Adjustment Facility
SBAs	Stand-By Arrangements
SCF	Standby Credit Facility
SMP	Staff-Monitored Program

I. OVERVIEW

The last 25 years have witnessed a profound transformation in the economic fortunes of low-income countries (LICs). A marked improvement in macroeconomic policies has resulted in improved fiscal performance, stronger external positions, and, most importantly, significant long-term increases in real GDP per capita growth together with reductions in poverty.

This paper assesses how the involvement of LICs in IMF-supported programs may have affected these economic developments in LICs over the past quarter century.[2] During this period, the IMF has engaged in financial or non-financial arrangements with more than half of all LICs, and more than three-quarters of all IMF-supported programs have been with LIC members.

Disentangling the specific impact of an IMF-supported program from the broader economic and development trends in LICs is no easy task. The vast academic literature on this subject—which has typically focused on a mixed sample of LICs and middle-income economies—has found both positive and negative effects of IMF-supported programs on economic performance, depending on the econometric methodology and sample used.

The fundamental methodological challenge in assessing the impact of IMF-supportedprograms is selection bias: countries that approach the IMF often do so because they are already facing economic difficulties or expect to experience problems in the near future. Thus a simple comparison of performance of IMF-supported program countries with non-program countries can be misleading.

Another difficulty in evaluating the impact of IMF support is the vast differences in country characteristics and circumstances. Our study starts with the premise that mixing LICs and middle-income economies, as most studies do (see Section II), would tend to overlook the unique characteristics of LICs as well as the distinct nature and objectives of IMF engagement in these countries, such as:

(i)   *Nature of shocks:* While emerging market countries may experience "sudden stop"types of capital account crises, LICs are more vulnerable to other domestic and external shocks (e.g., terms of trade shocks, demand shocks, natural disasters, domestic or regional instability, etc.) that tend to occur frequently and reflect these countries' lack of economic development and diversification.

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[22] Preliminary ideas and analysis on this topic were presented in our work in IMF (2012b). Since then, we have expanded our analysis in multiple directions, most importantly through a comprehensive review of the literature as well as model estimations and robustness checks. Bal Gunduz et al (2013) complements the current paper by discussing the evolution of IMF program engagement in LICs, providing country case studies, and drawing lessons for future IMF engagement.

(ii)   *Access to financing:* LICs have much less access to domestic or external financing than emerging market countries, making them more dependent on donor assistance and periodically on IMF-supported programs that can help catalyze such assistance.

(iii)   *Longer-term challenges:* IMF-supported programs with LICs tend to focus heavily on medium- and longer-term objectives that are important for poverty reduction and growth, and which tend to extend well beyond the duration of an individual program. In this context, these programs emphasize more capacity and institution building rather than just provision of financing and short-term policy advice.

(iv)   As a result of these factors, IMF-supported program engagement with most LICs has been less episodic than with other countries, and more continuous in nature. Consequently, analyzing the impact of IMF support by looking at snapshots of performance right before and after an individual program, as most studies do, tends to ignore the repeated nature of IMF engagement with most LICs and does not measure progress toward the longer-term objectives that are pursued under these programs (Figure 1).

Figure 1. Years Spent by LICs Under IMF-Supported Programs, 1986–2010
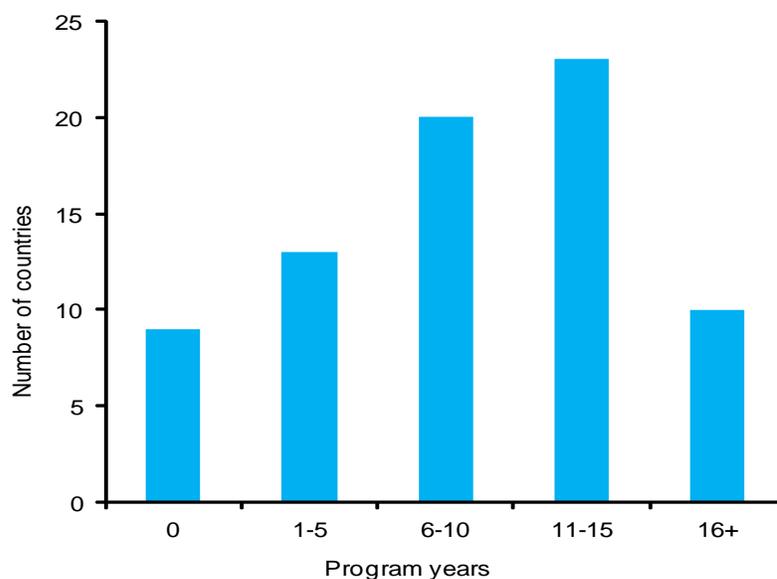
Source: IMF staff calculations.
Notes: Program years are defined as years when a country had a SAF, ESAF, PRGF, ECF or PSI for at least six months. The sample is composed of 75 out of the 78 LICs as of January 2010. Somalia, Timor-Leste, and Tonga had no available data.

A related limitation of the existing literature is that it has usually not differentiated IMF-supported programs by types of instruments. To tailor its support to member countries, the IMF offers a diverse range of instruments—medium-term support, episodic short term and emergency financing, precautionary financing, and non-financial policy support. Economic objectives tend to differ under these instruments. In particular, medium-term instruments place greater emphasis on addressing entrenched imbalances and institutional weaknesses, while short-term instruments are more focused on financing and adjustment to shocks. These differences can have important implications for the examination of the impact of IMF engagement on macroeconomic outcomes.

This study breaks down IMF-supported programs with LICs into two subsets: those aiming to provide more prolonged support, and those aiming to provide short-term financing in response to shocks. We also introduce a number of other methodological refinements to the existing literature, including taking into account the implementation of IMF programs and examining a wider range of macroeconomic and social outcomes using Propensity Score Matching (PSM) approach to correct for selection bias.

Using these techniques, our evidence suggests that longer-term IMF program support may indeed have helped LICs sustain economic growth and boost resilience by building fiscal buffers (Section III). Our findings indicate that while the majority of LICs improved their longer-term macroeconomic performance, this tendency was more pronounced for those with longer-term IMF support (at least five years of program engagement per decade). Specifically, controlling for selection bias, the study shows that between 1986 and 2010, LICs with IMF-supported programs experienced, on average, significantly higher real per capita GDP growth, fiscal balances, foreign investment, and social spending compared to LICs without such programs. At the same time, countries with longer-term IMF engagement tended to attain significant reductions in poverty, income inequality, inflation, and growth volatility relative to their control group.

A further noteworthy finding is that, controlling for the presence of longer-term IMF engagement, the scale of IMF financing does not appear to be significant in determining economic growth over long time frames. This finding may point to the role of the IMF as policy advisor and an implicit institutional capacity building aspect of IMF-supported programs, which may dominate its lending role when the focus is on long-term growth.

This is not to suggest that concessional financial support from the IMF necessarily takes a back seat to policy support or other forms of assistance. In Section IV, we present evidence that suggest that IMF financial support has the greatest impact when LICs are faced with substantial short-term macro-economic imbalances or exogenous shocks.Notably, after controlling for selection bias, stepped-up IMF financing through augmentations of existing programs or short-term and emergency facilities is positively associated with short-term growth and indicators of macroeconomic stability.

II.   OVERVIEW OF THE EMPIRICAL LITERATURE AND CONTRIBUTION OF THE CURRENT STUDY

Existing literature and methodological challenges

While there is a large literature on the macroeconomic consequences of IMF-supported programs, country samples have varied significantly across studies, and very few papers have focused exclusively on LICs. However, regardless of the country sample, the main challenge of these studies has always been the treatment of the endogeneity/self-selection bias related to the participation in IMF-supported programs, and the identification of relevant macroeconomic outcomes of such programs. Selection bias arises from systematically different initial macroeconomic and structural conditions for program versus a non-program countries. Countries that approach the IMF often do so because they are already facing economic difficulties. Structural vulnerabilities such as commodity dependence or poor governance may also lead to longer-term use of Fund facilities, and may result in increased exposure to shocks and a decreased ability to implement appropriate macroeconomic policies in the face of these shocks.

If econometric estimations of the impact of IMF programs ignore these systematic differences between program and non-program countries, the estimated effect of IMF engagement on growth and other macroeconomic indicators would likely be biased. Because most of the variables that determine the participation into an IMF program are also likely to have an independent impact on macroeconomic outcomes, it is particularly difficult to find exogenous sources of variation for IMF programs that can serve as valid instruments to address the selection bias.

The self-selection bias (explained by the fact that countries actually "request" an IMF arrangement when they need it the most) remains a concern when studying the impact of longer-term IMF engagement on various outcomes. Amongst the various factors that may explain the status of a country as a "longer term user of IMF facilities," one critical role is played by structural vulnerabilities (which increase the exposure to and the severity of shocks when those happen and prevent sustainable macro-economic policies from being put in place). These factors include structural exposure to global shocks, weak external buffers, governance and lack of democracy, and lack of domestic resources. In addition to these factors, one can also consider the role of the political proximity vis-à-vis main donors.

In order to disentangle the different factors—and, hence, isolate the specific contribution of IMF engagement—many studies begin by attempting to assess the determinants of countries' participation in IMF-supported programs.[3] While early research emphasized the economic determinants of participation in IMF programs, the low predictive power of these models led researchers to include in participation equations political variables that would affect the

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[3] See Bird (2007) and Steinwand and Stone (2008) for comprehensive surveys.

"supply" side of programs.[4] Evidence on the significance of these factors is again mixed. Although some individual political factors appeared to be significant, they did not significantly improve the models' predictive power (Bird and Rowlands, 2001). Moser and Sturm (2011) distinguished nonconcessional and concessional loans and found that although several economic and political variables robustly explain the approval of nonconcessional loans only three variables (international reserves to imports, past IMF programs and an election in the past year) pass the robustness test for concessional loans.[5]

Steinwand and Stone (2008, p.129) conclude that "the variety of models used to explain participation in IMF programs and the plethora of contradictory results they produce indicates that existing models are far from definitive. This unfinished business is the strongest reason to urge caution in rushing to judgment about the effects of IMF lending." In light of the little consensus in the literature on which variables really matter for participation in IMF-supported programs Bird (2007) concluded that 'the empirical evidence so far may imply that important determining variables may still have been omitted… or that there is no one overall explanation of IMF arrangements. Rather certain things are important in some cases but not in others, such that their significance effectively cancels out in large sample studies'. Therefore, he suggests that future research could look into subsets of country cases, distinguishing the traditional current account crisis, capital account crisis, and LICs.

Recently just a handful of studies have disaggregated the analysis of participation in IMF arrangements by country income groups. Ghosh and others (2005) and Cerutti (2007) examine IMF engagement with Middle Income Countries (MICs) and emerging market economies and find several economic variables significant. Bird and Rowlands (2009) report significant differences between their regression specifications for LICs and MICs; however, the results for LIC specification are weaker than for MICs.[6] Bal Gündüz (2009) focuses on a specific subset of IMF arrangements with LICs addressing policy and exogenous shocks and reports various economic variables as being statistically significant. The latter study is particularly relevant for our research as the selection equation in assessing the short-term impact of concessional programs draws on this empirical model.

While the literature has primarily focused on explaining the annual participation in IMF-supported programs in any given year, a few studies look into the factors behind the prolonged use of Fund resources.[7] This line of research is closely related to the selection

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[4] Andersen, Hansen, and Markussen (2006), Barro and Lee (2005), Oatley and Yackee (2004), Dreher, Sturm, and Vreeland (2006), Dreher and Jensen (2007), Stone (2002, 2004), and Presbitero and Zazzaro (2012) explore the impact of various political variables, including the size of governments, quotas at the IMF, various instruments for U.S. and European influence, and the number of veto players.

[5] This was a refinement of previous analysis by Sturm, Berger and de Haan (2005) where the authors had not made a distinction between concessional and nonconcessional IMF lending.

[6] Only three variables are significantly related to participation in Fund arrangements in LICs (previous Fund arrangements, high inflation, and the rescheduling of debt).

[7] Bird, Hussain, and Joyce (2004) , Conway (2007), Joyce (2005), and Independent Evaluation Office (2002),

model we estimate to assess the impact of longer-term IMF engagement. Overall, this limited literature suggests that repeated use is peculiar to LICs and is explained by both economic and structural variables.

Turning to the impact of IMF engagement, the large empirical literature has reached some consensus that IMF-supported programs are associated with significant improvement in the balance of payments and have some effect on inflation; however, results are mixed regarding the impact on growth (Table 1).[8] A few observations are noteworthy about this literature:

i.   Most of the previous research examines only non-concessional programs (Stand-By Arrangements (SBAs) and Extended Fund Facilities (EFFs)) on a mixed sample of countries. Few studies have focused on just LICs or concessional programs, and they have identified some positive effects of IMF engagement on macroeconomic performance, but not in all areas.[9] A few studies have examined the social impact of IMF programs with mixed results.[10]

ii. Only a few studies explore the impact of prolonged engagement on longer-term growth.[11] Independent Evaluation Office (IEO, 2002) concluded that IMF lending appears to have negative effects on growth for some prolonged users, though not for those under concessional arrangements. Drawing on a mixed sample of LICs and MICs, IMF (2006) noted that macroeconomic problems were reduced in many countries with longer-term program engagement, while structural problems often persisted.

iii. Although the literature widely acknowledges that whether IMF-supported programs are fully implemented or not is a key issue in properly assessing their impact, most studies do not take into account compliance with programs.[12]

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[8] For an extensive survey of earlier literature on effects of Fund programs see Ul Haque and Kahn (1998).

[9] Bredenkamp and Schadler (1999); Dicks-Mireaux, Mecagni, and Schadler (2000); IEO (2004); Ghosh and others (2005), and Bird and Mosley (2006).

[10] Garuda (2000) reported that Fund programs may have important distributional effects that depend on economic conditions prior to programs. Hajro and Joyce (2009) found that the Fund's concessional programs increase the impact of growth on lowering infant mortality while the nonconcessional programs lower the impact of growth on the human development index. Clements, Gupta, and Nozaki (2011) reported that, among LICs, IMF-supported programs have a positive effect on education and health outlays. IMF (2012d) concluded that most Fund-supported programs appear to have helped member countries improve macroeconomic and social conditions. Oberdabernig (2013) investigates the impact of IMF programs on poverty and inequality for a mixed sample of low- and middle-income countries and finds that while there are adverse short-run effects for the whole sample, these are actually reversed for a 2000–2009 sample.

[11] Barro and Lee (2005), Dreher (2006), and IEO (2002).

[12] Mercer-Blackman and Unigovskaya (2000) report a positive association between growth and compliance in transition economies. Dreher (2006) finds that increased compliance reduces the negative impact of programs on growth.

iv. Correcting for selection bias has become a standard component of the analysis only more recently, while most studies having applied either the Heckman two-stage methodology or instrumental variable (IV) regressions (notable exceptions implementing the PSM are Garuda (2000), Hardoy (2003), Hutchison (2004), Atoyan and Conway (2006), and IMF (2012d)).[13] However, the key challenge associated with these approaches was to identify exclusion restrictions, i.e., finding variables strongly correlated with the likelihood of having an IMF-supported program but not correlated with the macro-economic outcome of interest.

v. The more recent literature builds on techniques borrowed from the microeconometric impact evaluation literature to correct for selection bias. Under this approach, each IMF-supported program country observation is matched to a counterfactual nonprogram-country observation with a similar predicted probability of having a program, and their macroeconomic outcomes are then compared. Using this technique, Atoyan and Conway (2006) found little statistical support that IMF programs contemporaneously improve real economic growth in participating countries (though this was the case for the fiscal and current account balances), but found stronger evidence of an improvement in economic growth in years following a program.

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[13] For early studies Ul Haque and Khan (1998) conclude that those that do not correct for selection bias (before–after and with–without approaches) yield less favorable results compared to studies using the General Evaluation Estimator (GEE). However, Dicks-Mireaux, Mecagni, and Schadler (2000) largely discredit the validity of the GEE owing to many restrictive assumptions necessary to define the counterfactual based on policy reaction functions.

Table 1. Summary of Literature on the Impact of IMF Programs, 2000–12

Outcome variables	GDP growth	Inflation	Fiscal deficit	Current account balance	Monetary growth	Gini coefficient	Education spending	Health spending	Poverty	Period	Countries	Type of programs	Selection Correction	Method
Bordo and Schwartz (2000)	-	+		+						1973–1998	14 EMs	SBA EFF	No	
Dicks-Mireaux, Mecagni, Schadler (2000)	+*	-								1986–1991	61 LICs	ESAF	No	
Garuda (2000)						+*/-* [a]				1975–1991	39 countries	Mixed	Yes	PSM
Przeworski and Vreeland (2000)	-*									1970–1990	79 countries	Mixed	Yes	Heckman
Evrensel (2002)	+* [b]	-		+*	+/-					1971–1997	91 countries	Mixed & by program	No	
Hardoy (2003)	-									1970–1990	109 developing countries	Mixed	Yes	PSM PSM(DID)
Hutchison (2003)	-*									1975–1997	67 countries	SBA EFF	Yes	Heckman [c]
Vreeland (2003)	-*									1961–1993	110 countries	Mixed	Yes	Heckman
Dreher and Vaubel (2004)			-*		-*					1975–1997	94 countries	Mixed	No	
Hutchison (2004)	+									1975–1997	25 EMs	SBA EFF	Yes	PSM Heckman
Independent Evaluation Office (2002)	-*/- [d]									1975–1999	82 Prolonged vs temporary users	Mixed & by program	Yes	IV
Barro and Lee (2005)	-*									1975–1999	130 countries	SBA EFF	Yes	IV
Butkiewicz and Yanikkaya (2005)	-*									1970–1999	100 developing countries	Mixed	Yes	IV
Easterly (2005)	0 [e]		-		-					1980–1999	20 repeated users	Mixed	Yes	IV [f]
Atoyan and Conway (2006)	+/-		-*	+*						1993–2002	95 developing countries	Mixed	Yes	PSM Heckman
Dreher (2006)	-*									1970–2000	98 developing countries	SBA EFF	Yes	IV
Nooruddin and Simmons (2006)							-*	-*		1980–2000	98 countries	Mixed	Yes	
Eichengreen, Gupta, and Mody (2008)	-*									1980–2003	24 countries with sudden stops	SBA EFF	Yes	Heckman
Marchesi and Sirtori (2011)	-* [g]									1982–2005	128 developing countries	Mixed	Yes	IV
IMF (2012d) [h]	-[i]	-	+		0					2002–2011	44 MICs	SBA EFF	Yes	PSM
Clements, Gupta, and Nozaki (2012)							+*	+*		1985–2009	LICs and MICs	Mixed & by program	Yes	
Oberdabernig (2013)						+* [j]			+* [j]	1982–2009	LICs and MICs	Mixed	Yes	IV

Source: Draws on Steinwand and Stone (2008), expanded by authors to include selected key aspects of previous studies as well as recent literature.

Note: Heckman = Heckman two-step estimator for correcting selection bias; IV = Instrumental variable estimator; PSM = Propensity Score Matching; DID= Difference-in-difference; EMs = Emerging Markets; EFF = Extended Fund Facility; ESAF = Enhanced Structural Adjustment Facility; LICs = Low-Income Countries; MICs = Middle Income Countries; SAF = Structural Adjustment Facility; SBA = Stand-By Arrangement. +* Significantly positive; -* Significantly negative; + Positive but insignificant; - Negative but insignificant; 0 Very close to zero.

[a] Countries with low propensity scores show improvement, while for those with high propensity scores inequality deteriorates.

[b] Significant only for SAF/ESAF, positive but insignificant in mixed sample.

[c] This study applies Heckman correction to growth equation, however, the inverse mills ratio (IMR) turns insignificant. The author notes that his participation equation is not strong. Therefore, it is difficult to know whether the insignificance of the IMR is because a stable participation equation is not identified or participation is random.

[d] Finds significant negative effect for prolonged users only, while the impact on growth is insignificant for temporary users.

[e] Results from IV regressions are very close to zero.

[f] Easterly (2005) notes that his instruments are weak.

[g] They report a significantly positive impact from the interaction of IMF and World Bank programs.

[h] Based on descriptive comparison vis-à-vis the control group constructed by the PSM, therefore, significance level is not reported.

[i] Positive effect is reported for years following the initiation of programs.

[j] The findings are reversed for the period 2000–09 with IMF programs leading to lower poverty and lower inequality.

Contribution of the current paper

This paper contributes to the existing literature on the impact of IMF-supported programs in at least four ways:

- *Focus on LICs.* By focusing entirely on LICs, the paper contributes to a nascent literature that distinguishes the impact of IMF–supported programs by country-income groups, explicitly recognizing that LICs' unique characteristics (discussed in Section I) set them apart from other countries and warrant a distinct approach to assessing program impact.

- *Longer and short-term support.* The paper studies two homogenous and complementary subsets of IMF-supported programs with LICs (longer-term prolonged support versus short-term episodic support) not examined by the earlier research. This level of disaggregation significantly improves the identification of economic and structural factors in participation models, which is the key step to correct for selection bias, while also making it possible to distinguish between short-run effects and effects of prolonged use of IMF facilities for LICs;

- *Matching techniques.* Based on a sample covering nearly three decades and ending in 2010, the current paper examines a wide range of macroeconomic and social outcomes using the PSM, previously implemented only by a handful of studies for a few outcome indicators and for a mixed sample of countries, to correct for selection bias.

- *Transmission channels.* The paper investigates a number of potential channels of transmission through which longer-term IMF engagement can affect long-term growth and distinguishes between effects due to IMF financing versus the role of its policy advice and capacity development.

III. IMPACT OF LONGER-TERM IMF ENGAGEMENT IN LICS

As noted in Section I, macroeconomic conditions have improved substantially over the last two decades for most LICs, regardless of whether they were engaged with the IMF.[14] On average, LICs experienced long-term increases in real GDP per capita growth, government balances, reserves, current account balances, foreign direct investment (FDI), exports, institutional quality, and social spending while also achieving noticeable reductions in economic volatility, inflation, external debt, as well as poverty (see Figures 2 and 3). This finding holds across country sizes (small versus non-small economies), geographical groupings (coastal versus landlocked), institutional capacity (as measured by the World Bank's CPIA), and per-capita income (see Figure 4).

LICs with longer-term IMF program engagement have experienced, on average, a comparatively stronger improvement in longer-term economic performance. Looking at the past three decades, countries with extensive program engagement faced comparatively weaker initial economic conditions in the 1980s, and experienced on average larger increases in real GDP per capita growth, government balance, exports, FDI and social spending than countries without such extensive engagement.[15] LICs with longer-term program engagement also achieved a more marked reduction in economic volatility, inflation, and external debt. This stylized fact was first reported in IMF (2009) and continues to hold after updating the data to include the most recent years covering the global financial crisis. This strong economic improvement of extensive program users has largely eliminated the performance gap that existed relative to other LICs around the time the Enhanced Structural Adjustment Facility (ESAF) was created in 1987. Figure 5 shows a similar result when looking at the change in decadal averages of economic indicators and splitting the country sample into LICs with longer-term engagement (at least five years within the second decade) and those without such engagement.

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[14] The country sample comprises up to 75 of the 78 countries that were eligible for the Fund's concessional support as of January 1, 2010. Timor-Leste, Somalia, and Tonga were excluded because of severe lack of data.

[15] While the current account for LICs with longer-term Fund engagement seems to have deteriorated over the last two decades, the current account adjusted for FDI has significantly improved pointing to the likely high import content of FDI.

Figure 2. Changes in Average Decadal GDP Per Capita Growth and Poverty Gaps, 1986–2010
(In percent)

A. Change in Average Decadal Real GDP Per Capita Growth

B. Change in Average Decadal Poverty Gaps
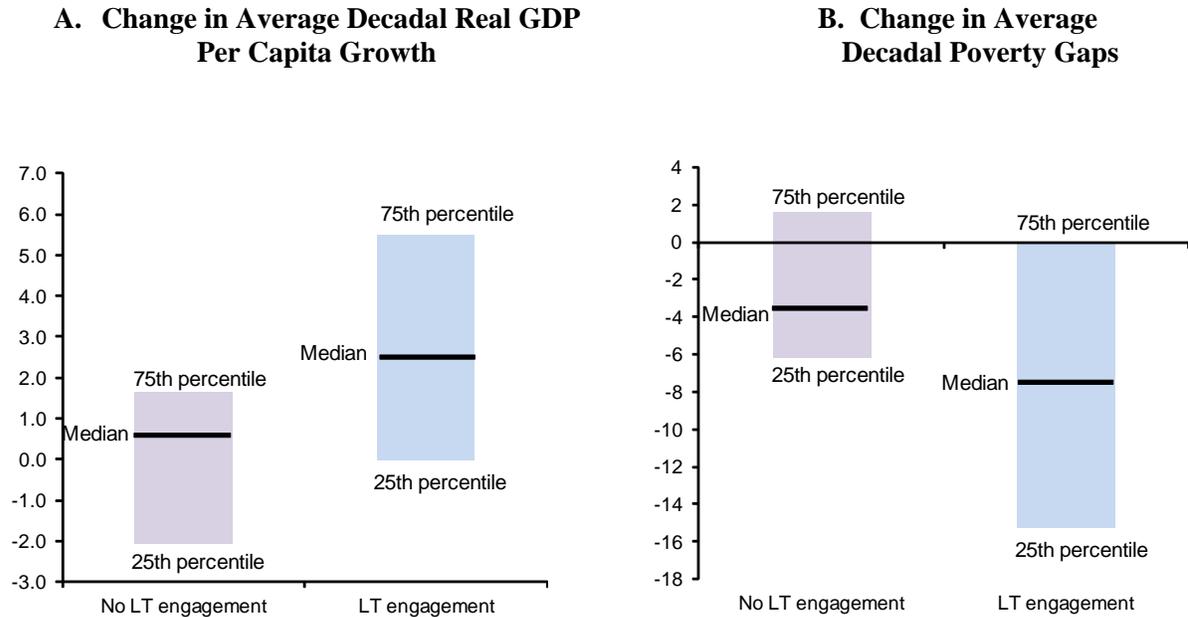
Source: IMF staff calculations using World Bank data.
Note: The sample is composed of 75 low-income countries and four overlapping decadal period averages:1986−95; 1991−2000; 1996−2005; and 2001−10. A country is considered to have longer-term (LT) engagement in a given decade if in five or more years it had a financial arrangement or a Policy Support Instrument in place, for at least six months in each of these years. The figure shows the distribution of decadal changes across countries by quartiles. Poverty gap is defined as the mean shortfall from the poverty line (counting the nonpoor as having zero shortfall), expressed as a percentage of the poverty line. A more negative change in the figure implies a bigger reduction in the poverty gap.

Econometric analysis

The analysis that follows investigates to what extent the positive association of longer-term IMF engagement and economic performance discussed above and presented in Figures 2-5 holds up when controlling for other factors and addressing the sample selection bias. The questions addressed in this section are the following:

a. *How does longer-term IMF program engagement affect macroeconomic performance, including growth and institutional variables?* The approach used is the PSM, an econometric matching technique, which is a two-stage process where (i) a first-stage regression estimates the propensity score (probability) of a country becoming a longer-term user of IMF-supported programs and (ii) then the average economic performance of countries over a 10-year period is compared between longer-term program users and others with similar propensity scores.

b. *What is the longer-term impact of IMF engagement on economic growth, and what are the associated transmission channels?* We run panel regressions based on 10-year period averages that control for the traditional determinants of long-run growth commonly studied in the economic literature as well as a dummy identifying longer-

term IMF engagement. The goal of the panel growth regressions is to identify the channels through which the IMF support impacts longer-term growth performance—namely macroeconomic stabilization, institutional development, and provision of development financing.

The analysis uses a panel dataset of 75 LICs and decadal averages spanning the period 1986–2010. Given the focus on longer-term engagement we work with decadal averages where periods share a 50 percent overlap with each other.[16] We also worked with yearly rolling decadal averages but considered them suboptimal given the stronger serial correlation generated by the repetition of the bulk of the observations. For any given 10-year period, longer-term IMF engagement is captured by a dummy variable that takes the value of 1 if a country has had five or more years of IMF-supported programs in the 10-year period and zero otherwise. The qualifying programs are all IMF financial arrangements available to LICs, primarily the Extended Credit Facility (ECF) and its predecessors (Poverty Reduction and Growth Facility (PRGF), ESAF, and Structural Adjustment Facility (SAF)) but also the SBA, Exogenous Shocks Facility-High Access Component (ESF-HAC), and Standby Credit Facility (SCF), as well as the Policy Support Instrument (PSI). Program years have been purged of episodes when there were prolonged program interruptions to address a shortcoming of the existing literature in failing to take into account program implementation when investigating the impact of IMF engagement.[17]

The Propensity Score Matching (PSM) Approach To control for selection bias, a PSM selection equation is specified to estimate the determinants of longer-term IMF engagement. We specify a pooled panel probit model to avoid the well-known "incidental parameters problem" when estimating probit models with country fixed-effects.[18]The independent variables are chosen broadly in line with the literature's approach of including both demand and supply factors determining IMF support, with the aim of identifying a parsimonious set of variables that achieves a relatively good fit based on the historical data series. Longer-term IMF engagement is assumed to be determined by a country's initial macroeconomic buffers, its structural and institutional characteristics, as well as external demand conditions during the period, but also by the role of IMF quotas in determining countries' available financing from the Fund. Initial macroeconomic buffers are proxied by the reserve coverage ratio and the foreign aid to GDP ratio at the beginning of each decade. Structural characteristics are proxied by a dummy variable identifying landlocked countries, countries' political connectedness, natural resource rents, and institutional characteristics, with the latter stemming from the more recent empirical focus on political and institutional influences on

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[16] This allows for a larger set of observations and also reduces the possible bias from arbitrarily selecting a 10-year period. The periods from which decadal averages are generated are: 1986–95; 1991–00; 1996–05; 2001–10.

[17] This is captured by examining cases when there was a delay of more than six months in completing a review owing to noncompliance with macroeconomic performance criteria. The program interruptions series is taken from Bal Gunduz (2009) and updated by the authors of this study for the period 2008–11.

[18] The incidental parameters problem in fixed-effects estimations stems from unobservable individual specific effects which lead to inconsistent estimators in panel samples with T observations.

IMF agreements. Trading partners' real GDP growth captures exogenous external demand. Finally, countries' access to IMF resources is proxied by their IMF quota. See Annex I for additional discussion and estimation results.

The results of the PSM suggest that longer-term IMF engagement has been associated with improved macroeconomic and socio-institutional outcomes. Table 2 presents the PSM results for dependent variables measured in changes in order to capture relative differences between countries with and without longer-term IMF engagement in their macroeconomic outcomes. Measuring the outcomes variables as decadal changes within countries also allows for controllingcountry specific time-invariant characteristics that may be correlated with macroeconomic performance between countries. The PSM estimations are run using four different matching approaches (nearest-neighbor matching, five-nearest neighbor matching, radius matching, and Kernel matching) to test the robustness of the estimates.[19]

The main findings are as follows:

- Longer-term IMF engagement leads to significantly higher long-term real per capita GDP growth compared to the initial conditions. The panel growth regressions that follow attempt to identify the possible channels through which IMF engagement may affect growth performance.

- Longer-term IMF users have significantly higher reductions in growth volatility and inflation, corroborating the role of continued Fund engagement in restoring or fostering macroeconomic stability. Improvements in the government balance are larger for longer-term users.

- Longer-term IMF engagement is associated with significantly larger increases in FDI.

- Changes in social spending, in particular education spending, are larger for countries with longer-term IMF engagement. They are also positive but not statistically significant for health spending.

- The poverty gap decreased more for countries with longer-term IMF engagement. Declines in poverty rates are also larger for countries with longer-term IMF engagement, but they are not statistically signifi cant. Data availability for poverty gaps and poverty rates is limited, especially for earlier years, leading to a signifi cantly smaller regression sample and possibly less variation in the data.

- Longer-term IMF engagement is associated with significantly greater reductions in income inequality. Like the poverty data, data on income inequality are limited for the

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[19] All estimates are based on matches of observations within the "common support" sample.

earlier years. Yet, the regression coefficients are consistently significant across matching techniques.

- Changes in reserve coverage, tax revenue, and CPIA are larger for countries with longer-term IMF engagement but are not significantly different from the control group (with the exception of the CPIA under one estimation). The relationship between longer-term IMF engagement and changes in aid (a test of the so-called "catalytic effect"), external debt, and the current account is not conclusive under the four estimation techniques

At first sight some of these last findings of insignificant or inconclusive results may seem surprising. For reserves, one possible explanation could be that the presence of the IMF implies that countries are often able to adjust less, since Fund presence serves to some extent as insurance when a balance of payments need arises. Therefore, countries may have less need to accumulate reserves, especially considering the high opportunity cost of doing so in countries where development needs are vast. Furthermore, oftentimes LICs requesting IMF financial support face protracted balance of payments needs and the necessity to undertake major structural reforms, so the role of Fund programs may not necessarily be to boost reserves. This is also suggested by the first-stage regression, which links long-term Fund engagement with initial levels of reserves. As for aid and debt, it is quite plausible that the effect of IMF engagement is weakened when measured as an average over the decade but may be nevertheless significant at the start of an IMF program, or at the point when debt relief is granted in the context of the program.[20]

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[20] Some evidence of this is provided in the subsequent section on the impact of short-term IMF engagement, which corroborates the catalytic role of the Fund. Regarding debt, alternative participation equations do show that countries that received HIPC/MDRI debt relief face a higher probability of Fund engagement. However, even after controlling for the HIPC/MDRI status between countries in the sample, the second-stage regressions point to a positive and significant impact of longer-term engagement on economic growth. Regarding the insignificant impact of longer-term IMF engagement on debt, multiple events can be taking place within the span of a decade (which is our unit of measurement). For example, Fund programs may have catalyzed other donor financing on more concessional terms, thus reducing the burden on countries' budgets but increasing the debt-to-GDP ratios. An additional explanation includes the fact that debt relief operations may have allowed many LICs to scale up a significant amount of financing for their large capital spending projects (though in principle under sound debt sustainability analyses) aimed at fostering long-term growth and strengthening countries' capacity to repay.

Table 2. Impact of Longer-Term IMF Engagement on Economic Performance

	Nearest-Neighbor Matching	Five-Nearest - Neighbor Matching	Radius Matching	Kernel Matching
GDP per capita growth	3.38 ***	3.41 ***	3.30 ***	3.50 ***
	(0.80)	(0.73)	(0.75)	(0.68)
GDP per capita growth volatility	-1.85	-2.33 **	-2.02 ***	-2.45 ***
	(1.33)	(0.99)	(0.75)	(0.90)
Inflation	-10.57 *	-10.46 **	-10.75 ***	-9.60 **
	(5.60)	(4.21)	(3.98)	(4.22)
Tax revenue	0.47	0.92	1.23 *	0.93
	(0.90)	(0.73)	(0.69)	(0.76)
Government balance	3.58 ***	3.52 ***	1.59	3.38 ***
	(1.16)	(1.02)	(1.15)	(0.95)
Reserve coverage	0.18	0.20	0.32	0.15
	(0.45)	(0.35)	(0.30)	(0.33)
Current account	-0.21	0.02	0.10	-0.08
	(1.44)	(1.08)	(1.02)	(1.04)
FDI	1.76 ***	1.86 ***	1.06 ***	1.85 ***
	(0.39)	(0.39)	(0.38)	(0.35)
External debt	50.23	-17.53	-4.19	-25.65
	(38.77)	(27.18)	(22.63)	(19.90)
CPIA	0.26	0.31 *	0.14	0.33
	(0.23)	(0.19)	(0.15)	(0.18)
Social spending	1.07	1.00 *	1.06 ***	0.91
	(0.67)	(0.52)	(0.34)	(0.57)
Education spending	0.78	0.80 *	1.01 ***	0.80 *
	(0.58)	(0.44)	(0.27)	(0.49)
Health spending	0.29	0.20	0.05	0.12
	(0.27)	(0.24)	(0.16)	(0.23)
Aid	-0.45	0.17	-0.26	-0.19
	(1.72)	(1.45)	(1.45)	(1.32)
Poverty gap	-3.90	-3.98 *	-3.83 **	-3.89
	(3.00)	(2.39)	(1.89)	(2.59)
Poverty rate	-2.16	-2.98	-2.51	-2.49
	(3.18)	(2.66)	(2.43)	(2.81)
Gini	-4.94 *	-3.67 *	-3.84 ***	-3.58 *
	(2.56)	(2.14)	(1.38)	(2.09)

Source: IMF staff calculations.

Note: Bootstrapped standard errors in parentheses. Each coefficient represents a separate estimation. All coefficient estimates share the same first-stage regression on the determinants of longer-term IMF engagement. Analysis is based on four 10-year period averages between 1986 and 2010 where periods overlap by 50 percent. A country is considered to have longer-term engagement in a given decade if in five or more years it had a financial arrangement or a Policy Support Instrument in place, for at least six months in each of these years. Changes in each varaible refer to first decadal differences. *10 percent significance; **5 percent significance; ***1 percent significance. CPIA = Country Policy and Institutional Assessment; FDI = Foreign Direct Investment.

What are the channels through which longer-term IMF engagement spurs these outcomes? Some of the macroeconomic variables captured above are often directly linked to IMF program conditionality. For instance, fiscal targets often aim to create fiscal space, changes in the composition of spending to favor health and education outlays or to better target spending on the poorest and most vulnerable, or capital projects with growth benefits. In addition, the IMF assists country authorities in designing consistent macroeconomic frameworks, provides regular and independent policy advice, has been a key player in debt relief initiatives, as well as an important source of capacity building through its policy support and technical assistance.

Panel growth regressions

Panel regressions are used as a complementary approach to estimate the impact of longer-term IMF engagement on growth and to identify the associated transmission channels of longer-term IMF engagement. The starting point for the growth specification follows a large strand of empirical growth literature that seeks to link economic growth performance to economic as well as institutional variables in a panel dataset context. All regressions also control for the endogeneity of longer-term Fund engagement through the inverse Mills Ratio estimated in the first stage selection equation model.[21] The analysis uses the dynamic panel generalized method of moments (GMM) procedure that addresses endogeneity of the other explanatory variables and controls for unobserved country-specific factors through the presence of country fixed-effects.[22] Under an initial regression specification we include as explanatory variables certain growth determinants that have received attention in the literature but exclude variables that are likely to be under the direct influence of IMF-supported programs. In subsequent regressions, we augment our specification by including explanatory variables that are likely to be influenced directly by IMF engagement as identified in the PSM analysis above, and we study the change in magnitude of the coefficients associated with the longer-term IMF engagement dummy along with the changes in their statistical significance.[23] A variable will be considered as a likely transmission channel if it is significant and the coefficient associated with the IMF dummy decreases in size and/or significance relative to the benchmark model.

The panel growth regressions corroborate the PSM findings that longer-term IMF engagement appears to support higher real per capita GDP growth in LICs. They also help to identify some of the transmission channels through which this impact is achieved (Table 3).

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[21] The inverse Mills ratio is the ratio of the probability density function to the cumulative density function of a distribution.

[22] The estimation is performed using the one-step system GMM estimator with robust standard errors. The number of lags of explanatory variables used to build the matrix of instruments has been systematically set in such a way that the instrument "proliferation problem" is ruled out. The rule-of-thumb for setting the number of instruments to below the number of countries has been applied across the various specifications.

[23] The variables used to augment the growth regressions must have turned out to be significant in the PSM analysis in conjunction to being common determinants of growth in the literature.

- The regression results confirm the PSM finding above that longer-term IMF program engagement appears to have a positive impact on long-term real per capita GDP growth.

- Based on the different specifications of the panel regressions, it appears that the decline in real per capita GDP growth volatility and inflation are likely transmission channels of the IMF longer-term impact on per capita GDP growth given the observance of a lower coefficient on the IMF engagement dummy when these factors are controlled for.

- When controlling for both the longer-term IMF engagement and the size of net IMF disbursements in the decade, only the longer-term IMF engagement dummy is significant. This suggests that for longer-term growth performance, it is the IMF's policy support that matters rather than the overall level of financing provided in this context.[24]

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[24] The findings remain the same when gross IMF disbursements are controlled for to take into account the fact that over a 10-year period an IMF loan is typically repaid in full.

Table 3. Determinants of Long-Term Real Per Capita GDP Growth

Long-term Fund engagement	3.52 *	3.35	3.18 *	3.53 *
	(2.08)	(2.13)	(1.92)	(2.15)
Inflation		-0.003		
		(0.02)		
Growth volatility			-0.001	
			(0.12)	
IMF disbursements				-0.19
				(1.12)
Initial GDP per capita	0.97	0.79	0.49	0.92
	(2.42)	(2.57)	(2.19)	(2.75)
Trade openness	-0.02	-0.021	-0.01	-0.18
	(0.04)	(0.04)	(0.04)	(0.04)
Education	0.14 **	0.13 **	0.13 **	0.14 **
	(0.06)	(0.05)	(0.06)	(0.07)
Change in terms of trade	0.04	0.02	0.04	0.04
	(0.05)	(0.05)	(0.05)	(0.06)
Inverse Mills ratio	-1.80	-1.58	-1.56	-1.80
	(1.23)	(1.27)	(1.14)	(1.29)
Constant	-11.78	-9.55	-8.60	-11.48
	(14.23)	(15.44)	(13.59)	(16.39)
Observations/countries	181/54	178/54	181/54	181/54
Arellano-Bond test for AR(1) in first differences	0.16	0.29	0.20	0.20
Arellano-Bond test for AR(2) in first differences	0.56	0.36	0.43	0.56
Sargan test of overidentifying restrictions	1.00	0.99	0.99	1.00
Hansen test of overidentifying restrictions	0.38	0.41	0.29	0.34

Source: IMF staff calculations.
Note: Robust standard errors in parentheses. Analysis is based on four 10-year period averages between 1986 and 2010 where periods overlap by 50 percent. A country is considered to have longer-term engagement in a given decade if in five or more years it had a financial arrangement or a Policy Support Instrument in place, for at least six months in each of these years. *10 percent significance; **5 percent significance; ***1 percent significance.

Robustness

We performed a series of robustness tests to confirm the validity of the findings discussed above. These tests pertained to: (i) choice of the period of analysis; (ii) alternative specification of the [paritcipationequation; (iii) role of IMF program implementation;

(iv) impact of IMF program engagement in the context of donor aid. What follows is a brief discussion of each of these areas.[25]

We investigated whether our results would be different if alternative periods of analysis were chosen. We divided our sample into two sub-samples broadly consisting of a pre-2000s period and a post-2000s period. The results remained qualitatively similar (see Tables 7 and 8). The main differences were that the effect of longer-term IMF engagement on reserve coverage turned out to be positive and significant in the pre-2000s period, while the effect on government balance was no longer statistically significant. In addition, there were insufficient poverty data for the pre-2000s sample, and the results of the post-2000s sample were statistically weaker. We also reran our regressions with a sample of non-overlapping observations, and, although the sample size was significantly reduced, we found that the results remained qualitatively similar to those reported above.

We ran an alternative participation equation that controls for a lagged dummy of longer-term IMF program engagement. The dummy turns out to be significant implying that there may be other factors driving countries' decisions to participate in IMF programs beyond the structural and macroeconomic factors that we have explicitly controlled for. Nevertheless, the second-stage regressions remain qualitatively similar, and we choose to present the results without the lagged longer-term engagement dummy given that at least for our type of analysis prior involvement does not necessarily imply continuity of engagement since the program dummy is defined as at least five years of program engagement in a decade. Although this lagged variable may capture unidentified deepseated structural problems, more work would be needed to identify potential additional variables to be included in the participation equation.

In the analysis presented above we took the view that it is not just the presence of an IMF program that matters but also the degree of implementation. For this reason, and unlike most of the existing literature, we purged our dataset of program years when the IMF program was significantly interrupted, defined as a delay of more than six months in completing a review owing to noncompliance with macroeconomic performance criteria. Table 9 presents the PSM results when there is no adjustment for program implementation. We do, indeed, find that while the results are qualitatively similar, the coefficients tend to be larger when program implementation is taken into account. In particular, this holds for the change in GDP per capita growth variable. Additional research could try to investigate this question even further by devising ways of measuring program performance (i.e., number of conditions met, timing of reviews, etc.). We interpret this finding to suggest that the size of our coefficients may be a lower bound of the true impact of longer-term IMF engagement and that a more refined measure of longer-term IMF engagement could lead to more significant results for some of the variables analyzed which were insignificant in the current analysis.

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[25] The full set of estimation results is available from the authors upon request.

The panel growth regressions presented in Table 3 were re-estimated by including foreign aid as an additional explanatory variable. The rationale was to rule out that the positive impact attributed to IMF engagement was not in fact capturing that of other donors. The alternative specification did not change the results substantially, and aid was not statistically significant in any of the five regressions of Table 3.

Sensitivity analysis of matching estimates to unobserved heterogeneity indicate that the estimated impacts of longer-term IMF engagement are not sensitive to hidden bias. Standard matching procedures are based on the conditional independence assumption implying that selection in the treatment group (in our context, the group of countries with longer-term engagement with the IMF) is only based on observable characteristics. In our context, this means that the selection into longer- term engagement with the IMF is "entirely" explained or modeled with observable factors. Recent empirical work employing PSM techniques in micro-econometric studies checked the sensitivity of the PSM estimated results with respect to deviations from this identifying assumption. Following Clément (2011), we carry out a sensitivity analysis using the Rosenbaum bounds method (Rosenbaum, 2002). Our paper is among the first studies having explicitly tested the robustness and the relevance of the matching framework with respect to hidden bias. The purpose of this procedure is to determine if the average effect of longer-term IMF engagement may be modified or altered by unobserved variables, thus creating a hidden bias. One wants to determine how strongly unobservable factors must influence the selection process to undermine the implications of the matching analysis. Indeed, when considering Hodges-Lehmann point estimates, the results indicate that the unobserved country characteristics would have to increase the odds ratio of being in a longer-term engagement with the IMF by more than 300 percent (well above the rule-of-thumb of 100 percent suggested by Aakvik, 2001) before they would bias the estimated baseline results. These results hold regardless of the matching algorithm used in the propensity score methodology.[26]

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[26] Detailed results of the test are available from the authors upon request.

IV. IMPACT OF SHORT-TERM IMF ENGAGEMENT IN LICS

This section explores the short-term macroeconomic effects of IMF financial support to LICs experiencing immediate balance of payment needs as a result of policy slippages or external shocks.[27] The nature of IMF support evaluated in this section differs from the more extensive program support via successive medium-term arrangements, as discussed above. Here, we focus on short-term IMF financial support, either through augmentations of access under existing medium-term financial arrangements or through short term or emergency financing instruments. Such support would often be called for when a country faces a pressing balance of payments problem, which would require a combination of macroeconomic adjustment and external financing. The IMF engagement in these cases would typically involve understandings on short-term macroeconomic adjustment accompanied by IMF financing, which could potentially have catalytic effects inducing additional bilateral and multilateral financing.

Sample selection bias is an even greater methodological challenge when the short-term impact of IMF-supported programs is studied. If countries that are experiencing balance of payments crises owing to policy slippages or exogenous shocks are more likely to participate in IMF-supported programs, failing to correct for selection bias could lead to a flawed conclusion that programs "cause" these crises along with adverse effects on macroeconomic outcomes. As in the previous section, this study implements the PSM methodology. In the first stage, the annual probability of participating in IMF-supported programs is estimated conditional on observable economic conditions and country characteristics. The second stage uses these probabilities, or propensity scores, to match program countries to non-program countries, and thereby, construct a statistical comparison, or control, group (see Annex I for details).

Empirical analysis

The probability of participation in IMF-supported programs that address policy and/or exogenous shocks increases with the deterioration in the pre-shock macroeconomic conditions and the magnitude of the adverse external shocks. The selection model for LIC participation in IMF-supported programs draws on Bal Gündüz (2009). This study finds that a lower reserve coverage, a deterioration in the current account balance, a weaker real GDP growth, increased macroeconomic instability (evident in higher fiscal deficits, inflation and exchange market pressures), and adverse terms of trade shocks would increase the likelihood of IMF financing. Moreover, global conditions, including changes in real oil and non-oil commodity prices and world trade, are also significant determinants of participation in IMF-supported programs which could potentially create cycles in demand for IMF financing as a result of adverse global shocks. Finally, persistent differences in debt service burden and

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[27] The set of arrangements include those addressing an immediate balance of payments need arising from policy and/or exogenous shocks. SBAs, SAF/ESAF/PRGF/ECF augmentations, Compensatory Financing Facilities (CFFs), ESFs, SCFs, and Rapid Credit Facilities (RCFs) are included in this set. Sample period covers 1980–2010. More details are provided in Annex I.

resource inflows among LICs seem to be significantly associated with unobserved country heterogeneity.

The results suggest that IMF-supported programs lead to significantly better outcomes particularly for LICs experiencing substantial prior macroeconomic imbalances and/or severe adverse external shocks. Table 4, Figure 6 and Figure 7 present the differences in various macroeconomic outcomes between program countries and the control groups.

While growth is estimated to be 0.9 percent higher than the control group for the full sample, the impact rises to 1¼–1¾ percent and becomes significant only for countries with high propensity scores, which indicate immediate balance of payments problems brought about by existing macroeconomic imbalances and/or external shocks. Furthermore, change in growth is positive but turns out significant only for those with high propensity scores.

Overall, program countries attain significantly higher current account balances, and reserve coverage, as well as lower inflation and fiscal deficits compared to their control groups. Moreover, reflecting the stabilization achieved under IMF-supported programs, these variables tend to post significant improvements during the program, with the impact especially pronounced for the high propensity group. Although program countries tend to have more depreciated real exchange rates, differences with the control groups are not significant.Changes in real health and education spending per capita are not statistically different from those of the control group.

The estimated positive impact on growth could be attributed to IMF financing (along with its potential catalytic effects) easing the burden of the short-term adjustment as well as restrotation of macroeconomic stability, especially for countries experiencing significant levels of instability prior to the program. Both commitments and disbursements of official developments assistance (ODA) are significantly higher for the program group. Lower differences in disbursements than those of commitments compared to the control group may suggest room for improving the utilization and predictability of ODA for program countries. However, contrary to the presumed catalytic role of IMF-supported programs, no significant change in ODA is detected. One explanation could be that some countries with high propensity scores could avoid or delay requesting IMF assistance thanks to an ad hoc increase in ODA flows, weakening the estimated catalytic impact for this group. Another explanation could be that ODA provided as budget support may be more responsive to IMF programs than the project support. Exploration of such heterogeneity in the catalytic effect of IMF-supported programs is left for further research.

Robustness checks

This section explores the robustness of results to four sensitivity analyses: (i) relaxing the adjustment made for the implementation record of programs; (ii) setting the sample to 1980–1999 to improve the comparability of results to earlier research; (iii) conditioning matching on propensity score and ODA disbursements to explore the IMF impact at similar levels of assistance; and (iv) conditioning matching on propensity score and lagged GDP growth to look into whether the positive growth impact is driven by a cyclical recovery in program

countries having a very weak growth prior to the program. Results turn out to be robust to these adjustments with some noteworthy changes highlighted below.

When the IMF program dummy is not adjusted for the implementation record, a dummy variable marking interruptions of six months or longer in completing a review, the estimated IMF impact on both the level and the change in growth and other macroeconomic variables remains qualitatively similar, however, the size of the impact tends to get lower (Table 10). Adjustment for implementation is one of the key departures of this work from the previous literature as only a few studies took it explicitly into account.[28] As our measure of implementation accounts for only serious interruptions in programs and does not assess the strength of programs across a more differentiated and continuous scale, the adjusted estimates may reflect the lower bound for the impact of a strongly-implemented program.

In order to facilitate the comparability of our results to earlier research, the impact is estimated for 1980–1999 sample studied by most of earlier research. The results turn out to be qualitatively similar and estimated quantitative impact on growth and other macroeconomic indicators is even stronger (Table 11). Therefore, the benchmark findings are not driven by differences in the sample.

Some countries with high propensity scores might avoid resquesting IMF assistance owing to high donor assistance that would ease or delay the necessary adjustment. A comparison of performances of program versus non-program countries having both similar propensity scores and ODA disbursements as percentage of GDP would be insightful to explore this issue. Results for levels of macroeconomic outcomes are qualitatively similar while the estimated impact, including on growth, gets stronger for program countries compared to the control group (Table 12). This finding may suggest that some non-program countries with high propensity scores seemed to have avoided a sharp adjustment thanks to high ODA disbursements. Differences in improvement in growth and government balances between program and non-program countries, although positive, become insignificant, indicating broadly similar outcomes for program versus non-program countries after controlling for ODA disbursements, suggesting that the catalytic effect of the short-term IMF-supported programs may be an important channel of transmission explaining their macroeconomic impact.

Finally, results are also tested for whether the positive growth impact is driven by a strong cyclical recovery in countries having a very weak prior growth if this group is overrespresented in the program sample. The participation equation reports that the lagged GDP growth strongly raises the likelihood of a program request. By conditioning matching on this variable in addition to the propensity score would control for prior growth performance on the estimated impact. Results are qualitatively similar and both the impact on growth and the improvement in growth becomes significant for the whole sample as well as for the group with high propensity scores (Table 13).

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[28] Mercer-Blackman and Unigovskaya (2000) and Dreher (2006).

Sensitivity analysis to hidden bias

The key assumption behind the PSM is conditional independence, implying that the program participation depends entirely on *observed* characteristics of LICs. However, hidden bias may arise from the omission of important covariates. The strong specification for the participation equation, encompassing a number of highly significant variables, should tend to alleviate the hidden bias. Moreover, this study looks into the impact of programs on changes in outcomes as well as their levels, which should help remove the unobserved heterogeneity arising from time-invariant country-specific factors not controlled in the participation equation.

In addition to these safeguards, Rosenbaum's sensitivity analysis is conducted to test sensitivity of findings to hidden bias. This analysis manipulates the estimated odds of having a program versus not having a program to see how much it can deviate from 1, the expected odds ratio for a randomized experiment, while results still remaining robust. Table 14 presents results of the sensitivity analysis. The parameter Γ is a measure of how much hidden bias can be present before results of the study begin to change. A variable is highly sensitive to hidden bias if the conclusions change for Γ just barely larger than 1, and it is insensitive if the conclusions change only for quite large values of Γ.[29]

For countries with high propensity scores, results are less sensitive to hidden bias for all outcome variables as odds ratios would need to increase in the range of 1.5-3.5 times before results begin to become insignificant. On the other hand, for the full sample the results for five variables (having Γ less than 1.2) seem to be highly sensitive to the hidden bias. The reserve coverage and the change in reserve coverage are the least sensitive while results for inflation are highly sensitive to hidden bias for both the full sample and the sample of LICs with high propensity scores.

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[29] 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.

Table 4. Results: Impact of Short-Term IMF Engagement by Propensity Score Matching

	All LICs	LICs with weaker fundamentals	
		PS>0.5	PS>0.7
Macroeconomic outcomes			
Real GDP growth (%)	0.88	1.24 *	1.76 **
	(0.56)	(0.66)	(0.75)
Inflation (%)	-12.09 ***	-14.30 ***	-15.83 ***
	(4.11)	(4.95)	(5.76)
Reserve coverage (in months of imports)	0.77 ***	0.99 ***	0.81 ***
	(0.15)	(0.16)	(0.16)
Current account balance plus FDI (% of GDP)	2.26 **	2.98 ***	3.97 ***
	(0.98)	(1.14)	(1.32)
Government balance (% of GDP)	2.23 ***	2.50 ***	2.89 ***
	(0.63)	(0.77)	(0.88)
Change in real health spending per capita (%)	8.38 *	8.59	13.42
	(5.02)	(6.74)	(8.41)
Change in real education spending per capita (%)	0.85	-1.85	-3.45
	(3.16)	(4.07)	(5.25)
Change in REER	-3.44	-3.40	-5.28
	(5.8)	(6.59)	(7.66)
ODA commitments (% of GDP)	2.19 ***	1.78 **	1.92 ***
	(0.61)	(0.7)	(0.75)
ODA disbursements (% of GDP)	1.55 ***	1.31 **	1.36 **
	(0.52)	(0.57)	(0.62)
Change in macroeconomic outcomes *(X(t)-X(t-1))*			
Real GDP growth (%)	0.74	1.41	2.21 **
	(0.75)	(0.87)	(1)
Inflation (%)	-6.45	-10.47 *	-13.96 **
	(4.6)	(5.33)	(6.22)
Reserve coverage (in months of imports)	0.71 ***	0.93 ***	0.79 ***
	(0.1)	(0.11)	(0.12)
Current account balance plus FDI (% of GDP)	1.44 **	2.03 **	2.43 **
	(0.71)	(0.84)	(0.97)
Government balance (% of GDP)	0.78 *	1.06 *	1.41 **
	(0.46)	(0.55)	(0.59)
Change in ODA commitments (% of GDP)	-0.24	-0.98	-1.04
	(0.72)	(0.87)	(1.01)
Change in ODA disbursements (% of GDP)	-0.15	-0.57	-0.73
	(0.42)	(0.49)	(0.57)
Number of observations /1	*633*	*349*	*293*

Source: IMF staff calculations.
Note: PS stands for the propensity score indicating the likelihood of IMF programs addressing immediate balance of payments needs. Changes in macroeconomic outcomes refer to first differences of the variables in the top panel. The sample is composed of 58 low-income countries (LICs) and covers 1980–2010. Significant at 10 percent:*; 5 percent:**; and 1 percent:***. Standard errors in parentheses. FDI = Foreign Direct Investment; ODA = Official Development Assisstance.

1/ All variables except for health and education spending and change in Real Effective Exchange Rate (REER) for which data is more limited.

V. CONCLUSIONS

The empirical work presented above suggests that IMF program support has benefited LICs' economies in two distinct ways:

- ***Longer-term policy support can help LICs gradually build macroeconomic buffers.*** Longer-term program support by the IMF is positively associated with higher long-term growth rates, less growth volatility, more rapid reductions in poverty and inequality, higher government balances, higher levels of social spending, higher FDI and lower inflation. Noticeably, this result does not seem to depend on the amount of IMF financing provided over the longer term.

- ***Short-term liquidity support to LICs has likely played an important role in mitigating the impact of shocks.*** Short-term IMF financial support in the context of shocks and policy slippages is positively associated with higher short-term growth, current account balances, and reserve coverage, as well as lower inflation and fiscal deficits compared to their control groups, with the impact especially pronounced for countries with high propensity scores, which indicate immediate balance of payments problems brought about by existing macroeconomic imbalances or external shocks. IMF-financing combined with its potential catalytic effect encouraging additional aid flows from other donors can provide a buffer to absorb shocks, thereby, preventing procyclical cuts in spending and investment. [30]

These results can help shed some light on how IMF support may have helped LICs weather the recent global financial crisis. First, longer-term IMF support via successive medium-term programs primarily under the ECF and its predecessors (and more recently under the PSI), seems to have helped LICs in raising longer-term growth and gradually building the macroeconomic buffers and institutions needed for a robust policy response to the crisis. Second, the IMF's sharp increase in financial assistance in 2009—doubling access and increasing commitments to roughly four times the historical average, in addition to the global SDR allocation— helped relax countries' liquidity constraints at the height of the crisis, which allowed them to preserve or even increase spending. [31] [32] The combination of stronger pre-crisis buffers and crisis financing allowed most LICs to mount a countercyclical fiscal policy response in 2009—a first for LICs, which in past crises tended to cut spending and tighten the fiscal stance.[33] This domestic response facilitated a rapid economic recovery in LICs, which in past crises had lagged behind the rest of the world.

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[30] Bird and Rowlands (2007) explore the extent to which the IMF has had a catalytic eff ect on official development assistance and the potential channels through which catalysis might work. They find strong evidence of a positive association between participation in IMF-supported programs and ODA and suggest that this may have more to do with conditionality than with the provision of IMF resources.

[31] This came in addition to the Fund's response to the food and fuel price shocks of 2008 when various new programs and augmentations were approved and the ESF was modified to better support eligible members.

[32] See IMF (2010). For a detailed analysis of program design and objectives, and outcomes, see IMF (2012c).

[33] See Fabrizio (2009), for a discussion of how LICs responded to the global financial crisis.

The empirical work also suggests that the IMF's facilities for LICs appropriately include a diverse set of tools, including some that focus on medium-term policy support and some that focus on short-term financing. It highlights the benefits of the ECF and PSI, which can provide policy support over the medium term. It also underlines that, whether or not a country has an ECF or PSI in place, IMF financing may need to be provided quickly and on an appropriate scale when urgent balance of payments needs arise, either through augmentations of the ECF or support under the SCF or RCF. It can also be inferred that, in the absence of shocks or urgent financing needs, ECF arrangements and precautionary SCF arrangements can have a significant value for LICs, even at low access levels, as they can provide both policy support (through well-designed macroeconomic programs) and insurance (through the possibility of disbursements in the event that shocks arise).

Annex I. Propensity Score Matching (PSM) Methodology

A.   Addressing Selection Bias—Alternative Approaches

The literature on the impact of IMF-supported programs has used various approaches to address sample selection bias, with the aim of constructing a credible counterfactual. One strategy is the 'before-after' approach, which assumes that all the conditions that can affect a country's performance are the same before a program is in place as they are after, hence any change in performance can be attributed to the IMF-supported program (Ghosh and others, 2005). This method suffers from biases associated with changes in the economic structure of the country or shocks between the two periods that are unrelated to the decision to participate in a program. Another approach is to use instrumental variables that are correlated with treatment selection but are not directly correlated with the outcome variable (Barro and Lee, 2005). The identification of appropriate and truly exogenous instruments is a major challenge for this approach. The Generalized Evaluation Estimator (GEE) uses policy reaction functions for non-program countries to approximate the counterfactual (Goldstein and Montiel, 1986). However, Dicks-Mireaux, Mecagni, and Schadler (2000) largely discredit the validity of the GEE owing to many restrictive assumptions necessary to defi ne the counterfactual based on policy reaction functions.[34] Yet another approach is Heckman's selection correction model, which reduces the sample selection problem to an omitted-variable problem. In the first stage, a probit model is used to predict the probability of IMF-supported program engagement and in the second stage, the inverse Mills ratio, a transformation of the predicted individual probabilities from the first stage, is included as a regressor. The latter term drops out only if the correlation between unobserved determinants of program participation and unobserved determinants of the outcome variable is 0. Heckman-type selection models are appropriate only when at least one explanatory variable infl uences selection but not the outcome of interest, which is known as an exclusion restriction. A final method, used in this paper, is discussed below.

B.   PSM Methodology

The econometric analyses in this paper use the PSM approach to control for selection bias. This is a relatively new and innovative class of statistical methods for impact evaluation using macroeconomic data. It involves a statistical comparison of country groups based on two steps:

- First, the probability of participating in IMF-supported programs is estimated conditional on observable economic conditions and country characteristics (selection model).[35]

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[34] They report that the counterfactual policy reaction function does not have any signifi cant explanatory power for the sample of nonprogram observations.

[35] Sections III and IV estimate separate Fund participation selection models. In Section III the dependent variable is the longer-term Fund engagement dummy, while in Section IV the depend variable is the Fund program participation dummy.

- At the second step, these probabilities, or *propensity scores*, are used to match program countries to non-program countries, and thereby, construct a statistical control group.[36]

The matching based on the likelihood of participation in IMF-supported programs assures similarity of initial macroeconomic conditions and country characteristics in the comparison, or control, group. The control group provides in effect a proxy for the counterfactual, that is, for macroeconomic outcomes if program countries had not had a program. The effects of the IMF-supported program are then calculated as the mean difference in a range of macroeconomic outcomes across these two groups.

The results from this approach should be interpreted with caution as PSM is useful when only observed pre-treatment characteristics are believed to affect program participation. Two necessary assumptions for identification of the program effects are (i) conditional independence; and (ii) presence of a common support. Conditional independence, also called confoundedness, implies that the program participation is based entirely on observed pre-shock characteristics of LICs. If unobserved characteristics determine program participation, conditional independence will be violated, and PSM would not be an appropriate method. Using a rich set of pre-program data to estimate the probability of participation in IMF-supported programs helps support the conditional independence assumption. In other words, a well-specified and comprehensive selection model explaining the participation in IMF-supported programs is the key to properly assess the impact of IMF programs. The second condition, i.e., presence of a common support, ensures that treatment observations have comparison observations "nearby" in the propensity score distribution.

In the analyses of this paper, IMF engagement is taken as a treatment status, analogous to the program evaluation literature in microeconomic studies.[37] Countries that have engagement with the IMF are called the treatment group whereas the remaining others in the sample are called the control group. The average treatment effect of IMF engagement on the treated group (ATT) is given by:

$$ATT = E[Y_{i1}|D_i = 1] - E[Y_{i0}|D_i = 1] \qquad [1]$$

where D is the dummy variable identifying LICs with IMF engagement in a given window period (annual for the short-term engagement, and decadal for the long-term engagement). $Y_{i0}|D_i = 1$ is the value of the macroeconomic outcome that would have been observed if a LIC with IMF engagement had not experienced such an engagement, and $Y_{i1}|D_i = 1$ is the outcome value observed on the same country. The key assumption needed to apply the

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[36] This study uses the nearest neighbor matching approach, which constructs a control group of countries by choosing those three non-program countries with probability of requesting a program as close as possible to that of the specific program country in question.

[37] The use of the PSM technique in the macroeconomic literature has been popularized by recent empirical papers focusing on the effects of the inflation targeting arrangement on macroeconomic performances (see Lin and Ye, 2007 and 2009; Lin, 2010), on the effects of fiscal rules on fiscal behavior in developing countries (Tapsoba, 2012), or on the economic impacts of foreign capital flows (see Chari, Chen, and Dominguez, 2012).

matching method is the conditional independence assumption which requires that, conditional on some control variables X, the outcomes be independent of the IMF engagement dummy D. Under this assumption, equation (1) can be rewritten as

$$ATT = E[Y_{i1}|D_i = 1, X_i] - E[Y_{i0}|D_i = 0, X_i] \qquad [2]$$

where we have replaced $E[Y_{i0}|D_i = 1, X_i]$ with $E[Y_{i0}|D_i = 0, X_i]$, which is observable. Rosenbaum and Rubin (1983) propose that one can match the treated units and control units on their propensity scores, (which represent here the probabilities of being long term IMF program countries for Section II or participants of IMF-supported programs in Section III) conditional on X and can be estimated by simple probit or logit models. A further assumption needed to apply propensity score matching is the common support assumption ($p(Xi) < 1$), which requires the existence of some comparable control units for each treated unit. When propensity score matching is used, the ATT now can be estimated as

$$ATT = E[Y_{i1}|D_i = 1, p(X_i)] - E[Y_{i0}|D_i = 0, p(X_i)] \qquad [3]$$

The strategy then consists in computing the differences in the outcomes (Y_i) for observations with similar propensity scores (the probability of engaging with the IMF). Various methods have been proposed in the literature to match observations. In this study, we present results using the nearest neighbor technique. The nearest neighbor matching estimator sorts all records by the estimated propensity score, and then searches forward and backward for the closest control units. In this study we make use of the three, four, and five nearest neighbors. We also assess the robustness of the results when using the radius and the Kernel matching algorithms. Radius matching uses all comparison observations within a predefined distance around the propensity score, while Kernel matching entails a weighted average of the outcome of all nontreated units, where the weights are related to their proximity to the treated unit.

C. Specification of the PSM Selection Model

Despite the vast literature on determinants of IMF arrangements, existing models are far from definitive. Bird (2007) argues that the empirical evidence so far may imply that important determining variables may still have been omitted, or there is no one overall explanation of IMF arrangements. Consistent with this view, the econometric analysis in the paper focused on the sub-group of LICs and distinguishes longer-term engagement from short-term financing, thereby creating more homogenous samples that allow for a more robust identification of the determinants of participation in IMF-supported programs.

Selection model for longer-term IMF engagement

The selection model estimated is a pooled probit regression. The dependent variable is a dummy variable identifying longer-term IMF engagement. The dummy variable takes the value of 1 if a country has had five or more years of IMF-supported programs in a 10-year period and zero otherwise. The qualifying programs are all IMF financial arrangements available to LICs, primarily the ECF and its predecessors (PRGF, ESAF, SAF) but also the SBA, ESF-HAC, and SCF, as well as the nonfinancial PSI. Program years have been purged

of episodes when there were prolonged program interruptions.[38] Given the focus on longer-term engagement the analysis is based on decadal averages where periods share a 50 percent overlap with each other in order to increase the number of observations.[39] Longer-term IMF engagement is determined by a country's initial macroeconomic buffers, its structural characteristics, as well as external demand conditions and the size of its Fund quota. The independent variables are chosen broadly in line with the literature's approach of including both demand and supply factors, with the aim of identifying a parsimonious set of variables that achieves a relatively good fit based on the historical data series. Initial macroeconomic buffers are proxied by the reserve coverage and the foreign aid to GDP ratio at the beginning of each decade. Structural characteristics are proxied by dummy variables identifying countries' geographic and institutional characteristics.[40] Trading partners' real GDP growth captures external demand conditions that are taken as entirely exogenous to LICs. Finally, countries' access to IMF resources is proxied by their IMF quota. The empirical findings (Table 5) indicate that countries with higher initial reserves and lower aid have exhibited a lower propensity for longer-term IMF engagement. Moreover, the probability of longer-term IMF engagement tends to increase with lower trading partner economic growth in the decade. Finally, landlocked and resource-poor countries have had a higher propensity for longer-term IMF engagement, while a larger quota and a lower political connectedness have implied a lower probability of longer-term engagement.[41]

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[38] Following the approach introduced by Mecagni (1999), a delay of more than six months in completing a review owing to noncompliance with macroeconomic performance criteria is taken as an interruption. The program interruptions series is taken from Bal Gündüz (2009) and updated for the period 2008–11. Bal Gündüz (2009) used the Ivanova and others (2003) dataset, identifying interruptions for the whole program as an input, and extended it to identify specific years of interruptions and the Mecagni (1999) dataset which identified program interruptions for SAF/ESAF.

[39] The periods from which decadal averages are generated are: 1986–95; 1991–2000; 1996–2005; 2001–10.

[40] Recent empirical studies have highlighted the role of institutional characteristics in explaining Fund agreements. See Bird and Rowlands (2001), Butkiewicz and Yanikkaya (2005), and Stone (2004).

[41] A country's quota as a share of GDP is interpreted here as the size of the available financing relative to the country's economic needs. The more "related" the quota is to the size of the economy, the less need for a country to become a long-term user of IMF resources.

Table 5. Determinants of Longer-Term IMF Engagement

Initial reserves	-0.156 ***
	(0.04)
Initial aid/GDP	0.016 *
	(0.01)
Trading partner growth	-0.092
	(0.07)
IMF quota/GDP	-0.078 **
	(0.03)
Resource rents/GDP	-0.020 **
	(0.01)
Landlockedness	0.741 ***
	(0.21)
Political connectedness	0.010 *
	(0.01)
Polity	0.010
	(0.02)
Constant	0.362
	(0.52)
Observations	203

Source: IMF staff calculations.
Note: Robust standard errors in parentheses. A country is considered to have longer-term engagement in a given decade if in five or more years it had a financial arrangement or a Policy Support Instrument in place, for at least six months in each of these years. *10 percent significance; **5 percent significance; ***1 percent significance.

Selection model for the short-term IMF engagement

The selection model adopted in this study draws on Bal Gündüz (2009).[42] This is the only study looking into determinants of LIC participation in IMF arrangements addressing immediate balance of payments needs in response to domestic policy and/or external shocks. Examining this more homogenous subset of IMF arrangements significantly improves the specification of the selection model, which is key to counter selection bias to properly assess the impact of IMF-supported programs.

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[42] Before Bal Gündüz (2009), only Bird and Rowlands (2009) looked into determinants of Fund arrangements with LICs, albeit without much success in improving the model specification. Only three variables turned significant: the presence of previous Fund arrangements, high inflation, and the rescheduling of debt in the current year. Other studies examined participation in Fund arrangements by MICs and emerging market economies including Ghosh and others (2005) and Cerutti (2007).

The dependent variable is a panel dummy variable, taking the value of 1 if a new IMF arrangement is approved, and 0 otherwise, indicating a normal episode. The set of arrangements include those addressing an immediate balance of payments need arising from policy and/or exogenous shocks. SBA, SAF/ESAF/PRGF/ECF augmentations, ESF, SCF, RCF and CFF are included in this set. The following refinements are made to this basic set: (i) precautionary SBA/SCF and SBA/PRGF/ECF augmentations addressing natural disasters are excluded[43], and (ii) some SAF/ ESAF /PRGF/ECF arrangements are added if they address immediate balance of payments needs arising from policy shocks. In order to systematically determine the latter cases, this study relied heavily on program interruptions preceding SAF/ESAF/PRGF/ECF arrangements. For first time SAF/ESAF/PRGF arrangements, narratives from IMF staff reports are used to identify programs that envisaged a drastic shift in macroeconomic policies to address an immediate financing gap. Normal episodes are identified as the initial year of two successive years with no IMF financing for shocks when the member is eligible to access IMF resources. Several refinements are made to normal episodes to identify cases where supply constraints are binding.[44]

The effects of various economic variables on the probability of a LIC requesting IMF financing in response to shocks are assessed by estimating a binary response model for panel data. The general specification for panel probit models is given by

$$y_{it} = 1 \qquad \text{if Fund financing is requested}$$
$$y_{it} = 0 \qquad \text{normal episodes} \qquad\qquad\qquad (1)$$
$$P(y_{it} = 1 \mid x_{it}, c_i) = \Phi(x'_{it}\beta + c_i) \qquad i = 1,...,n \text{ and } t = 1,...,T$$

where, y is the observed outcome, Φ is the cumulative normal density function (c.d.f.), x_{it} is the $1xk$ vector of explanatory variables, and β is $kx1$ vector of coefficients associated with x_{it}. Different estimators are constructed depending on their assumptions for the panel heterogeneity, i.e., how they treat c_i.[45] The estimations are carried out step-by-step under

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[43] The exclusion was based on the lack of immediate balance of payments need for precautionary SBAs and different nature of the shock for SBAs/PRGF augmentations addressing natural disasters.

[44] Members with overdue obligations to the Fund are ineligible to use Fund resources, therefore, observations with arrears to the Fund are excluded from normal episodes. Observations with Fund financing for natural disasters through Emergency Natural Disaster Assistance (ENDA) or PRGF augmentations, program interruptions or break-up of negotiations for a program, Staff-Monitored Program (SMP), Emergency Post-Conflict Assistance (EPCA), and three years leading up to EPCAs are also excluded. Finally, episodes during which members incurred arrears to other bilateral and multilateral creditors and did not have adjustment programs that would garner the Fund support and rescheduling by their major creditors are excluded from normal episodes.

[45] Pooled probit models assume independence of observations over both t and i. A random effects (RE) probit model treats the individual specific effect,, as an unobserved random variable with if an overall intercept is excluded, and imposes independence of and . A fixed effects (FE) probit model treats as parameters to be estimated along with, and does not make any assumptions about the distribution of given. This can be problematic in short panels as both and are inconsistently estimated owing to an incidental parameters problem.

different estimators and a correlated random effects probit model is preferred based on the econometric tests for the significance of both the individual specific effect and the sample average for covariates.

Bal Gündüz (2009) finds that a number of economic variables are significantly associated with increased probability of IMF financing, including reserve coverage, the ratio of current account balance to GDP, real GDP growth, macroeconomic stability indicator and terms of trade shocks (Table 6).[46] Moreover, Bal Gündüz reports that adverse global shocks to the change in real oil and non-oil commodity prices, and the cyclical component of world trade increase the participation in IMF arrangements. Therefore, the demand for IMF resources by LICs is likely to be cyclical in response to global conditions with its intensity depending on the magnitude and persistence of adverse external shocks.

Finally, a correlated random effects model relaxes independence between and using the Chamberlain (1982) and Mundlak (1978) device under conditional normality. In this specification, the time average is often used to save on degrees of freedom.

[46]In order to assess the macroeconomic policy stance based on a comprehensive set of complementary indicators, this study used a variant of the composite indicator introduced by Jaramillo and Sancak (2009). The version of this index that includes the black market premium was first used in Bal Gündüz (2009). The formula for the indicator is given by:

$$mitot_{it} = \frac{\ln(\frac{cpi_{it}}{cpi_{it-1}})}{\sigma_{\Delta \ln(cpi)}} + \frac{\ln(\frac{xr_{it}}{xr_{it-1}})}{\sigma_{\Delta \ln(xr)}} - \frac{\frac{res_{it} - res_{it-1}}{mgs_{t-1}}}{\sigma_{\Delta res/mgs_{t-1}}} - \frac{\frac{gbal_{it}}{gdp_{it}}}{\sigma_{gbal/gdp}} + \frac{\ln(1 + blackpr_{it})}{\sigma_{\Delta \ln(xr)}}$$

where mitot is the macroeconomic stability index for country i at time t, cpi is the consumer price index, xr is the exchange rate of national currency to U.S. dollar (an increase indicates a nominal depreciation), res is the stock of international reserves, mgs is the imports of goods and services, gbal is the government balance, gdp is the nominal GDP, blackpr is the black market premium, and σ is the standard deviation of each variable. Weights are inverses of the standard deviation of each component for all countries over the full sample after removing the outliers. Higher levels of mitot indicate increased macroeconomic instability.

Table 6. Demand for IMF Financing in Response to Policy and/or External Shocks

Current account balance to GDP (t-1)	-0.076 *** (-4.61)
Reserve coverage in months of imports (CFA) (t-1)	-0.478 *** (-6.08)
Reserve coverage in months of imports (non-CFA) (t-1)	-0.769 *** (-8.71)
Macroeconomic stability indicator (t-1)	0.068 *** (2.89)
Real GDP growth (t-1)	-0.113 *** (-4.24)
Change in terms of trade (t-1)	-0.022 *** (-2.8)
Change in real oil prices in previous two years	0.009 *** (2.85)
Real world trade, cyclical component	-0.099 ** (-2.53)
Change in real non-oil commodity prices	-0.020 (-1.58)
Real growth of goods exports (t-1)	-0.009 * (-1.79)
Paris Club dummy	0.774 *** (3.24)
Constant	0.551 (1.23)
Country-specific averages	
Total debt service to exports	0.044 *** (2.63)
FDI to GDP	-0.105 * (-1.76)
Pseudo R2	0.58
LR test : $\beta_2 = \ldots = \beta_k = 0 \ \chi^2$ (Prob)	376 (0.00)
LR test : $\rho = 0 \ \chi^2$ (Prob)	11 (0.00)
Number of observations	532
Sample probability	0.44
Number of countries	55

Source: Bal Gunduz (2009).

Note: Demand for IMF financing in response to policy and/or exogenous shocks excluding natural disasters is estimated by a correlated random effects probit model. Significant at 10 percent:*; 5 percent:**; and 1 percent:***, t-statistics in paranthesis. Country-specific averages are calculated as the sample average of variables for each country. FDI = foreign direct investment; LR = likelihood ratio test.

[1] The CFA franc zone consists of 14 countries in sub-Saharan Africa, each affiliated with one of two monetary unions maintaining the same currency, the CFA Franc.

The ultimate objective is to distinguish the short-term impact of IMF-supported programs when a country has an immediate external financing need. The treatment variable is identified mostly symmetrically to the one used in the selection equation. A panel dummy variable taking the value of 1 for the approval of IMF-supported programs with LICs addressing immediate balance of payments needs, and 0 for non-program episodes, is constructed as the treatment variable.[47] Refinements to the program and non-program episodes are made similar to those for the dependent variable in the selection equation. Within the set of program countries, a higher propensity score will identify the IMF-supported programs addressing a clear financing need. Severe state failure events are excluded from both program and non-program sets as the macroeconomic outcomes in these episodes will be frail, independent of the impact of IMF-supported programs.[48] Furthermore, in order to take account of program implementation, years of program interruptions are excluded from the sample.

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[47] Some asymmetries compared to the dependent variable in the participation equation are introduced for nonprogram episodes to increase the common support for the PSM. The treatment variable includes nonprogram years followed immediately by an IMF-supported program and nonprogram episodes without IMF membership as zeros whereas the dependent variable in the participation equation excludes these observations from the sample.

[48] The severe state failure events are identified from Political Instability Task Force (PITF) dataset. Four types of political crises are included in this dataset: revolutionary wars, ethnic wars, adverse regime changes, and genocides and politicides. From this dataset the variable SFTPMMAX, which presents the maximum magnitude of all events in a year, exceeding 3.9 is taken as a severe state failure event.

Annex II. Panel Regression on the Determinants of Long-Term Growth

The impact of IMF-supported programs on per capita GDP growth also addresses the selection issue and is computed using dynamic two-way fixed-effects models for panel data. All regression specifications control for the inverse Mills ratio to address the selection bias discussed above.

The impact of IMF-supported programs on per capita GDP growth uses the GMM estimators developed for dynamic models of panel data that were introduced by Holtz-Eakin, Newey, and Rosen (1988), Arellano and Bond (1991), and Arellano and Bover (1995). These estimators are based, first, on differencing regressions or instruments to control for unobserved effects and, second, on using previous observations of explanatory and lagged-dependent variables as instruments (which are called internal instruments). The system-GMM estimator, which combines the equation in level and the equation in first-differences (to increase the moment conditions) is used. Traditional diagnostic tests such as the autocorrelation of second order of the residuals in differences, the Hansen over-identification test, and the limiting the number of internal instruments below the number of countries to avoid the so-called "instrument proliferation" problem are systematically applied to the data.

The starting estimation does not control for macroeconomic variables which are considered possible transmission channels of the longer-term impact of IMF-supported programs. The analysis here focuses on the effect of longer-term IMF engagement on the long-term average real GDP per capita growth rate. The specification is the following:

$$(g_{it}) = \theta_2 IMF_{it} + Z'_{it}\beta + \epsilon_{it} \quad (1)$$

where g refers to the real GDP per capita growth rate. Z is the matrix of control variables that are chosen not to be related to IMF engagement. θ_2 measures the total effect of IMF-supported programs on the level of growth.

The study also assesses the strength of the transmission channels in the outcome equations by controlling for those indirect channels and looking at the behavior of the coefficients associated with the longer-term IMF dummy. In order to assess the strength of each transmission channel of Fund engagement, equation (2) is augmented with the variables Y that were significantly affected by the IMF program dummy in the PSM estimations. The specification is then:

$$(g_{it}) = \theta_3 IMF_{it} + Z'_{it}\beta + \alpha Y_{it} + \epsilon_{it} \quad (2)$$

If the inclusion of a potential transmission channel variable Y lowers (in absolute terms) the magnitude and the significance of the coefficient associated with the IMF dummy, this will confirm that the variable Y is one channel through which IMF-supported programs help foster economic growth. One would then expect: $|\theta_3| < |\theta_2|$ along with changes in the significance of the two coefficients.

Figure 3. Macroeconomic Conditions in LICs Across Decades

Real GDP per Capita Growth
(Annual averages)

LICs with more than 10 program years

All LICs

1981-90   1991-00   2001-10

Inflation
(Median of averages)

LICs with more than 10 program years

All LICs

1981-90   1991-00   2001-10

Real GDP per Capita Volatility
(Averages of standard deviations)

All LICs

LICs with more than 10 program years

1981-90   1991-00   2001-10

Tax Revenue
(In percent of GDP)

All LICs

LICs with more than 10 program years

1981-90   1991-00   2001-10

Capital Spending
(In percent of GDP)

LICs with more than 10 program years

All LICs

1981-90   1991-00   2001-10

Government Balance
(In percent of GDP)

All LICs

LICs with more than 10 program years

1981-90   1991-00   2001-10

Reserves
(In months of imports)

All LICs

LICs with more than 10 program years

1981-90   1991-00   2001-10

Current Account
(In percent of GDP)

All LICs

LICs with more than 10 program years

1981-90   1991-00   2001-10

Current Account + FDI
(In percent of GDP)

All LICs

LICs with more than 10 program years

1981-90   1991-00   2001-10

Figure 3. Macroeconomic Conditions in LICs Across Decades (continued)

Foreign Direct Investment
(In percent of GDP)

All LICs

LICs with more than 10 program years

1981-90   1991-00   2001-10

Exports
(In percent of GDP)

All LICs

LICs with more than 10 program years

1981-90   1991-00   2001-10

External Debt
(In percent of GDP)

LICs with more than 10 program years

All LICs

1990   2000   2010

CPIA

LICs with more than 10 program years

All LICs

1990   2000   2009

Poverty

LICs with more than 10 program years

All LICs

1981-90   1991-00   2001-09

Aid
(In percent of GDP)

LICs with more than 10 program years

All LICs

1981-90   1991-00   2001-09

Social Spending
(In percent of GDP)

All LICs

LICs with more than 10 program years

1985-90   1991-00   2001-09

Education Spending
(In percent of GDP)

All LICs

LICs with more than 10 program years

1985-90   1991-00   2001-09

HealthSpending
(In percent of GDP)

All LICs

LICs with more than 10 program years

1985-90   1991-00   2001-09

Source: IMF stafff calculations.
Notes: The sample is composed of 75 low-income countries (LICs.) Each value represents an unweighted average (except inflation which shows the median) over each decade. Longer-term engagement is defined as 10 or more years of having an IMF financial arrangement or Policy Support Instrument in place during 1991–2010, for at least six months in each of these years. CPIA = Country Policy and Institutional Assessment; FDI = foreign direct investment.

Figure 4. Macroeconomic Conditions in LICs Across Decades and County Groupings

Real GDP Per Capita
(Growth in percent)

Landlocked

Coastal

Small Economies

Non-Small Economies

Fragile

Non-Fragile

Per Capita GDP<1175

Per Capita GDP>1175

Social Spending
(Percent of GDP)

Landlocked

Coastal

Small Economies

Non-Small Economies

Fragile

Non-Fragile

Per Capita GDP<1175

Per Capita GDP>1175
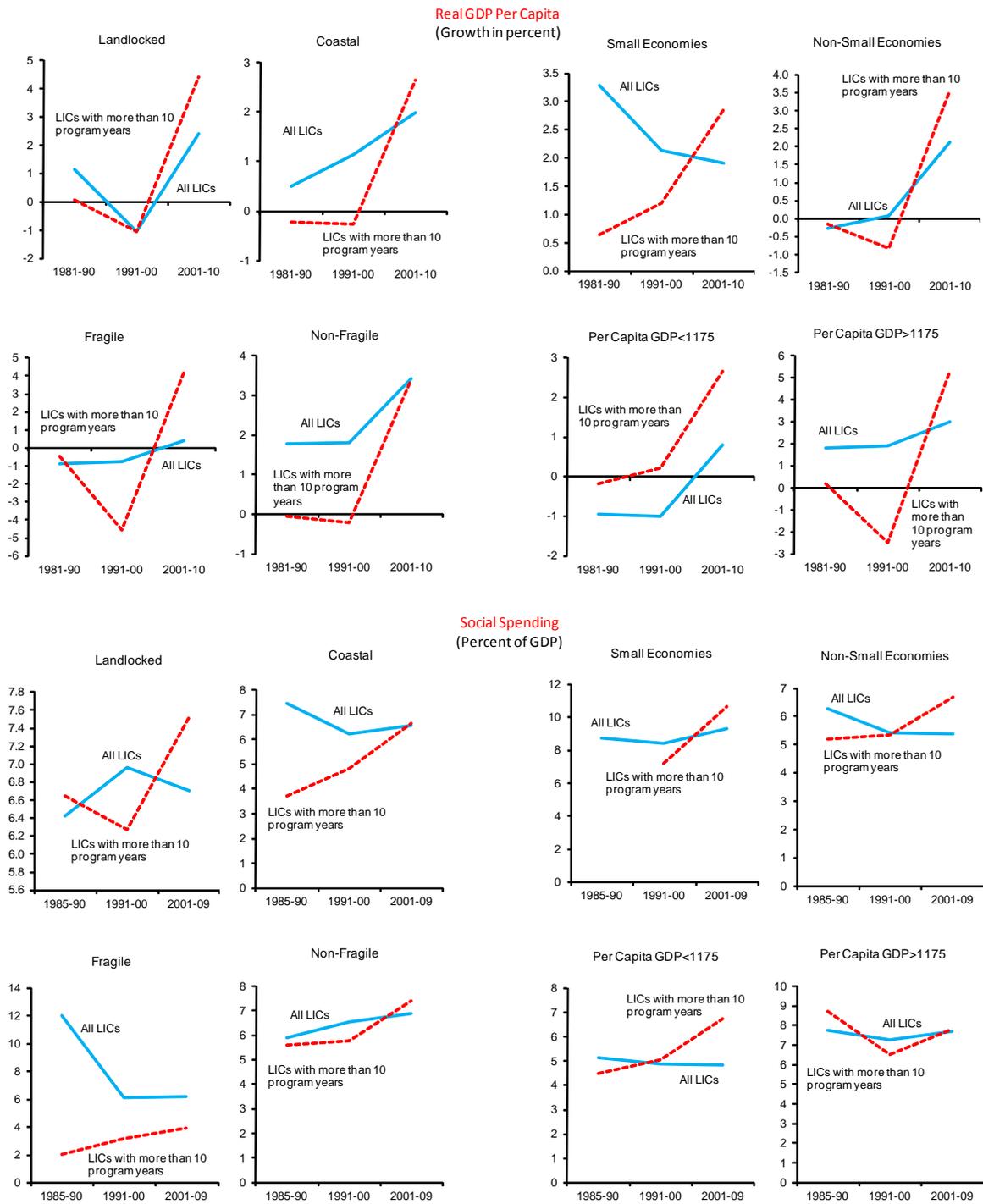
Source: IMF stafff calculations.
Note: The sample is composed of 75 low-income countries (LICs). Each value represents an unweighted average over each decade. Longer-term engagement is defined as 10 or more years of having an IMF financial arrangement or Policy Support Instrument in place during 1991–2010, for at least six months in each of these years.

Figure 5. Changes in Macroeconomic Performance of LICs

Change in Average Decadal Real GDP Per Capita Growth

75th percentile

Median

75th percentile

Median

25th percentile

25th percentile

No LT engagement · LT engagement

Change in Average Decadal Real GDP Per Capita Volatility

75th percentile

Median

75th percentile

Median

25th percentile

25th percentile

No LT engagement · LT engagement

Change in Average Decadal Inflation

75th percentile

Median

75th percentile

25th percentile

Median

25th percentile

No LT engagement · LT engagement

Change in Average Decadal Government Balance/GDP

75th percentile

75th percentile

Median

Median

25th percentile

25th percentile

No LT engagement · LT engagement

Change in Average Decadal (Current account + FDI)/GDP

75th percentile

75th percentile

Median

Median

25th percentile

25th percentile

No LT engagement · LT engagement

Change in Average Decadal FDI/GDP

75th percentile

75th percentile

Median

Median

25th percentile

25th percentile

No LT engagement · LT engagement

Figure 5. Changes in Macroeconomic Performance of LICs (continued)

Change in Average Decadal Exports/GDP

Change in External Debt/GDP

Change in Average Decadal Aid/GDP

Change in CPIA

Change in Average Decadal Social Spending/GDP

Change in Average Decadal Poverty Gap

Figure 5. Changes in Macroeconomic Performance of LICs (continued)

Change in Average Decadal Tax Revenue/GDP

Change in Average Decadal Capital Spending/GDP

Change in Average Decadal Current Account/GDP

Change in Average Decadal Education Spending/GDP

Change in Average Decadal Reserve Coverage *(In months of imports)*

Change in Average Decadal Health Spending/GDP

Source: IMF staff calculations.

Notes: The sample is composed of 75 low-income countries and four overlapping decadal period averages: 1986−95; 1991−00; 1996−05; and 2001−10. A country is considered to have longer-term (LT) engagement in a given decade if in five or more years it had a financial arrangement or a Policy Support Instrument in place, for at least six months in each of these years. The figure shows the distribution of decadal changes across countries by quartiles. CPIA = Country Policy and Institutional Assessment; FDI = Foreign Direct Investment.

Figure 6. The Impact of Short-Term IMF Engagement on Macroeconomic Outcomes

(By propensity scores: Fund programs minus the control group)
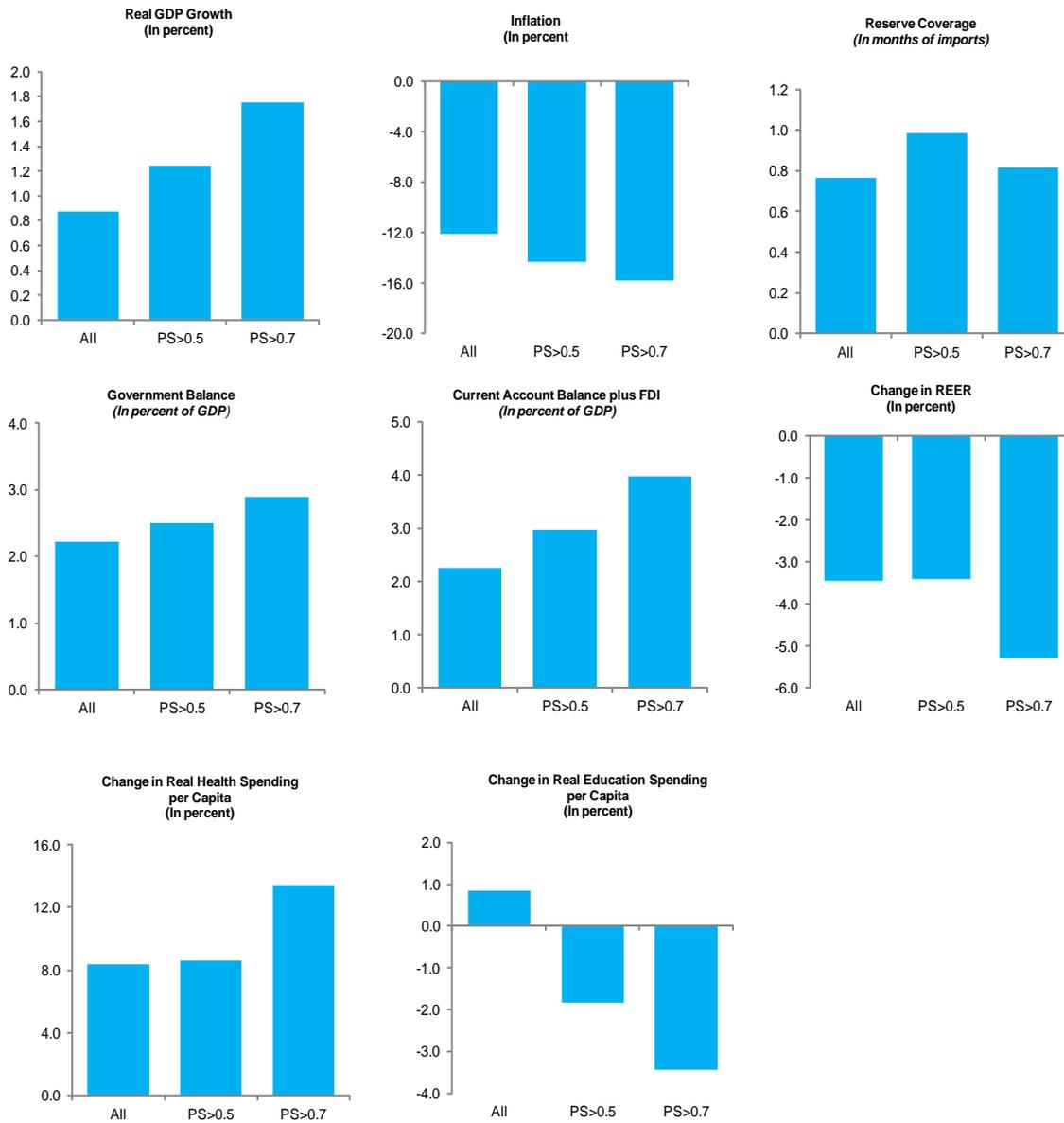
Source: IMF staff estimates.
Notes: Estimated impact of short-term Fund engagement relative to the control group having similar propensity scores. PS stands for the propensity score indicating the likelihood of Fund programs addressing immediate balance of payments needs.The sample is composed of 58 LICs and covers 1980–2010.

Figure 7. The Impact of Short-Term IMF Engagement on Changes in Macroeconomic Outcomes

(By propensity scores: Fund programs minus the control group)

Real GDP Growth
(In percent)

Inflation
(In percent)

Reserve Coverage
(In months of imports)

Government Balance
(In percent of GDP)

Current Account Balance plus FDI
(In percent of GDP)
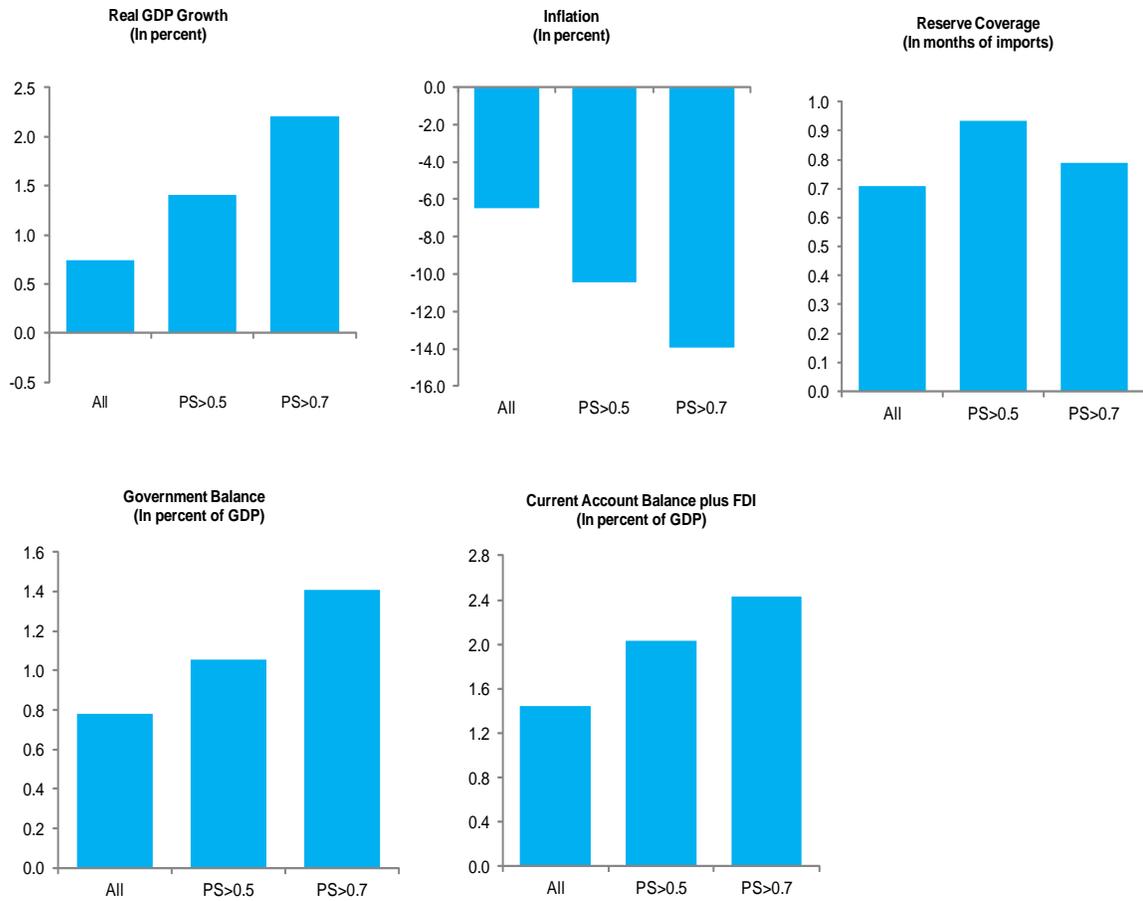
Source: IMF staff estimates.
Notes: Estimated impact of short-term Fund engagement on changes in macroeconomic outcomes relative to the control group having similar propensity scores. PS stands for the propensity score indicating the likelihood of Fund programs addressing immediate balance of payments needs. Changes in macroeconomic outcomes refer to first differences of the outcome variables. The sample is composed of 58 LICs and covers 1980–2010.

Table 7. Impact of Longer-Term IMF Engagement on Economic Performance Using Pre-2000s and Post-2000s Periods

	Nearest-Neighbor Matching	Five-Nearest - Neighbor Matching	Radius Matching	Kernel Matching
GDP per capita growth	0.84	1.19	1.60 **	1.42 *
	(0.96)	(0.87)	(0.72)	(0.82)
GDP per capita growth volatility	-4.11 *	-3.36 *	-1.72 **	-3.05 *
	(2.26)	(1.80)	(0.82)	(1.83)
Inflation	-8.89	-2.93	-4.17	-3.62
	(7.54)	(6.65)	(5.09)	(6.31)
Tax revenue	0.18	-0.39	-0.03	-0.61
	(1.52)	(2.22)	(1.65)	(1.76)
Government balance	3.71 *	3.23	3.87 ***	4.20 **
	(2.22)	(1.97)	(1.39)	(1.83)
Reserve coverage	1.26 **	0.83	0.84 *	0.67
	(0.60)	(0.52)	(0.44)	(0.55)
Current account	0.07	1.12	1.93	1.20
	(2.18)	(1.98)	(1.70)	(1.92)
FDI	0.91	0.81	-0.01	0.73
	(0.73)	(0.59)	(0.46)	(0.61)
External debt	-20.12	-24.66	22.08	-24.03
	(37.71)	(36.10)	(40.11)	(32.08)
CPIA	0.00	0.22	0.13	0.04
	(0.40)	(0.30)	(0.26)	(0.42)
Social spending	1.22	1.90	1.13 *	1.45
	(1.75)	(1.38)	(0.58)	(1.62)
Education spending	1.34	1.91	0.99 *	1.54
	(1.61)	(1.20)	(0.53)	(1.50)
Health spending	-0.12	-0.01	0.14	-0.09
	(0.39)	(0.36)	(0.31)	(0.42)
Aid	-2.16	0.29	2.89	0.68
	(3.20)	(2.73)	(2.33)	(2.84)
Poverty gap	..	..	..	..
Poverty rate	..	..	..	..
Gini	..	..	..	..
	..	..	..	..

Source: IMF staff calculations.

Notes: Bootstrapped standard errors in parentheses. Each coefficient represents a separate estimation. All coefficient estimates share the same first-stage regression on the determinants of longer-term Fund engagement. Analysis is based on two 10-year period averages between 1986 and 2005 where periods overlap by 50 percent. A country is considered to have longer-term (LT) engagement in a given decade if in five or more years it had a financial arrangement or a Policy Support Instrument in place, for at least six months in each of these years. Changes in each variable refer to first decadal differences. * 10 percent significance; **5 percent significance; ***1 percent significance.

.. Implies that there are no data to run the estimation.

Table 8. Impact of Longer-Term IMF Engagement on Economic Performance Using Non-Overlapping Periods

	Nearest-Neighbor Matching	Five-Nearest-Neighbor Matching	Radius Matching	Kernel Matching
GDP per capita growth	4.75 ***	3.97 ***	3.02 **	3.96 ***
	(1.26)	(1.24)	(1.17)	(1.25)
GDP per capita growth volatility	-1.12	-1.31	-0.96	-1.62
	(1.59)	(1.39)	(1.00)	(1.31)
Inflation	-8.59	-6.99	-6.17	-7.06
	(7.47)	(7.18)	(5.94)	(7.02)
Tax revenue	0.81	1.00	1.37	0.71
	(1.23)	(1.05)	(0.88)	(1.19)
Government balance	1.60	1.59	-0.80	1.42
	(2.29)	(1.78)	(1.94)	(1.55)
Reserve coverage	-0.29	-0.29	-0.17	-0.11
	(0.62)	(0.51)	(0.46)	(0.49)
Current account	-3.69 *	-2.34	-1.83	-2.86
	(2.17)	(1.93)	(1.70)	(1.83)
FDI	2.12 *	2.20 **	1.67 *	2.38 **
	(1.12)	(0.98)	(0.90)	(1.02)
External debt	-15.40	-13.04	-9.74	-12.82
	(14.49)	(11.57)	(10.48)	(12.21)
CPIA	0.31	0.17	0.06	0.27
	(0.31)	(0.30)	(0.24)	(0.31)
Social spending	1.34 **	0.88	1.25 ***	0.89
	(0.63)	(0.58)	(0.48)	(0.58)
Education spending	0.78 *	0.67 *	1.08 ***	0.65
	(0.42)	(0.40)	(0.38)	(0.40)
Health spending	0.56	0.22	0.18	0.24
	(0.37)	(0.34)	(0.20)	(0.34)
Aid	-2.10	-1.76	-0.87	-1.25
	(3.16)	(2.38)	(1.44)	(2.24)
Poverty gap	-4.35	-2.08	-4.22	-4.93
	(4.22)	(3.56)	(2.74)	(4.21)
Poverty rate	-7.31	-2.43	-5.04	-6.33
	(5.40)	(4.38)	(3.22)	(5.72)
Gini	0.65	-1.83	-1.40	-1.04
	(3.32)	(2.77)	(1.79)	(3.18)

* 10 percent significance; **5 percent significance; ***1 percent significance.

Notes: Bootstrapped standard errors in parentheses. Each coefficient represents a separate estimation. All coefficient estimates share the same first-stage regression on the determinants of longer-term Fund engagement. Analysis is based on two 10-year period averages between 1996 and 2010 where periods overlap by 50 percent. A country is considered to have longer-term (LT) engagement in a given decade if in five or more years it had a financial arrangement or a PSI in place, for at least six months in each of these years. Changes in each variable refer to first decadal differences.

**Table 9. Impact of Longer-Term IMF Engagement on Economic Performance
With No Adjustment for Program Implementation**

	Nearest-Neighbor Matching	Five-Nearest -Neighbor Matching	Radius Matching	Kernel Matching
GDP per capita growth	2.73 ***	2.45 ***	2.01 ***	2.53 ***
	(0.74)	(0.71)	(0.63)	(0.69)
GDP per capita growth volatility	-1.20	-1.14	-0.49	-0.86
	(1.34)	(1.01)	(0.77)	(0.95)
Inflation	-8.09	-6.91	-6.84 *	-9.21
	(6.66)	(6.39)	(3.60)	(5.89)
Tax revenue	1.45	1.31	1.14	1.22
	(1.35)	(1.17)	(0.87)	(1.20)
Government balance	-1.62	-0.80	-1.90	-1.57
	(1.42)	(1.24)	(1.75)	(1.17)
Reserve coverage	-0.40	-0.31	-0.34	-0.46
	(0.50)	(0.46)	(0.34)	(0.45)
Current account	-0.05	0.04	-1.00	-0.29
	(1.79)	(1.59)	(1.41)	(1.53)
FDI	1.58 ***	1.36 ***	0.74	1.40 ***
	(0.60)	(0.50)	(0.51)	(0.48)
External debt	-24.19	-28.65	-22.55	-27.55
	(19.87)	(18.03)	(17.93)	(17.35)
CPIA	0.27	0.36	-0.07	0.26
	(0.30)	(0.26)	(0.19)	(0.27)
Social spending	0.83	1.24 **	1.34 ***	1.11 **
	(0.57)	(0.60)	(0.39)	(0.54)
Education spending	0.58	0.97 **	1.16 ***	0.83 *
	(0.51)	(0.49)	(0.33)	(0.47)
Health spending	0.25	0.26	0.18	0.28
	(0.32)	(0.31)	(0.17)	(0.26)
Aid	0.74	-0.11	1.25	0.43
	(1.81)	(1.40)	(1.47)	(1.36)
Poverty gap	-1.62	-0.25	-3.06	-0.99
	(3.65)	(2.90)	(2.34)	(3.13)
Poverty rate	-2.24	1.76	-3.06	-0.07
	(3.85)	(3.50)	(3.03)	(3.65)
Gini	-5.72 *	-3.91	-2.92	-5.41
	(3.18)	(3.09)	(2.09)	(3.66)

* 10 percent significance; **5 percent significance; ***1 percent significance.

Notes: Bootstrapped standard errors in parentheses. Each coefficient represents a separate estimation. All coefficient estimates share the same first-stage regression on the determinants of longer-term Fund engagement. Analysis is based on four 10-year period averages between 1986 and 2010 where periods overlap by 50 percent. A country is considered to have longer-term (LT) engagement in a given decade if in five or more years it had a financial arrangement or a Policy Support Instrument in place, for at least six months in each of these years. Changes in each varaible refer to first decadal differences.

Table 10. Impact of Short-Term IMF Engagement With No Adjustment for Implementation

	All LICs	LICs with weaker Fundamentals	
		PS>0.5	PS>0.7
Macroeconomic outcomes			
Real GDP growth (%)	0.53	0.87	1.33 **
	(0.49)	(0.56)	(0.62)
Inflation (%)	-13.35 ***	-15.70 ***	-17.42 ***
	(3.92)	(4.65)	(5.27)
Reserve coverage (in months of imports)	0.58 ***	0.68 ***	0.53 ***
	(0.13)	(0.13)	(0.13)
Current account balance plus FDI (% of GDP)	2.14 **	2.79 ***	3.58 ***
	(0.86)	(0.99)	(1.12)
Government balance (% of GDP)	1.64 ***	1.90 ***	2.24 ***
	(0.58)	(0.69)	(0.77)
Change in real health spending per capita (%)	3.70	2.36	4.97
	(4.44)	(5.71)	(6.84)
Change in real education spending per capita (%)	-1.30	-4.51	-5.90
	(3.16)	(4.07)	(4.99)
Change in REER	-4.73	-4.60	-6.11
	(4.67)	(5.3)	(6.03)
ODA commitments (% of GDP)	1.88 ***	1.55 ***	1.66 ***
	(0.53)	(0.6)	(0.63)
ODA disbursements (% of GDP)	1.13 **	0.88	0.89
	(0.48)	(0.54)	(0.59)
Change in macroeconomic outcomes (X(t)-X(t-1))			
Real GDP Growth (%)	0.42	0.98	1.66 **
	(0.63)	(0.72)	(0.8)
Inflation (%)	-3.88	-7.00 *	-9.18 *
	(3.72)	(4.23)	(4.8)
Reserve coverage (in months of imports)	0.59 ***	0.74 ***	0.63 ***
	(0.09)	(0.09)	(0.09)
Current account balance plus FDI (% of GDP)	1.37 *	1.81 **	2.18 **
	(0.71)	(0.83)	(0.93)
Government balance (% of GDP)	0.27	0.45	0.67
	(0.42)	(0.49)	(0.53)
Change in ODA commitments (% of GDP)	0.08	-0.38	-0.35
	(0.6)	(0.71)	(0.8)
Change in ODA disbursements (% of GDP)	-0.03	-0.34	-0.43
	(0.36)	(0.42)	(0.47)
Number of observations 1/	*753*	*449*	*386*

Source: IMF staff calculations.

Note: PS stands for the propensity score indicating the likelihood of Fund programs addressing immediate balance of payments needs. Changes in macroeconomic outcomes refer to first differences of the variables in the top panel. needs. The sample is composed of 58 LICs and covers 1980–2010. Significant at 10 percent:*; 5 percent:**; and 1 percent:***. Standard errors in parentheses. FDI = Foreign Direct Investment; REER = Real Effective Exchange Rate.

1/ All variables except for health and education spending and change in REER for which data is more limited.

Table 11. Impact of Short-Term IMF Engagement, 1980–99

	All LICs	LICs with Weaker Fundamentals	
		PS>0.5	PS>0.7
Macroeconomic outcomes			
Real GDP growth (%)	1.31 *	1.70 **	2.15 **
	(0.71)	(0.77)	(0.88)
Inflation (%)	-16.04 ***	-16.83 **	-19.47 **
	(6.24)	(7)	(8.06)
Reserve coverage (in months of imports)	0.51 ***	0.59 ***	0.52 ***
	(0.17)	(0.17)	(0.18)
Current account balance plus FDI (% of GDP)	2.91 **	2.98 **	3.91 ***
	(1.21)	(1.3)	(1.47)
Government balance (% of GDP)	2.95 ***	3.29 ***	3.87 ***
	(0.82)	(0.92)	(1.05)
Change in real health spending per capita (%)	5.38	2.67	7.69
	(6.9)	(7.29)	(8.86)
Change in real education spending per capita (%)	-3.36	-5.80	-5.58
	(4.42)	(4.67)	(5.9)
Change in REER	-2.20	-1.91	-3.81
	(7.88)	(8.87)	(10.23)
ODA commitments (% of GDP)	2.02 **	1.62 **	1.61 *
	(0.8)	(0.82)	(0.88)
ODA disbursements (% of GDP)	1.46 **	1.18 *	1.11
	(0.7)	(0.67)	(0.73)
Change in macroeconomic outcomes (X(t)-X(t-1))			
Real GDP Growth (%)	1.22	1.77 *	2.43 **
	(0.95)	(1.03)	(1.17)
Inflation (%)	-9.00	-12.67 *	-16.94 **
	(6.18)	(6.52)	(7.42)
Reserve coverage (in months of imports)	0.58 ***	0.67 ***	0.61 ***
	(0.11)	(0.12)	(0.13)
Current account balance plus FDI (% of GDP)	1.75 *	1.76 *	2.08 *
	(0.92)	(1)	(1.12)
Government balance (% of GDP)	0.88	1.14 *	1.68 **
	(0.58)	(0.63)	(0.69)
Change in ODA commitments (% of GDP)	-0.42	-1.15	-1.23
	(0.97)	(1.09)	(1.24)
Change in ODA disbursements (% of GDP)	-0.31	-0.77	-0.91
	(0.57)	(0.61)	(0.69)
Number of observations 1/	*430*	*293*	*251*

Source: IMF staff calculations.

Note: PS stands for the propensity score indicating the likelihood of Fund programs addressing immediate balance of payments needs. Changes in macroeconomic outcomes refer to first differences of the variables in the top panel. The sample is composed of 58 LICs and covers 1980–1999. Significant at 10 percent:*; 5 percent:**; and 1 percent:***. Standard errors in parentheses. FDI = Foreign Direct Investment; REER = Real Effective Exchange Rate. ODA = Official Development Assistance.

1/ All variables except for health and education spending and change in REER for which data is more limited.

Table 12. Impact of Short-Term IMF Engagement, Matching on Propensity Score and ODA Disbursements
(Percent of GDP)

	All LICs	LICs with Weaker Fundamentals	
		PS>0.5	PS>0.7
Macroeconomic outcomes			
Real GDP growth (%)	1.75 ***	2.19 ***	2.70 ***
	(0.6)	(0.67)	(0.74)
Inflation (%)	-27.03 ***	-28.30 ***	-27.04 **
	(9.22)	(9.88)	(10.97)
Reserve coverage (in months of imports)	0.51 ***	0.80 ***	0.66 ***
	(0.16)	(0.17)	(0.17)
Current account balance plus FDI (% of GDP	2.39 **	2.95 **	3.56 ***
	(1.14)	(1.2)	(1.35)
Government balance (% of GDP)	3.33 ***	3.68 ***	3.54 ***
	(0.99)	(1.07)	(1.17)
Change in real health spending per capita (%	7.18 *	3.57	10.15
	(3.93)	(6.46)	(8.96)
Change in real education spending per capita	2.63	1.33	1.96
	(3.5)	(4.31)	(5.31)
Change in REER	-7.97	-7.97	-9.64
	(10.7)	(11.01)	(11.59)
Change in macroeconomic outcomes (X(t)-X(t-1))			
Real GDP Growth (%)	0.04	0.38	1.56
	(0.89)	(1.01)	(1.1)
Inflation (%)	-9.24	-15.38 **	-16.69 **
	(5.73)	(6.28)	(7.13)
Reserve coverage (in months of imports)	0.66 ***	0.91 ***	0.86 ***
	(0.13)	(0.13)	(0.15)
Current account balance plus FDI (% of GDP	1.28	1.95 *	2.69 **
	(0.97)	(1.07)	(1.23)
Government balance (% of GDP)	0.24	0.55	0.74
	(0.48)	(0.57)	(0.6)
Number of observations 1/	603	329	277

Source: IMF staff calculations.
Note: PS stands for the propensity score indicating the likelihood of Fund programs addressing immediate balance of payments needs. Changes in macroeconomic outcomes refer to first differences of the variables in the top panel. The sample is composed of 58 LICs and covers 1980–2010. Significant at 10 percent:*; 5 percent:**; and 1 percent:***. Standard errors in parentheses. FDI = Foreign Direct Investment; REER = Real Effective Exchange Rate.
1/ All variables except for health and education spending and change in REER for which data is more limited.

Table 13. Impact of Short-Term IMF Engagement, Matching on Propensity Score and Lagged GDP Growth

	All LICs	LICs with Weaker Fundamentals	
		PS>0.5	PS>0.7
Macroeconomic outcomes			
Real GDP growth (%)	1.23 **	1.59 **	2.11 ***
	(0.57)	(0.66)	(0.73)
Inflation (%)	-22.10 ***	-26.09 ***	-24.56 ***
	(5.77)	(7.16)	(8.47)
Reserve coverage (in months of imports)	0.76 ***	1.05 ***	0.81 ***
	(0.14)	(0.15)	(0.16)
Current account balance plus FDI (% of GDP)	2.13 **	2.97 ***	4.20 ***
	(1.02)	(1.16)	(1.32)
Government balance (% of GDP)	2.79 ***	3.43 ***	3.51 ***
	(0.82)	(0.87)	(1.02)
Change in real health spending per capita (%)	6.55 *	7.40	10.11
	(3.79)	(5.5)	(6.36)
Change in real education spending per capita (%)	-2.22	-3.84	-5.13
	(2.71)	(3.82)	(4.87)
Change in REER	-3.76	-3.07	-7.27
	(7.38)	(9.22)	(10.02)
Change in macroeconomic outcomes (X(t)-X(t-1))			
Real GDP Growth (%)	1.10 *	1.51 **	2.12 **
	(0.64)	(0.76)	(0.85)
Inflation (%)	-9.88 *	-16.03 ***	-19.69 ***
	(5.03)	(5.93)	(6.9)
Reserve coverage (in months of imports)	0.71 ***	0.90 ***	0.83 ***
	(0.1)	(0.12)	(0.13)
Current account balance plus FDI (% of GDP)	1.42 *	2.15 ***	2.84 ***
	(0.76)	(0.83)	(0.94)
Government balance (% of GDP)	0.76	0.91 *	1.12 *
	(0.48)	(0.55)	(0.61)
Number of observations 1/	633	349	293

Source: IMF staff calculations.

Note: PS stands for the propensity score indicating the likelihood of Fund programs addressing immediate balance of payments needs. Changes in macroeconomic outcomes refer to first differences of the variables in the top panel. The sample is composed of 58 LICs and covers 1980–2010. Significant at 10 percent:*; 5 percent:**; and 1 percent:***. Standard errors in parentheses. FDI = Foreign Direct Investment; REER = Real Effective Exchange Rate.

1/ All variables except for health and education spending and change in REER for which data is more limited.

Table 14. Short-Term IMF Engagement: Rosenbaum Sensitivity Analysis to Hidden Selection Bias

	All LICs		LICs with Weaker Fundamentals	
	Γ	Probability	Γ	Probability
Macroeconomic outcomes				
Real GDP growth (%)	1.38	0.044	1.76	0.046
Inflation (%)	1.14	0.045	1.27	0.048
Reserve coverage (in months of imports)	2.11	0.046	2.57	0.049
Current account balance plus FDI (% of GDP)	1.17	0.049	1.49	0.044
Government balance (% of GDP)	1.65	0.043	1.76	0.045
Change in macroeconomic outcomes (X(t)-X(t-1))				
Real GDP Growth (%)	1.13	0.047	1.54	0.047
Inflation (%)	1.19	0.049	1.50	0.050
Reserve coverage (in months of imports)	2.80	0.044	3.49	0.048
Current account balance plus FDI (% of GDP)	1.19	0.044	1.48	0.047
Government balance (% of GDP)	1.33	0.049	1.61	0.044

Source: IMF staff calculations.

Note: PS stands for the propensity score indicating the likelihood of Fund programs addressing immediate balance of payments needs. Changes in macroeconomic outcomes refer to first differences of the variables in the top panel. The sample is composed of 58 LICs and covers 1980–2010. Γ is a measure of how much hidden bias can be present. i.e., how much Γ can deviate from 1, before results of the study begin to change. FDI = Foreign Direct Investment.

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