

INTERNATIONAL MONETARY FUND

Review of Facilities for Low-Income Countries—Supplement 1

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In consultation with other Departments

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ACRONYMS AND ABBREVIATIONS

CFF	Compensatory Financing Facilities
CPIA	Country Policy and Institutional Assessment
ECF	Extended Credit Facility
EPA	Ex Post Assessment
ENDA	Emergency Natural Disaster Assistance
EPCA	Emergency Post-Conflict Assistance
ESAF	Enhanced Structural Adjustment Facility
ESF	Exogenous Shocks Facility
FDI	Foreign Direct Investment
GEE	Generalized Evaluation Estimator
GRA	General Resources Account
HAC	High Access Component
IEO	Independent Evaluation Office
LICs	Low-Income Countries
PITF	Political Instability Task Force
PRGF	Poverty Reduction and Growth Facility
PSI	Policy Support Instrument
PSM	Propensity Score Matching
RCF	Rapid Credit Facility
SAF	Structural Adjustment Facility
SBA	Stand-By Arrangement
SCF	Standby Credit Facility
SMP	Staff-Monitored Programs

REVIEW OF FACILITIES FOR LOW-INCOME COUNTRIES—SUPPLEMENT 1

ECONOMIC IMPACT OF FUND ENGAGEMENT¹

This supplement aims to assess the economic impact of the Fund’s support through its facilities for low-income countries (LICs). It relies on two complementary econometric analyses: the first investigates the longer-term impact of Fund engagement—primarily through successive medium-term programs under the Extended Credit Facility (ECF) and its predecessors (and more recently the Policy Support Instrument (PSI))—on economic growth and a range of other indicators and socio-economic outcomes; the second focuses on the role of IMF shock-related financing—through augmentations of ECF arrangements and short-term and emergency financing instruments—on short-term macroeconomic performance. The empirical results shed some light on two channels through which different Fund facilities may have helped LICs respond to the global financial crisis—(i) by supporting a gradual buildup of macroeconomic buffers in the decades prior to the crisis and (ii) by providing liquidity support at the height of the crisis. The combination of strong pre-crisis buffers and crisis financing allowed LICs to pursue counter-cyclical policy responses that preserved spending and facilitated a rapid recovery.

I. INTRODUCTION

1. **Previous studies by the staff and the Independent Evaluation Office (IEO) have identified some positive effects of Fund engagement on LICs’ macroeconomic performance, but not in all areas.** Bredenkamp and Schadler (1999) reviewed the experience of countries that used the Fund’s concessional lending window under three-year Structural Adjustment Facility (SAF) and Enhanced Structural Adjustment Facility (ESAF) arrangements during 1986–1995 and concluded that most countries pursuing reforms and adjustment programs with the support of the SAF and ESAF strengthened their economies materially. An IEO report (2002) based on a mixed sample of countries using General Resources Account (GRA) and concessional Fund resources over the period 1975–1999 and using econometric methods found that IMF lending appeared to have negative effects on growth for some prolonged users of Fund resources, though not for those using the Fund’s concessional lending window. Ghosh and others (2005) reviewed the experience of LICs with the ESAF and the Poverty Reduction and Growth Facility (PRGF) as well as that of countries relying on GRA resources over the period 1995–2003 and found that countries with IMF-supported programs often experienced marked reductions in inflation and higher economic growth. The *Review of Ex Post Assessments and Issues Relating to the Policy on Longer-Term Engagement*, which drew on a mixed sample of LICs and GRA countries using

¹ This supplement was prepared by Linda Kaltani, Yasemin Bal Gunduz, and Christian Ebeke, with guidance from Christian Mumssen.

inputs from Ex Post Assessment (EPA) teams, country mission chiefs and country authorities, noted that macroeconomic problems were reduced in many countries with longer-term program engagement, while structural problems often persisted. Clements, Gupta, and Nozaki (2011) presented econometric evidence based on LICs and GRA users for the period 1985–99 and found that, among LICs, IMF-supported programs had a positive effect on education and health outlays. The *2011 Review of Conditionality--Outcomes of Fund-Supported Programs* examined the effects of Fund-supported programs initiated during 2002–11 through multiple approaches and concluded that most Fund-supported programs appear to have helped member countries improve macroeconomic and social conditions.

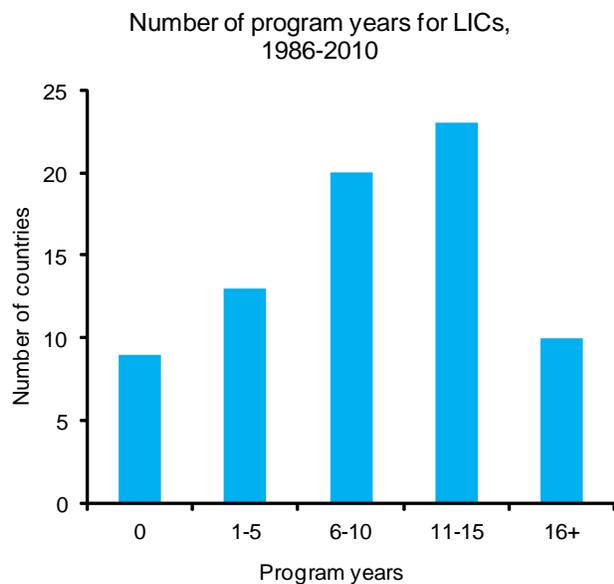
2. **The academic literature has found both positive and negative effects of Fund-supported programs on economic performance, depending on the econometric methodology and sample used.** Steinwand and Stone (2008) provide a broad overview of the empirical literature on the IMF and the underlying theories. Specific empirical studies that have examined the impact of Fund engagement include:

- Przeworski and Vreeland (2000) examined the effect of participation in Fund-supported programs on economic growth across all types of IMF lending facilities over the period 1970–1990 and found that program participation lowers growth rates.
- Barro and Lee (2005) looked at the effects of Fund-supported programs on economic growth using data spanning 1975–1999, focusing mainly on the short-term stabilization programs, and found a negative impact on growth.
- Dicks-Mireaux, Mecagni, and Schadler (2000) focused on the effects of Fund-supported programs on LICs for the period 1986–1991 and found statistically significant beneficial effects of IMF support on output growth and the debt service ratio but no effect on inflation.
- Atoyán and Conway (2006) examined the impact of Fund-supported programs on the real per capita GDP growth rate, the ratio of the fiscal surplus to GDP, and the ratio of the current account surplus to GDP on a sample of developing and transition countries over the period 1993–2002 and across GRA and LIC facilities. They found little statistical support that Fund-supported programs contemporaneously improve real economic growth in participating countries, but stronger evidence of an improvement in economic growth in years following a program. Moreover, both the fiscal ratio and the current-account ratio improved contemporaneously with IMF participation relative to the counterfactual.
- Biglaiser and DeRouen (2010), using a mixed sample of LICs and emerging economies during 1980–2003, found that IMF borrowers tend to be more attractive to U.S. investors but not all Fund-supported programs have the same effect. They

demonstrate that differences in loan duration, the extent of borrower input in policy decisions, and loan amounts affect borrowers' leverage with the IMF and the U.S.

3. **One important methodological challenge facing such studies is the issue of sample selection bias.** Sample selection bias stems from the fact that economic performance under a Fund-supported program is observed only for a restricted, nonrandom sample of countries with programs and countries in such a sample may self-select (i.e., are not random). For instance, countries that approach the Fund often do so because they are already facing economic difficulties or expect to experience possible problems in the near future. Similarly, countries with institutional and structural weaknesses are more vulnerable to policy slippages and exogenous shocks, which could increase their demand for Fund support. If countries with weaker economic positions are more likely to seek IMF support, failing to correct for selection bias would lead to flawed conclusions about the impact of Fund-supported programs on growth and other macroeconomic indicators. Thus, conditions at the start of a program need to be taken into account together with unique country characteristics. The literature has used various approaches to address sample selection bias—all attempts having in common the aim to construct a credible counterfactual.

4. **The academic literature has typically used country samples that mix LICs and middle-income economies, which tends to overlook the distinct nature and objectives of Fund engagement between these country groups.** LICs face a number of challenges that differentiate them from other economies: (i) *Nature of shocks*: While emerging market countries may experience “sudden stop”-type capital account crises, LICs are more vulnerable to other shocks, both domestic and external, which tend to occur more frequently and reflect the lack of economic development and diversification; (ii) *Access to financing*: LICs have less access to domestic or external financing, making them dependent on donor assistance and on Fund-supported programs that can help catalyze such assistance; and (iii) *Longer-term challenges*: LIC programs tend to focus more on medium- or longer-term objectives that are important for poverty reduction and growth, which tend to extend well beyond the duration of an individual Fund-supported program. In this context, LIC programs emphasize more capacity- and institution-building rather than just provision of financing and short-term policies. As a result of these factors, Fund program engagement with most LICs has generally been less



Notes: The sample is composed of 75. Program years are defined as years when a country had a financial arrangement or PSI for at least six months.

episodic than with other countries, and more of a continuous nature. Consequently, analyzing the impact of Fund 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 Fund engagement with most LICs and does not measure progress toward the longer-term objectives that are pursued under these programs.

5. **A related limitation of the existing literature is that it has generally not differentiated Fund-supported programs by types of instruments.** To tailor its support to member countries, the Fund offers a diverse range of instruments—medium-term support, episodic short term and emergency financing, precautionary financing, and pure policy support. Economic objectives tend to differ under these instruments, in particular in that 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 Fund engagement on macroeconomic outcomes.

6. **The econometric analysis below is designed to address the above methodological considerations, including by focusing on LICs and differentiating between short-term and longer-term instruments.** Specifically, Section II will seek to assess the longer-term impact of Fund engagement—primarily through successive medium-term programs under the ECF and its predecessors (and more recently the PSI)—on longer-term economic growth and a range of other indicators and socio-economic outcomes. As Fund engagement in many LICs has been in effect continuous in nature, we assess the longer-term impact of Fund-supported programs by looking at decade averages rather than contemporaneous economic indicators.² Section III complements the analysis by assessing the impact of short-term financing—through augmentations of ECF arrangements and short-term and emergency financing instruments—on short-term macroeconomic performance. This analysis focuses in particular on the question of whether short-term Fund financing can help countries alleviate liquidity constraints and cushion the impact of shocks. For both the longer- and short-term econometric analysis, we use the *Propensity Score Matching* (PSM) approach to control for selection bias and assess impact (see Annex I for details). Section IV then suggests some general conclusions about the economic impact of the Fund’s support through its LIC facilities.

² The existing academic literature has focused on annual macroeconomic indicators in the years before, during, and after individual Fund-supported programs. Bird, Hussain, and Joyce (2004) is a notable exception as it analyzes the number of Fund-supported programs and number of years under programs.

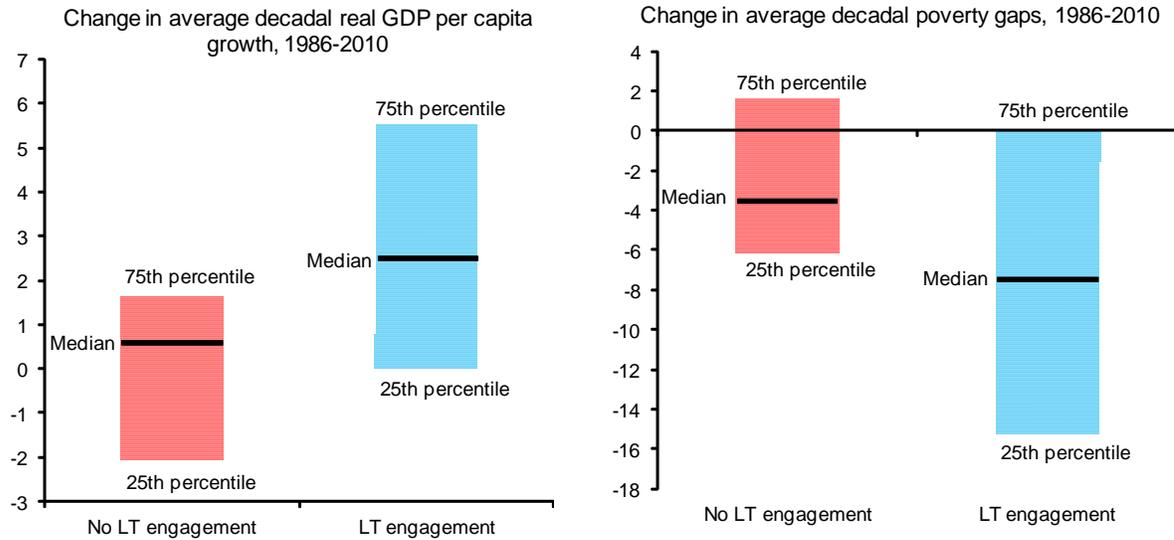
II. IMPACT OF LONGER-TERM FUND ENGAGEMENT IN LICs

7. **Macroeconomic conditions have improved substantially over the last two decades for most LICs.**³ On average, LICs experienced significant 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 Figure 1). 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 Country Policy and Institutional Assessment (CPIA)), and per-capita income (see Figure 2).

8. **LICs with extensive IMF program engagement have experienced, on average, a comparatively strong 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.⁴ 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 The Fund's Facilities and Financing Framework for Low-Income Countries—Supplementary Information 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 ESAF was created in 1987. Figure 3 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 (see also text charts below).

³ 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.

⁴ 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.



Notes: The sample is composed of 75 LICs and four overlapping decadal period averages: 1986-95; 1991-00; 1996-05; 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 PSI in place, for at least six months in each of these years. The chart shows the distribution of decadal changes across countries by quartiles. Poverty gap is defined as the mean shortfall from the poverty line (counting the non-poor as having zero shortfall), expressed as a percentage of the poverty line. A more negative change in the chart implies a bigger reduction in the poverty gap.

Econometric analysis

9. **The analysis that follows investigates to what extent the positive association of longer-term Fund engagement and economic performance 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 Fund engagement affect macroeconomic performance, including growth, and institutional variables?* The approach used is the abovementioned PSM, 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 Fund-supported programs and (ii) the average economic performance of countries over a 10-year period is then compared between longer-term program users and others with similar propensity scores.
- b. *What is the longer-term impact of IMF engagement on long-term economic growth, and what are the associated transmission channels?* We run panel regressions based on 10-year period averages that control for the determinants of long-run growth based on explanatory variables that have been commonly studied in the economic literature as well as a dummy identifying longer-term Fund 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.

10. **The analysis uses a panel dataset of 75 LICs and decadal averages spanning the period 1986–2010.**⁵ Given the focus on longer-term engagement we work with decadal averages where periods share a 50 percent overlap with each other.⁶ We also worked with yearly rolling decadal averages but considered them suboptimal given the serial correlation generated by the repetition of the bulk of the observations. For any given 10-year period, longer-term Fund engagement is captured by a dummy variable that takes the value of 1 if a country has had five or more years of Fund-supported programs in the 10-year period and zero otherwise. The qualifying programs are all Fund financial arrangements available to LICs, primarily the ECF and its predecessors (PRGF, ESAF, SAF) but also the Stand-By Arrangement (SBA), Exogenous Shocks Facility-High Access Component (ESF-HAC), and Standby Credit Facility (SCF), as well as the PSI. Program years have been purged of episodes when there were prolonged program interruptions.⁷

PSM approach

11. **To control for selection bias, a PSM selection equation is specified to estimate the determinants of longer-term IMF engagement.**⁸ 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 Fund engagement is assumed to be determined by a country's initial macroeconomic buffers, its structural characteristics, as well as external demand conditions during the period, but also by the role of IMF quotas in determining countries' available financing. 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, the latter stemming from the more recent empirical focus on political and institutional influences on Fund agreements. Trading partners' real GDP growth captures external demand conditions that are entirely exogenous

⁵ For the analysis, LICs are defined as those countries that were eligible to receive the Fund's subsidized resources as of January 1, 2010.

⁶ 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.

⁷ 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.

⁸ Of the academic studies mentioned in the literature review Atoyan and Conway (2006) have used a matching technique similar to the PSM. *2011 Review of Conditionality—Outcomes of Fund-Supported Programs*, forthcoming has also made use of the PSM.

to LICs. Finally, countries' access to IMF resources is proxied by their IMF quota. See Annex I for additional discussion and estimation results.

12. The results of the PSM suggest that longer-term Fund engagement has been associated with improved macroeconomic and socio-institutional outcomes. Table 1 presents the PSM results for dependent variables measured both in levels and changes in order to capture both absolute and relative differences between countries with and without longer-term Fund engagement in their macroeconomic outcomes.

- Longer-term Fund engagement leads to significantly higher long-term real per capita GDP growth both in levels and changes. Similarly, the poverty gap is significantly lower and decreases more for countries with longer-term Fund engagement.
- Growth volatility and external debt are lower and the CPIA is higher for countries with longer-term Fund engagement, although the changes in these variables are not significantly different from the control group of non-longer-term Fund users.
- Changes in inflation, tax revenue, FDI, and social spending are significantly higher in absolute terms for longer-term Fund users while the corresponding level is not significantly different from the control group. This result corroborates the stylized fact that strong economic improvement of longer-term program users has largely eliminated the performance gap that existed relative to other LICs over the 1986–2010 period.
- Government balance and its changes are positive but not significantly different from the control group of non-longer-term users. One possible explanation for this result may be the fact that LICs are financing-constrained and Fund-supported programs provide direct financing and catalyze donor support which allows them to address their development needs.
- Reserve coverage and its changes are positive but also not significantly different from the control group.

Table 1: Impact of Longer-term Fund Engagement on Economic and Institutional Performance

	Growth	Change in growth	Growth volatility	Change in growth volatility	Inflation	Change in inflation
Coefficient	1.83 ***	3.448 ***	-0.38 ***	-1.747	-4.192	-14.072 ***
St. Error	(0.48)	(0.78)	(0.13)	(1.14)	(14.65)	(4.15)
	Tax revenue	Change in tax revenue	Government balance	Change in government balance	Reserve coverage	Change in reserve coverage
Coefficient	0.462	1.67 *	0.952	1.551	0.236	0.256
St. Error	(1.25)	(0.96)	(0.66)	(1.65)	(0.38)	(0.41)
	Current account	Change in current account	FDI	Change in FDI	External debt	Change in external debt
Coefficient	-1.593	0.401	0.875	1.45 **	-25.986 **	-33.559
St. Error	(1.12)	(1.38)	(0.86)	(0.66)	(13.27)	(17.36)
	CPIA	Change in CPIA	Poverty gap	Change in poverty gap	Social spending	Change in social spending
Coefficient	0.302 ***	0.008	-7.47 **	-4.992 *	0.653	1.602 ***
St. Error	(0.12)	(0.19)	(3.24)	(3.06)	(0.59)	(0.63)

* 10 percent significance; **5 percent significance; ***1percent 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 PSI in place, for at least six months in each of these years. Changes in each variable refer to first decadal differences.

Panel growth regression

13. **Panel regressions are used as a complementary approach to estimate the impact of longer-term Fund engagement on growth and identify the associated transmission channels.** 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. Under an initial regression specification, a two-way fixed-effects model is estimated where 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 by IMF engagement as identified in the PSM analysis above and study the change in magnitude of the coefficients associated with the longer-term Fund engagement dummy along with the changes in their statistical significance.⁹ A variable will be considered as a likely transmission channel if it is significant and the coefficient associated with the Fund dummy decreases in size and/or significance relative to the benchmark model.

14. **The panel growth regressions corroborate the PSM findings that longer-term Fund engagement appears to support higher real per capita GDP growth.** They also help to identify the transmission channels through which this impact is achieved (Table 2). All regressions control for standard determinants of real GDP growth and also for the

⁹ 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.

endogeneity of longer-term Fund engagement through the inverse Mills ratio estimated in the first-stage PSM selection equation model.¹⁰

- The regression results confirm the PSM finding above that longer-term Fund engagement appears to have a positive impact on long-term real per capita GDP growth.
- Based on the different specifications of the panel regression, it appears that inflation, real per capita GDP growth volatility, debt, and institutional quality are significant transmission channels of the Fund longer-term impact on growth.
- When controlling for both the longer-term Fund engagement and the size of net IMF disbursements in the decade, only the longer-term Fund 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.

Robustness

15. **The econometric results under the PSM and panel growth regression approaches remain broadly unchanged under a series of robustness checks.** For the PSM approach, the significance of the coefficients remains broadly similar when alternative matching approaches are used. Furthermore, the PSM estimation results were broadly similar when yearly rolling decadal averages were used to increase the number of observations.¹¹ For the panel growth regression, an alternative specification that included foreign aid as an additional explanatory variable did not change the results substantially, and aid did not turn out to be statistically significant.

¹⁰ The inverse Mills ratio is the ratio of the probability density function to the cumulative distribution function of a distribution.

¹¹ The results shown in Table 1 are based on decades with a 50 percent rather than 90 percent overlap, which mitigates the possibility of serial correlation among the independent variables.

Table 2: Determinants of Long-term Real per Capita GDP Growth

Long-term Fund engagement	0.808 ** (0.40)	0.794 ** (0.40)	0.757 ** (0.38)	0.550 (0.38)	0.813 ** (0.40)	0.842 ** (0.40)	0.566 (0.36)
Inflation		-0.001 ** (0.00)					-0.002 *** (0.00)
Growth volatility			-0.171 *** (0.05)				-0.102 ** (0.05)
Institutional quality				1.656 *** (0.52)			1.742 *** (0.61)
Debt					-0.006 * (0.00)		0.009 (0.01)
IMF disbursements						-0.585 (0.77)	-1.073 (0.74)
Trade openness	0.030 * (0.02)	0.031 * (0.02)	0.03 * (0.02)	0.034 * (0.02)	0.028 (0.02)	-0.002 (0.01)	0.008 (0.01)
Education	0.044 *** (0.02)	0.042 *** (0.02)	0.035 ** (0.02)	0.039 *** (0.02)	0.042 *** (0.02)	0.03 * (0.02)	0.018 (0.02)
Inverse Mills ratio	-1.639 ** (0.72)	-1.458 ** (0.71)	-1.486 ** (0.69)	-1.619 ** (0.72)	-1.481 ** (0.72)	-2.164 *** (0.68)	-1.928 *** (0.64)
Constant	-2.97 (2.16)	-2.968 (2.14)	-1.768 (2.12)	-8.198 *** (2.43)	-2.529 (2.19)	1.482 (1.99)	-4.089 (3.07)
Observations	234	234	234	234	234	199	199

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

Notes: Robust standard errors in parentheses. Period dummies were included in the regression specification (not shown). 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 PSI in place, for at least six months in each of these years.

III. IMPACT OF SHORT-TERM FUND FINANCING IN LICs

16. **This section explores the short-term macroeconomic effects of Fund financial support to LICs experiencing immediate balance of payment needs as a result of policy slippages or external shocks.**¹² The nature of Fund support evaluated in this section differs from the more extensive program support via successive medium-term arrangements discussed above. Here, we focus on short-term Fund 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 Fund engagement in these cases would typically involve understandings on short-term macroeconomic adjustment accompanied by Fund financing, which could potentially have catalytic effects inducing additional bilateral and multilateral financing.

17. **Sample selection bias is an even greater methodological challenge when studying the short-term impact of Fund-supported programs.** If countries that are experiencing balance of payments crises owing to policy slippages and/or exogenous shocks are more likely to participate in Fund-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 Section II, this study implements the PSM methodology: in the first stage, the annual probability of participating in Fund-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

18. **The probability of participation in Fund-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 Fund-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

¹² 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.

would increase the likelihood of Fund financing. Moreover, global conditions, including changes in real oil and non-oil commodity prices and world trade, are also significant determinants of participation in Fund-supported programs which could potentially create cycles in demand for Fund financing as a result of adverse global shocks. Finally, persistent differences in debt service burden and resource inflows among LICs seem to be significantly associated with unobserved country heterogeneity.

19. The results suggest that Fund-supported programs lead to significantly better outcomes for LICs experiencing substantial prior macroeconomic imbalances and/or severe adverse external shocks. Table 3 and Figure 4 present the differences in various macroeconomic outcomes between program countries and the control groups. Overall, program countries have significantly higher growth, current account balances, and reserve coverage, as well as lower inflation and fiscal deficits compared to their control groups.

- The estimated impacts are higher for countries with high propensity scores, which indicate immediate balance of payments problems brought about by existing macroeconomic imbalances and/or external shocks.
- The positive impact on growth is likely explained by Fund financing (along with its potential catalytic effects) easing the burden of the short-term adjustment for countries experiencing severe balance of payments difficulties.
- Although program countries tend to have more depreciated real exchange rates, differences with the control groups are not significant.
- The change in growth is significantly higher and change in inflation significantly lower than those of the control groups for countries with high propensity scores.
- Reflecting the stabilization achieved under Fund-supported programs, reserves and the current account balances improve significantly more in all program countries than the control group.
- Change in fiscal balances is positive but not significantly different than the adjustments undertaken by their control groups, except for those with very high propensity scores (Figure 5 and Table 3).
- Changes in real health and education spending per capita are not statistically different from those of the control group.

Table 3: Impact of Short-term Fund Engagement by Propensity Score Matching

	All LICs	LICs with weaker fundamentals		
		PS>0.5	PS>0.7	
Macroeconomic outcomes				
Real GDP growth (%)	0.8	1.5 **	1.9 ***	
Inflation (%)	-16.5 ***	-20.4 ***	-22.2 ***	
Reserve coverage (in months of imports)	0.6 ***	0.8 ***	0.7 ***	
Current account balance plus FDI (% of GDP)	1.2	2.5 **	2.9 **	
Government balance (% of GDP)	1.2 **	1.7 **	1.9 **	
Change in real health spending per capita (%)	8.4 *	8.6	13.4	
Change in real education spending per capita (%)	0.5	-2.3	-4.1	
Change in REER	-3.4	-3.4	-5.3	
Change in macroeconomic outcomes (X(t)-X(t-1))				
Real GDP Growth (%)	0.3	1.2	1.9 **	
Inflation (%)	-6.2 *	-10.0 **	-12.5 **	
Reserve coverage (in months of imports)	0.6 ***	0.8 ***	0.7 ***	
Current account balance plus FDI (% of GDP)	2.2 ***	3.2 ***	3.6 ***	
Government balance (% of GDP)	0.6	0.8	0.9 *	
<i># of observations 1/</i>	<i>790</i>	<i>448</i>	<i>357</i>	

Source: 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. Significant at 10 percent:*; 5 percent:**; and 1 percent:***. The sample is composed of 58 LICs and covers 1980-2010. 1/ All variables except for health and education spending and change in REER for which data is more limited.

IV. CONCLUDING REMARKS

20. **The empirical work presented above suggests that Fund program support can benefit LICs' economies via two distinct channels:**

- ***Longer-term policy support can help LICs gradually build macroeconomic buffers.*** Longer-term program support by the Fund is positively associated with higher long-term growth rates, less growth volatility, more rapid poverty reduction, higher tax ratios, higher levels of social spending, higher institutional quality, higher FDI and lower inflation and external debt. Noticeably, this result does not seem to depend on the amount of Fund financing provided over the longer term.
- ***Short-term liquidity support can play an important role in mitigating the impact of shocks.*** Short-term Fund 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.

21. **These results shed some light on how Fund support may have helped LICs weather the recent global financial crisis.** First, longer-term Fund 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 institutional capacity needed for a robust policy response to the crisis. Second, the Fund'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.^{13 14} 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.¹⁵ This domestic response facilitated a rapid economic recovery in LICs, which in past crises had lagged behind the rest of the world.

¹³ 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.

¹⁴ See *Emerging from the Global Crisis: Macroeconomic Challenges Facing Low-Income Countries*. For a detailed analysis of program design and objectives, and outcomes, see 2011 *Review of Conditionality-Overview Paper*, forthcoming.

¹⁵ See Fabrizio (2009) *Coping with the Global Financial Crisis: Challenges Facing Low-Income Countries*, for a discussion of how LICs responded to the global financial crisis.

22. **The empirical work also suggests that the Fund’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, Fund 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).

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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 Fund-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 (Dicks-Mireaux, Mecagni, and Schadler (2000)). Identification of exogenous instruments remains a challenge under this approach. Yet another approach is Heckman’s selection correction model, based on unobservable factors, where in the first stage a probit model is used to predict the probability of Fund-supported program engagement and in the second stage, the inverse Mills’ ratio is included as a regressor (Przeworski and Vreeland (2000)). A final method, used in this supplement, is discussed below.

B. PSM Methodology

The econometric analyses in this supplement use the PSM approach to control for selection bias. This is a relatively new and innovative class of statistical methods for impact evaluation.¹⁶ It involves a statistical comparison of country groups based on two steps:

- First, the probability of participating in Fund-supported programs is estimated conditional on observable economic conditions and country characteristics (selection model).¹⁷
- 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.¹⁸

¹⁶ Of the studies mentioned in the literature review Atoyán and Conway (2006) have used a matching technique similar to the PSM. *2011 Review of Conditionality—Outcomes of Fund-Supported Programs, forthcoming* has also made use of the PSM.

¹⁷ Sections II and III estimate separate Fund participation selection models. In Section II the dependent variable is the longer-term Fund engagement dummy, while in Section III the dependent variable is the Fund program participation dummy.

¹⁸ 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.

The matching based on the likelihood of participation in Fund-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, i.e., for macroeconomic outcomes if program countries had not had a program. The effects of the Fund 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 Fund programs helps support the conditional independence assumption. In other words, a well-specified and comprehensive selection model explaining the participation in Fund programs is the key to properly assess the impact of Fund 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 supplement, Fund engagement is taken as a treatment status, analogous to the program evaluation literature in microeconomic studies.¹⁹ Countries that have engagement with the Fund are called the treatment group whereas the remaining others in the sample are called the control group. The average treatment effect of Fund engagement on the treated group (ATT) is given by:

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

where D is the dummy variable identifying LICs with Fund 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 Fund 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 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

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

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

¹⁹ 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).

scores, (which represent here the probabilities of being long term IMF program countries for Section II or participants of Fund-supported programs in Section III) conditional on X and can be estimated using simple probit or logit models. A further assumption needed to apply propensity score matching is the common support assumption ($p(X_i) < 1$), 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

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

The strategy then consists in computing the differences in the outcomes (Y_i) for observations with similar propensity scores (the probability of having a Fund engagement). 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 nearest neighbors.

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 supplement 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 Fund-supported programs.

Selection model for longer-term Fund engagement

The selection model estimated is a pooled probit regression. The dependent variable is a dummy variable identifying longer-term Fund engagement. The dummy variable takes the value of 1 if a country has had five or more years of Fund-supported programs in a 10-year period and zero otherwise. The qualifying programs are all Fund 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 PSI. Program years have been purged of episodes when there were prolonged program interruptions.²⁰ 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

²⁰ 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. Interruption 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.

observations.²¹ Longer-term Fund engagement is determined by a country's initial macroeconomic buffers, its structural characteristics, as well as external demand conditions and the size of its 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.²² Trading partners' real GDP growth captures external demand conditions that are entirely exogenous to LICs. Finally, countries' access to IMF resources is proxied by their IMF quota. The empirical findings (Annex I Table 1) indicate that countries with higher initial reserves and lower aid have exhibited a lower propensity of longer-term Fund engagement. Moreover, the probability of longer-term Fund engagement tends to increase with lower trading partner economic growth in the decade. Finally, landlocked and francophone countries have had a higher propensity for longer-term Fund engagement, while a larger quota has implied a lower probability of longer-term engagement.

Annex I Table 1: Determinants of Longer-term Fund Engagement

Initial reserves	-0.166 *** (0.04)
Initial aid/GDP	0.025 *** (0.01)
Trading partner growth	-0.129 * (0.07)
IMF quota/GDP	-0.070 ** (0.03)
Francophone	0.436 ** (0.21)
Landlocked	0.787 *** (0.20)
PRGF reform dummy	-0.771 *** (0.21)
Constant	0.571 * (0.34)
Observations	236

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

Notes: Robust standard errors in parentheses. 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.

²¹ The periods from which decadal averages are generated are: 1986–95; 1991–00; 1996–05; 2001–10.

²² Recent empirical studies have highlighted the role of institutional characteristics in explaining Fund agreements (see Bird and Rowlands (2001); Butkiewicz and Yanikkaya (2005); Stone (2004)).

Selection model for the short-term Fund engagement

The selection model adopted in this study draws on Bal Gündüz (2009).²³ This is the only study looking into determinants of LIC participation in Fund arrangements addressing immediate balance of payments needs in response to domestic policy and/or external shocks. Examining this more homogenous subset of Fund 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.

The dependent variable is a panel dummy variable, taking the value of one if a new Fund arrangement is approved, and zero 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. Several refinements are made to this basic set as follows: (i) precautionary SBA/SCF and SBA/PRGF/ECF augmentations addressing natural disasters are excluded²⁴, 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 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 Fund financing for shocks when the member is eligible to access Fund resources. Several refinements are made to normal episodes to identify cases where supply constraints are binding.²⁵

The effects of various economic variables on the probability of a LIC requesting Fund 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

²³ 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).

²⁴ 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.

²⁵ 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.

$$\begin{aligned}
y_{it} &= 1 && \text{if Fund financing is requested} \\
y_{it} &= 0 && \text{normal episodes} \\
P(y_{it} = 1 | x_{it}, c_i) &= \Phi(x_{it}'\beta + c_i) && i = 1, \dots, n \text{ and } t = 1, \dots, T
\end{aligned} \tag{1}$$

where, y is the observed outcome, Φ is the cumulative normal density function (c.d.f.), x_{it} is the $1 \times k$ vector of explanatory variables, and β is $k \times 1$ 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 .²⁶ The estimations are carried out step-by-step under 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.

BG finds that a number of economic variables are significantly associated with increased probability of Fund financing, including reserve coverage, current account balance to GDP, real GDP growth, macroeconomic stability indicator and terms of trade shocks (Annex I Table 2).²⁷ Moreover, it reports that adverse global shocks to the change in real oil and non-oil commodity prices, and the cyclical component of world trade increases the participation in Fund arrangements. Therefore, the demand for Fund 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.

²⁶ Pooled probit models assume independence of observations over both t and i . A random effects (RE) probit model treats the individual specific effect, c_i , as an unobserved random variable with $c_i | x_{it} \sim IN(\mu_c, \sigma_c^2)$ if an overall intercept is excluded, and imposes independence of c_i and x_i . A fixed effects (FE) probit model treats c_i as parameters to be estimated along with β , and does not make any assumptions about the distribution of c_i given x_i . This can be problematic in short panels as both β and c_i are inconsistently estimated owing to an incidental parameters problem. Finally, a correlated random effects model relaxes independence between c_i and x_i 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.

²⁷ 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 formula for the indicator is given by:

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

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.

Annex I Table 2: Demand for Fund 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 Franc zone) (t-1)	-0.478 ***	(-6.08)
Reserve coverage in months of imports (non-CFA Franc zone) (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 : $\beta_2 = \dots = \beta_k = 0$ χ^2 (Prob)	376(0.00)	
LR test : $\rho = 0$ χ^2 (Prob)	11(0.00)	
# of observations	532	
Sample probability	0.44	
# of countries	55	

Source: Staff calculations (Bal Gündüz, 2009).

Notes: Demand for Fund 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 parentheses. Country-specific averages are calculated as the sample average of variables for each country.

The ultimate objective is to distinguish the short-term impact of Fund-supported programs when a country has an immediate external financing need. The treatment variable is identified symmetrically to the one used in the selection equation. A panel dummy variable taking the value of one for the approval of Fund-supported programs with LICs addressing immediate balance of payments needs, and zero for non-program episodes, is constructed as the treatment variable. 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 Fund-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 Fund-supported programs.²⁸ Furthermore, in order to take account of program implementation, years of program interruptions are excluded from the sample.

²⁸ 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

(continued...)

ANNEX II. PANEL REGRESSION ON THE DETERMINANTS OF LONG-TERM GROWTH

The impact of Fund-supported programs on per capita GDP growth also addresses the selection issue and is computed using 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 starting estimation does not control for macroeconomic variables which are considered possible transmission channels of the longer-term impact of Fund-supported programs. The analysis here focuses on the effect of longer-term Fund 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 Fund engagement. θ_2 measures the total effect of Fund-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 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, model (2) is augmented with the variables Y that were significantly affected by the IMF program dummy in the PSM estimation. The specification is then:

$$(g_{it}) = \theta_3 IMF_{it} + Z'_{it}\beta + \alpha Y_{it} + \epsilon_{it} \quad (4)$$

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 Fund-supported programs help foster economic growth. One would then expect: $|\theta_3| < |\theta_2|$ along with changes in the significance of the two coefficients.

genocides and politicides. From this dataset the variable SFTPMAX, which presents the maximum magnitude of all events in a year, exceeding 3.9 is taken as a severe state failure event.

Figure 1: Macroeconomic Conditions in LICs across Decades

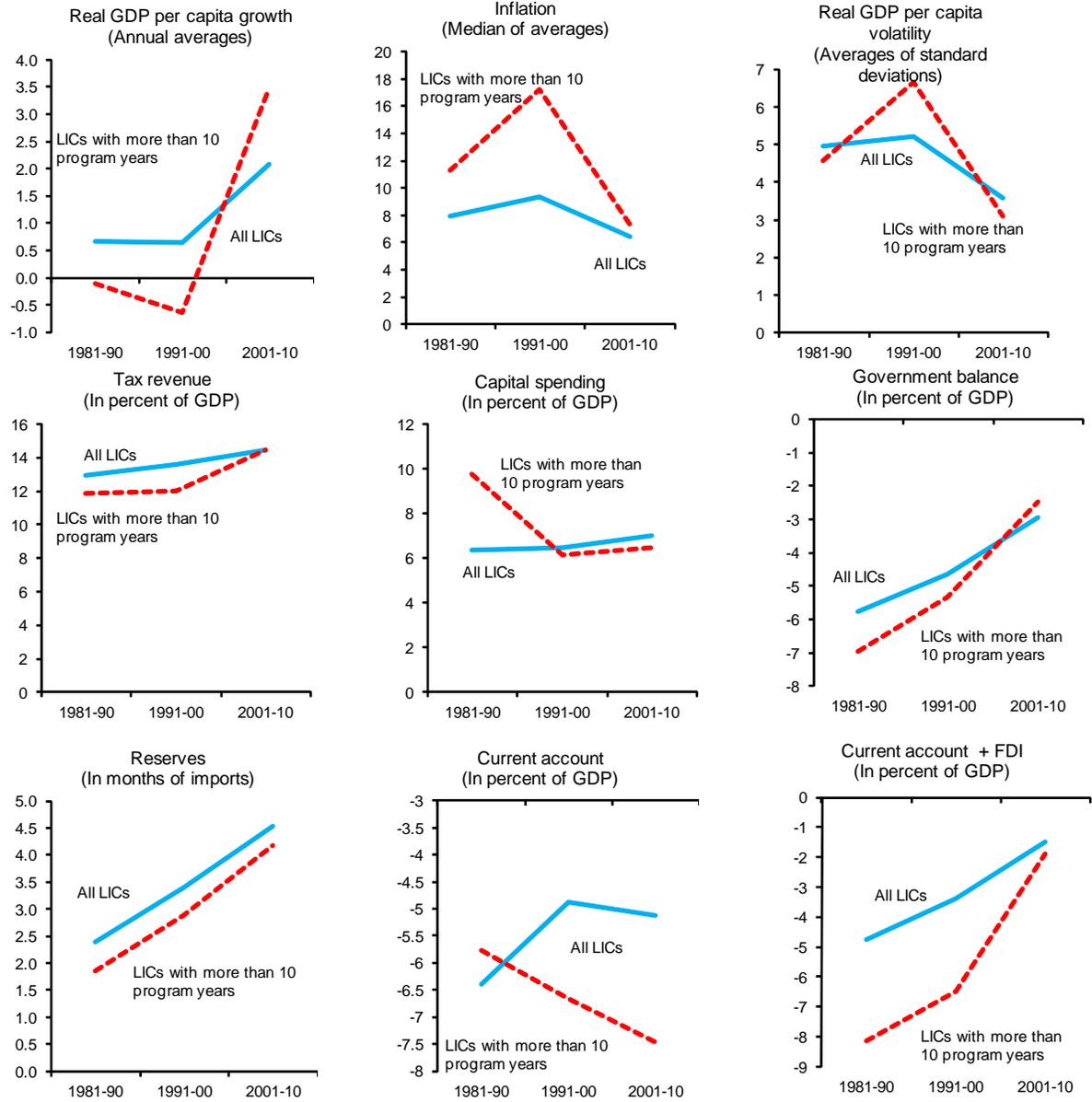
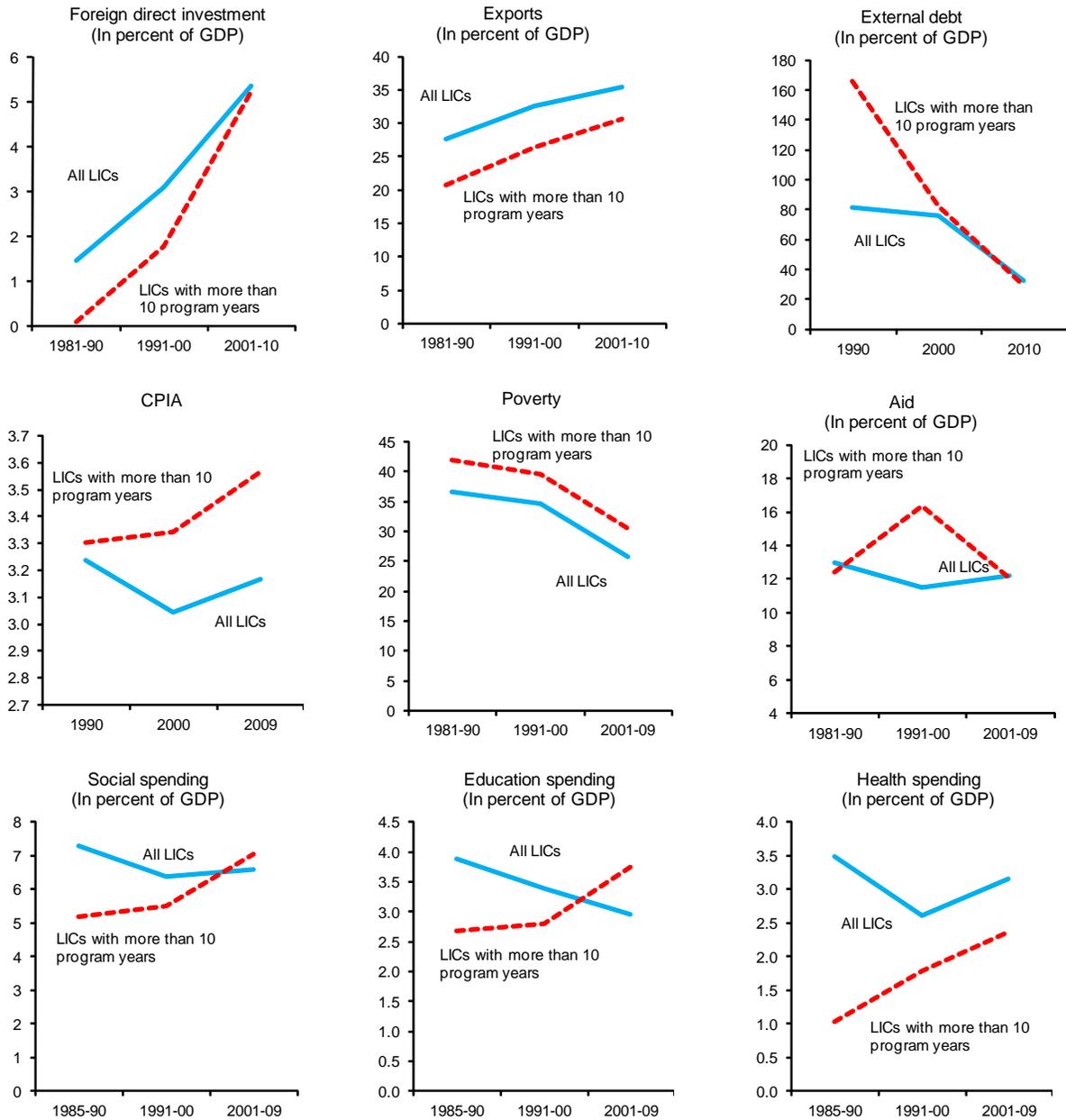
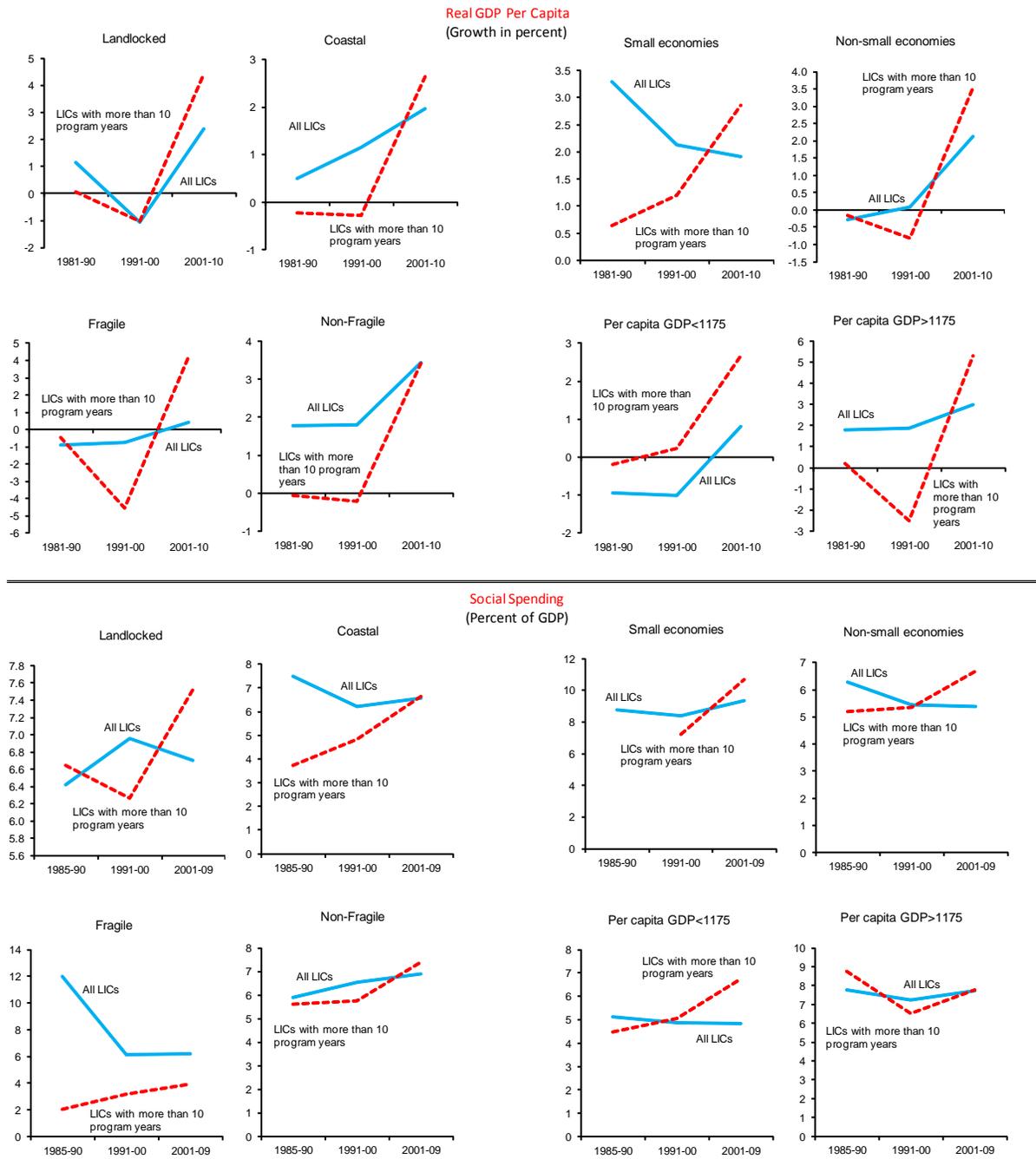


Figure 1: Macroeconomic Conditions in LICs across Decades (Continued)



Notes: The sample is composed of 75 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 PSI in place during 1991-2010, for at least six months in each of these years.

Figure 2: Macroeconomic Conditions in LICs across Decades and Country Groupings



Notes: The sample is composed of 75 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 PSI in place during 1991-2010, for at least six months in each of these years.

Figure 3: Changes in Macroeconomic Performance of LICs

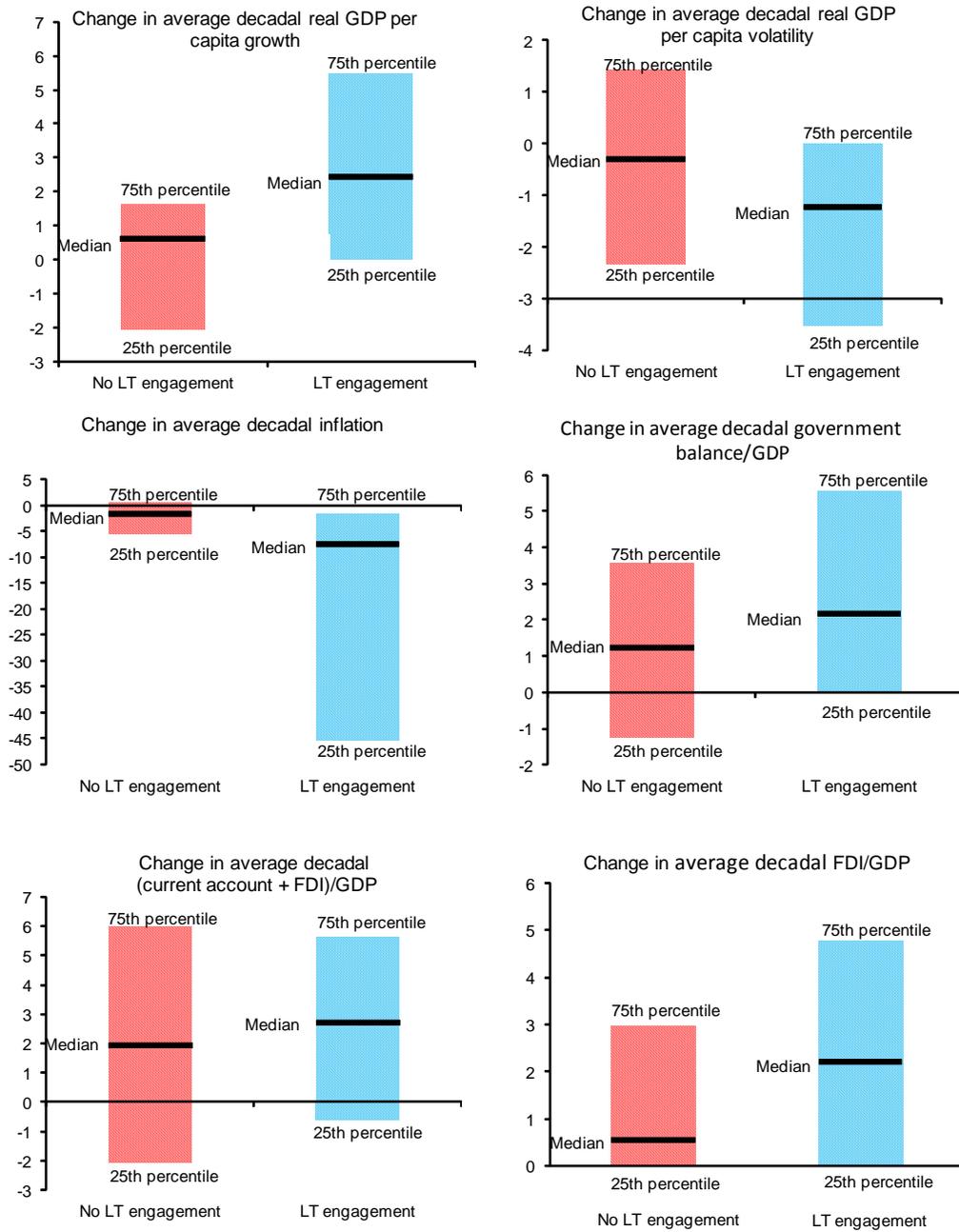


Figure 3: Changes in Macroeconomic Performance of LICs (Continued)

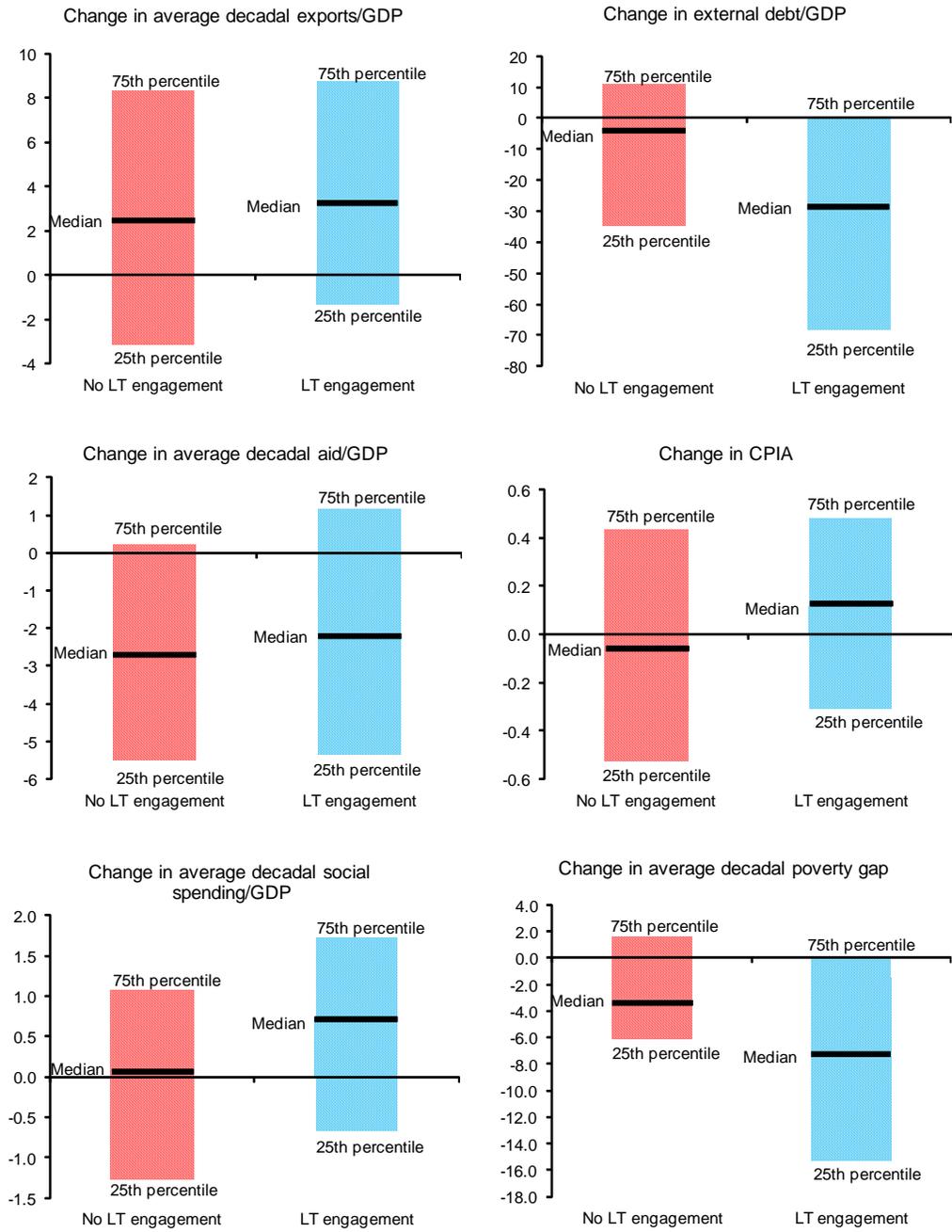
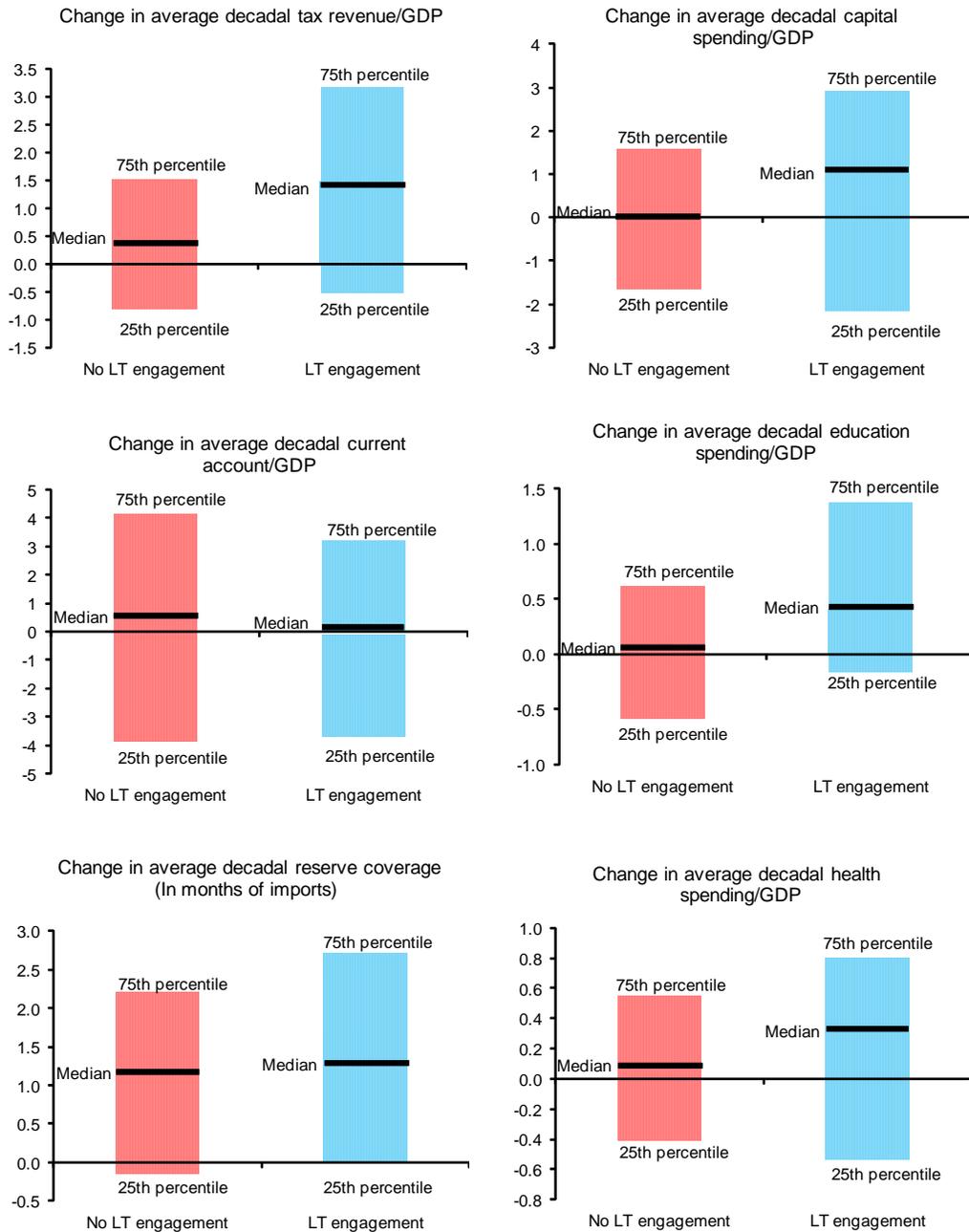
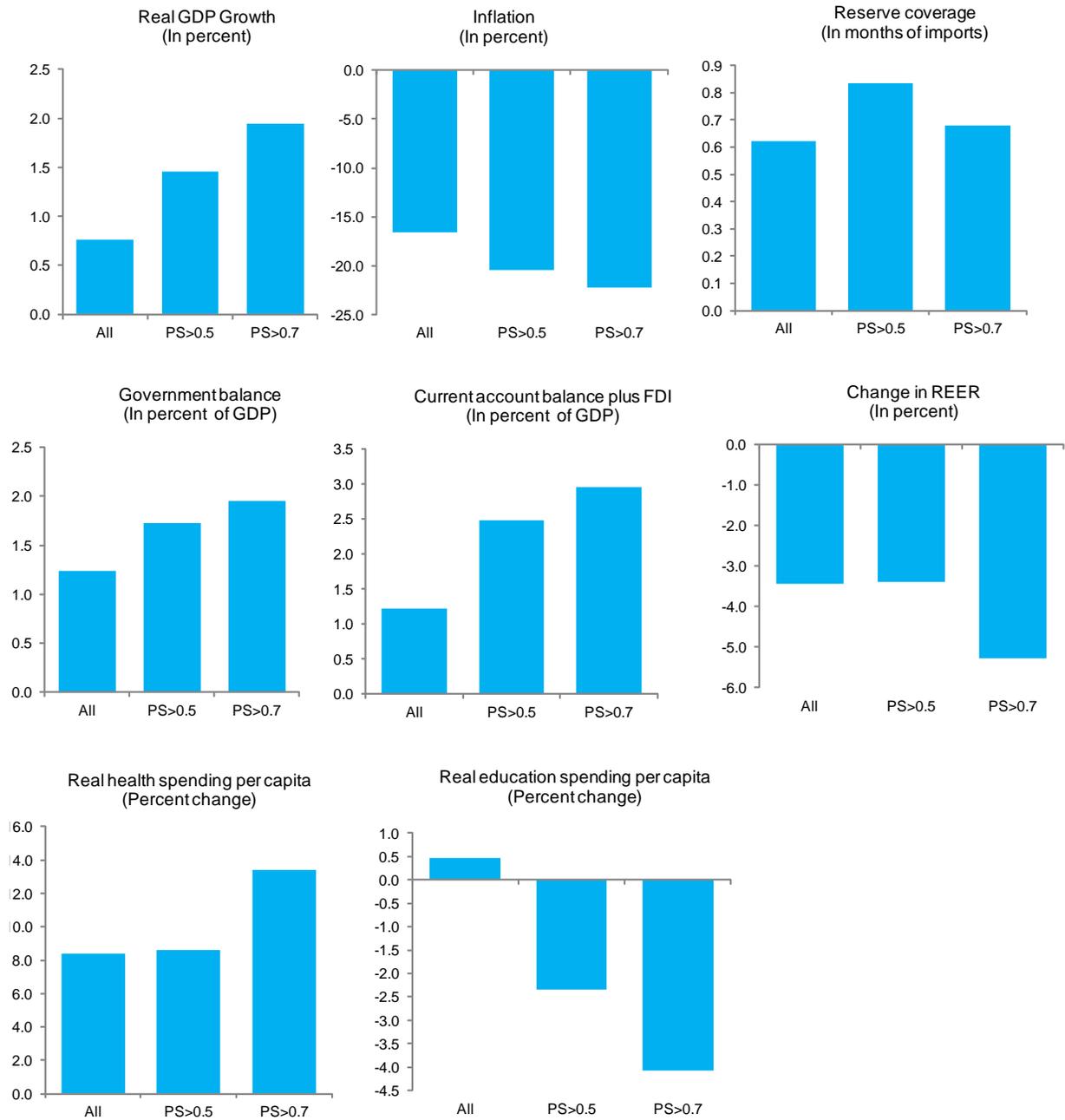


Figure 3: Changes in Macroeconomic Performance of LICs (Continued)



Notes: The sample is composed of 75 LICs and four overlapping decadal period averages: 1986-95; 1991-00; 1996-05; 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 PSI in place, for at least six months in each of these years. The chart shows the distribution of decadal changes across countries by quartiles.

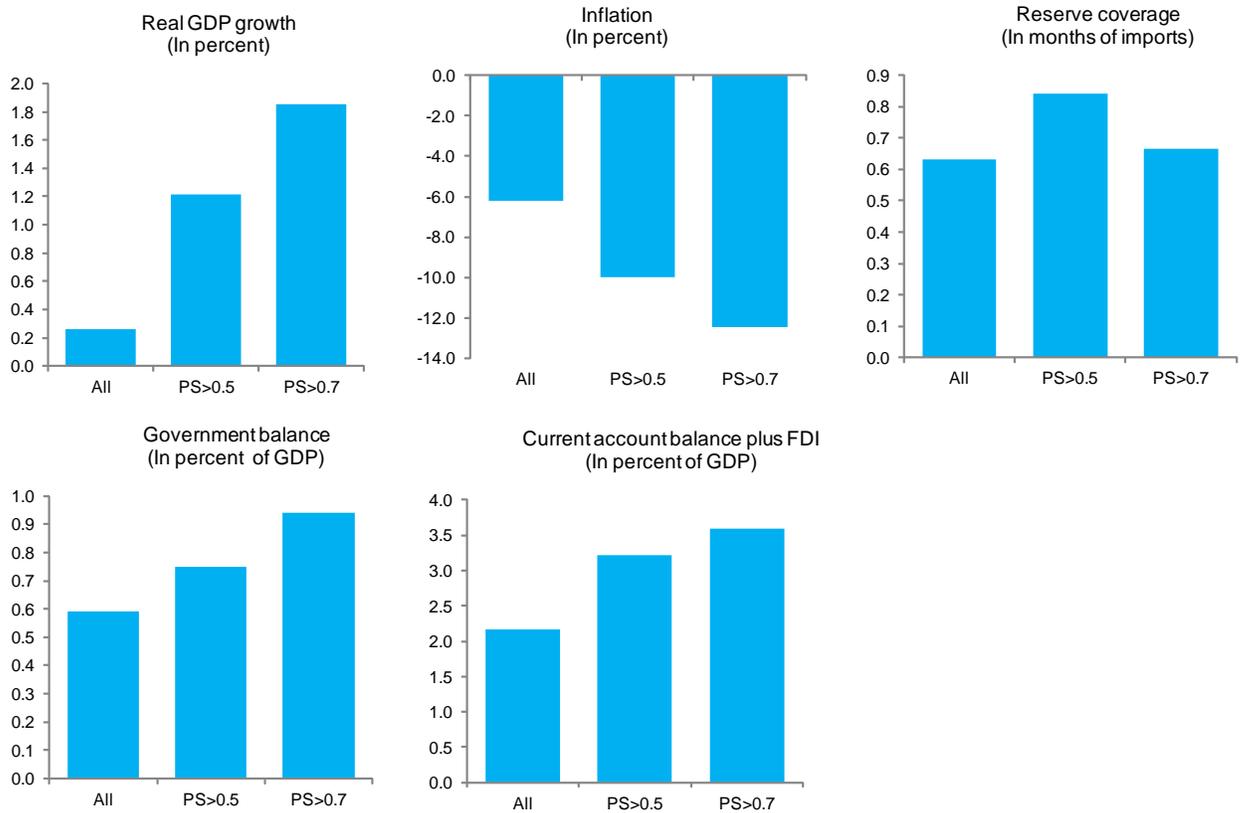
Figure 4: The Impact of Short-Term Fund Engagement on Macroeconomic Outcomes
(by propensity scores: Fund-supported programs minus the control group)



Source: 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.

Figure 5: The Impact of Short-Term Fund Engagement on Changes in Macroeconomic Outcomes
(by propensity scores: Fund programs minus the control group)



Source: 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.