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IMF-Supported Programs and Income Convergence in Low-Income Countries

by Tejesh Pradhan and Ali J. Al-Sadiq

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Abstract

Continuing the empirical debate on the effects of IMF-supported programs on participating countries' macroeconomic performance, we focus on the issue of whether these programs *accelerate conditional β-convergence* among low-income countries (LICs). We use an unbalanced panel dataset for 85 LICs over the period 1986-2015 and employ two different econometric methods to address the selection bias problem. Our empirical results suggest that the rate of conditional income per capita convergence is faster among LICs with extended IMF support than that in countries without support or with intermittent support.

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Keywords: Income Convergence, Endogenous Treatment Effects, Matched Treatment Fixed Effects, Poverty Reduction and Growth Trust, Low-Income Countries.

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TABLE OF CONTENTS

LIST OF FIGURES

Appendix

LIST OF TABLES

Appendix

1. INTRODUCTION

A central issue in the debate on the macroeconomic impacts of International Monetary Fund (IMF)-supported programs is whether these programs enhance economic growth. From a theoretical perspective, IMF's concessional assistance to eligible low-income countries (LICs), which is provided through the Poverty Reduction and Growth Trust (PRGT),[2] could promote growth through several channels: managing aggregate demand, raising aggregate supply, and a catalytic effect by facilitating additional private capital inflows and donor assistance. Recent empirical work supports these viewpoints (see Bird and Rowlands, 2017 and Bal Gündüz and Crystallin, 2014). However, while a positive impact of IMF-supported programs on economic growth may be a necessary condition to ascertain program effectiveness, it is insufficient to ensure that the growth effect of such programs is pro-poor in a macroeconomic sense. A deeper understanding of the role of IMF-supported programs in helping LICs attain their long-run potential is crucial to achieving a broad-based income convergence.

Against this backdrop, the main objective of this paper is to examine whether IMF-supported programs help *accelerate income convergence* among LICs, in addition to boosting growth. To carry out the empirical exercise, we use a modified version of the Mankiew *et al.*, (1992)'s model of *conditional β-convergence*, which is based on the assumption that countries reach different steady-state levels in terms of per capita income conditional on their fundamentals, in contrast to *unconditional convergence*, which implies a common steady state across all countries.[3] We use a comprehensive unbalanced panel dataset for 85 LICs over the 1986-2015 period and consider all IMF concessional financial and non-financial facilities available only to LICs.[4] Given that requesting an IMF-supported program is not a random decision, we employ two different econometric methods to control for selection bias:

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[2] The purpose of the PRGT is to support programs under Extended Credit Facility (ECF) and Standby Credit Facility (SCF), or policies under the Rapid Credit Facility (RCF). These programs assist low-income countries achieve and maintain a stable and sustainable economic position necessary for economic growth and poverty reduction.

[3] Regressing the growth rate of income per capita on initial income levels for a cross-section of countries is a natural empirical test of the income convergence hypothesis (Barro and Sala-i-Martin, 1992). A negative relationship between these two variables implies the existence of the so-called *unconditional β-convergence.* However, the Solow-Swan model predicts income convergence across countries which share the same production function, investment rate, population growth, depreciation rate, and technologies. Thus, to account for such differences, we can control for these as well as other variables in the *β-convergence regression*. If a negative partial correlation between initial income and subsequent income growth appears after controlling for other covariates, *conditional β-convergence* is said to exist. Thus, owing to the differences in the fundamental factors of economic growth, poor countries may not entirely catch up to rich ones. At the same time, countries with similar initial conditions might converge to the same steady state (see section 4 below).

[4] Extended Credit Facility (ECF) and its two predecessors (Poverty Reduction and Growth Facility (PRGF) and Enhanced Structural Adjustment Facility (ESAF)), Structural Adjustment Facility (SAF), Exogenous Shocks Facility (ESF), Standby Credit Facility (SCF), Policy Supported Instrument (PSI), and Staff-Monitoring programs (SMP). While the SMP is not limited to LICs, it is mostly used by those countries.

Endogenous Treatment Effects (ETE) and propensity score Matched Treatment Fixed Effects (MTFE).

The main empirical findings suggest that LICs with extended participation in IMF-supported programs (with more than five years of being under active IMF-supported programs in 10 years) grew statistically significantly faster than countries that participated intermittently or countries that did not request IMF support by 4.2 percentage points, on average, over a decade. This result is consistent with existing empirical literature on the impact of IMF-supported programs on economic growth. More importantly, IMF-supported programs accelerated conditional income convergence among LICs during the sample period – the rate of conditional income convergence is faster among LICs with extended IMF support than that in countries with intermittent or no support. Moreover, the impact of these programs on growth and the rate of conditional income convergence increased with lower debt burden, political stability, and better institutional capacity.

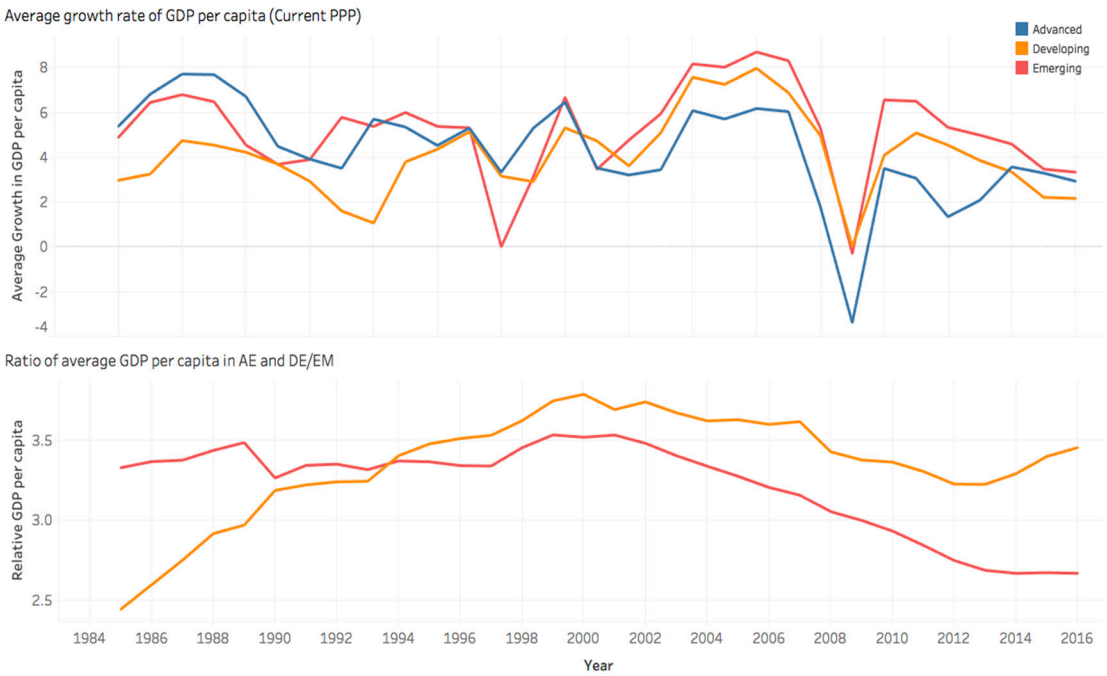
The rest of the paper is organized as follows. Section 2 presents an overview of long-term income and growth trends, and IMF-supported program participation of LICs. Section 3 reviews existing literature on the macroeconomic impacts of IMF-supported programs. Section 4 elaborates on the theory of income convergence. Section 5 discusses the empirical framework. Section 6 presents the data and summary statistics. Section 7 discusses graphical analysis and empirical results, and finally, Section 8 concludes.

2. OVERVIEW

2.1 Per capita income, growth trends and income convergence

LICs have experienced significant increases but strong cyclical movements in the growth of real GDP per capita over the past few decades. Since the early 1980s, growth in LICs has accelerated and has been substantially above that in advanced economies. The upper panel in Figure 1 shows that real GDP per capita grew faster in developing countries than in advanced economies during the 2000-14 period but has recently dipped. Despite this consistent growth and in contrast to the decrease in relative GDP per capita when comparing with emerging markets, income disparity between advanced and developing economies has increased significantly. The ratio of the average real GDP per capita in advanced economies to the average real GDP per capita in developing countries increased from around 2.5 in 1985 to around 3.5 in 2016, the gap widening further since 2012, as exhibited in the lower panel in Figure 1.

Figure 1. Growth and Relative GDP per Capita in Advanced, Developing and Emerging Economies (1986-2015)

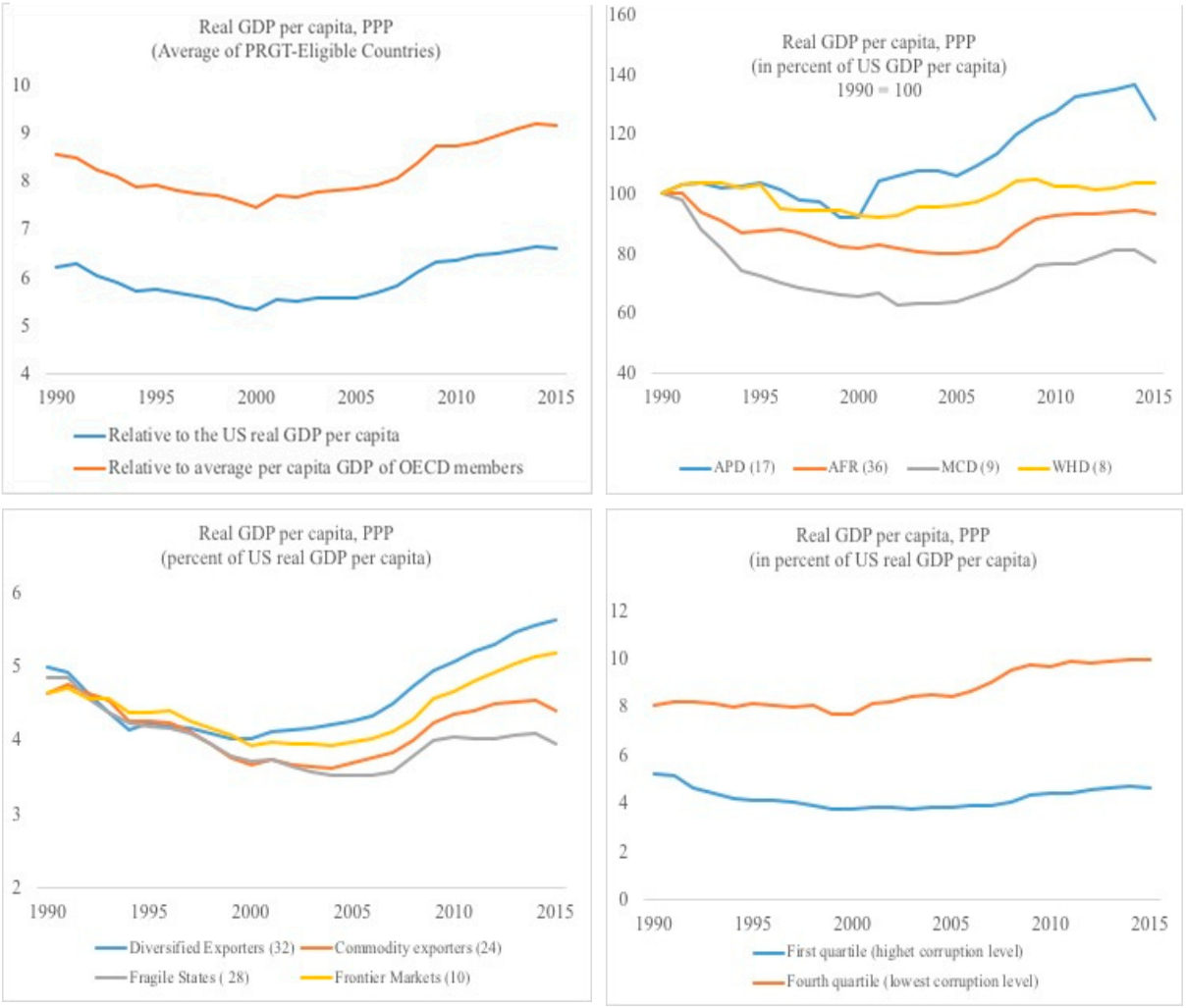


Source: IMF, World Economic Outlook, 2017

Note*:* The panel above plots average growth rate of per capita GDP in advanced, developing and emerging economies. The bottom panel shows the ratio of average GDP per capita in advanced economies to that in developing and emerging markets.

This increase in disparity is more pronounced when comparing LICs with the US or the Organization for Economic Co-operation and Development (OECD) countries. The top left panel in Figure 2 shows that the average real GDP per capita of both the US and OECD countries relative to that of the LICs has been consistently increasing in recent decades. Countries in the Middle East and Central Asia (MCD), Africa (AFR) and the Western Hemisphere (WHD) have seen their average real GDP per capita as a percentage of US real GDP per capita remain stagnant if not decline (top right). The average real GDP per capita in Asia-Pacific economies (APD), on the other hand, seems to be catching up with that of the US, although it has declined sharply since 2014. Non-commodity (diversified) exporters and LICs with lowest corruption levels experienced slight increase in the average real GDP per capita relative to that of the US (bottom panels).

Figure 2. Real GDP per Capita in LICs Relative to the US and OECD Members (1990-2015)

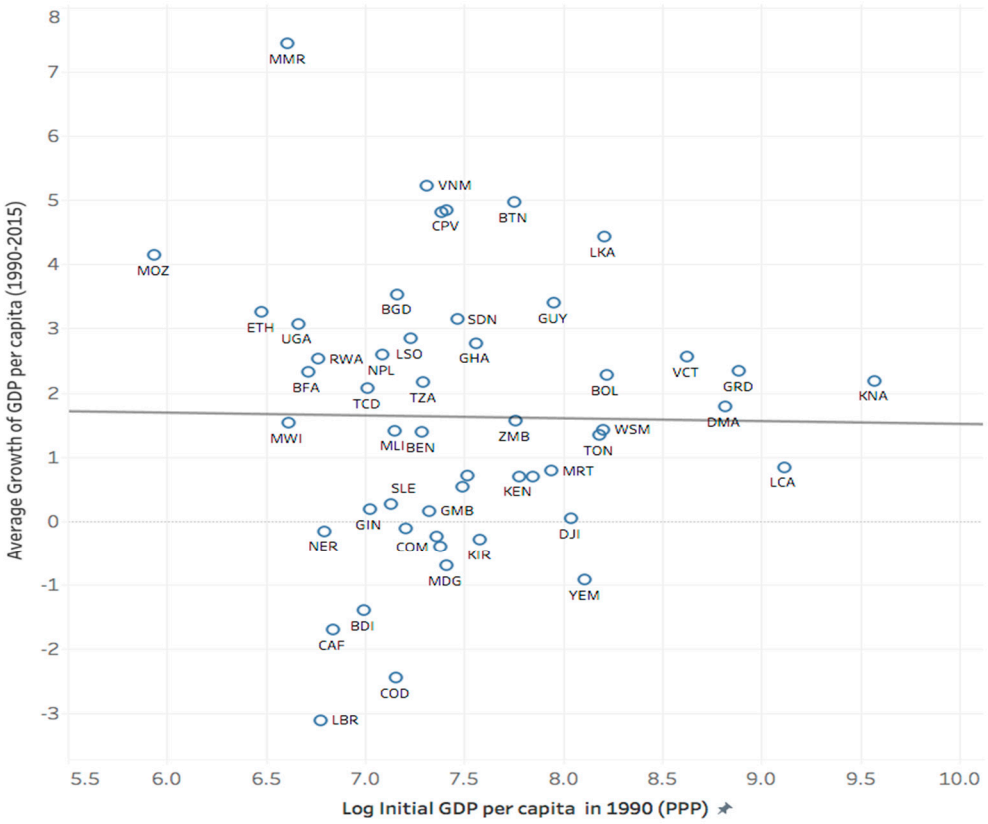


Source: The World Bank, World Development Indicators, 2017

Figure 3 (Figure A1 in the Appendix) plots the annualized average growth rate from 1990-2015 and initial (1990) Purchasing Power Parity (PPP) income per capita for all LICs (LICs in different regions of the world). Despite the lack of unconditional (absolute) β-convergence overall, consistent with cross-country convergence literature (Johnson and Papageorgiou, *forthcoming*), there are significant signs of catching up among LICs within Africa, Asia-Pacific, Middle East and Central Asia, and the Western Hemisphere as shown in Figure A1. The strong negative correlation between the average growth and initial income is evidence of the fact that *ceteris paribus*, initially poor LICs within the same regions grew faster, on average, in the long run. This negative correlation is the strongest among countries in the Middle East and Central Asia (although there are few countries that have limited variation in

growth and initial income level) followed by those in the Asia-Pacific, Western Hemisphere, and Africa regions. Excluding fragile economies in Africa from the sample would imply a rate of unconditional convergence among African countries comparable to that among Asian-Pacific economies.

Figure 3. Unconditional (Absolute) β-Convergence among LICs (1990-2015)



Source: Authors' calculation based on the World Bank's World Development Indicators, 2017

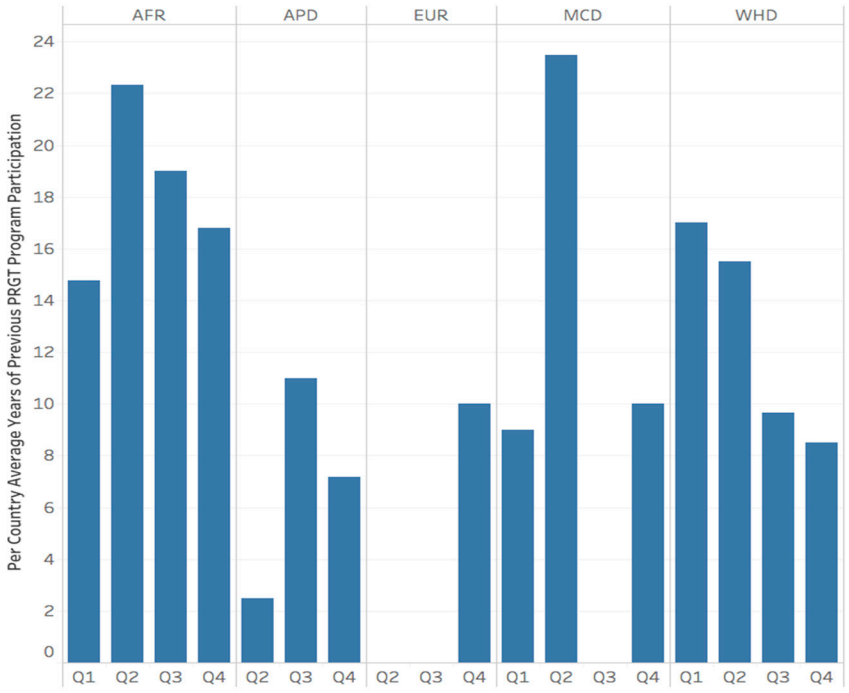
Note: Annualized average growth rate from 1990-2015 plotted against initial income PPP per capita (in 1990) shows slight evidence for the fact that *ceteris paribus*, initially richer LICs countries grow less on average in the long run.

2.2 Demand for IMF-supported concessional programs

The number of LICs participating in IMF-supported programs increased steadily over time, and noticeably so in years following financial crises (see upper panel in Figure A2 in the Appendix). LICs in Sub-Saharan Africa, representing about half of all PRGT-eligible countries, are the longest participants in IMF-supported programs, with eighteen years of experience, on average, between 1986 and 2015 (see lower panel in Figure A2 in the Appendix). These are the same countries that had recurring negative growth spells as well as declining real GDP per capita as shown in Figure A3 in the Appendix. Corroborating the

proposition that countries that are frequent users of IMF-supported programs are those that lag behind the rest in terms of average growth in GDP per capita, Figure 4 shows the average years of participation in IMF-supported programs for four quartiles (Q1 through Q4) of mean growth rates in 1986-2015 across different regions of the world. Both slow (Q1 and Q2) and fast (Q3 and Q4) growing countries from Africa (AFR) continually depend upon IMF support. Countries in the Middle East and Central Asia (MCD), and Western Hemisphere (WHD) regions that lie in the bottom two growth quartiles have participated in IMF-supported programs longer than their faster growing counterparts. However, countries in the Asia-Pacific region (APD), and Europe (EUR) that grew faster, on average, had more years of participation in IMF-supported programs. This paradoxical initial observation exemplifies the empirical challenge of estimating the causal effect of IMF-supported programs on economic growth and income convergence (see section 5).

Figure 4. IMF-Supported Program Participation by Region and Quartiles of Average Growth of Real GDP per Capita (1986-2015)



Source: Authors' calculation based on the World Bank's World Development Indicators, 2017 and program participation data from Finance Department, IMF

3. LITERATURE REVIEW

Existing cross-country literature on growth effects of IMF-supported programs provide mixed evidence.[5] Bird and Rowlands (2017) examine the impact of IMF-supported programs on economic growth in LICs using the Propensity Score Matching (PSM) methodology. They find that such programs have positive impacts on growth, which were observed (relative to non-program countries) for up to two years after the start of the program. Similarly, estimating the short- and long-term impact of IMF-supported programs on economic growth, specifically in LICs, Mumssen *et al*., (2013) highlight that longer-term (5 years or more) IMF assistance contributes to sustained growth and economic resilience. The program impact is the highest for countries that have a substantially imbalanced macro-economy or are experiencing severe macro shocks. Atoyan and Conway (2006) show a positive effect of IMF-supported programs on growth and fiscal surplus in participant countries in developing and transition economies in the period 1993-2002. Ghosh *et al*., (2005) find that programs under the Poverty Reduction and Growth Facility (PRGF) helped countries reduce inflation and enhance growth in between 1995 and 2003. Bredenkamp and Schadler (1999) conclude that countries that implemented reforms and adjustment programs with Structural Adjustment Facility (SAF) and Enhanced Structural Adjustment Facility (ESAF) arrangements experienced improved economic outcomes during the 1986-1995 period. Dicks-Mireaux *et al*., (2000) apply a modified control-group methodology on LICs for the years 1986-1991 to estimate the impact of ESAF on output growth, inflation and external debt/service ratio. Though they find statistically significant benefits of ESAF on growth and debt/service ratio, diagnostic tests of these results cast doubt on the validity of the measured impact.

On a pessimistic note, Dreher (2006) confirms the negative growth effects of IMF-supported programs that could be offset by compliance with conditionality. Barro and Lee (2005) show that the size of IMF lending and growth are insignificantly associated, and that participation has a negative impact when instrumenting participation and loan size with institutional and political determinants. Easterly (2005) critiques IMF-supported programs in the context of top 20 recipients by showing that adjustment loans in the period 1980–1999 did not have significant positive effects on either policy or growth. Przeworski and Vreeland (2000) find that while growth rates are lower during the program period, a country experiences a boost immediately after the program ends but stays lower than it would have without the program. Many other studies show long term negative effects of IMF-supported programs (Bird and Rowlands, 2003; Bird, 2001; Hutchinson, 2001; Bordo and Schwartz, 2000; Stiglitz, 2000).

IMF-supported programs have been shown to have beneficial impacts on other macroeconomic variables that are conducive to economic growth. Al-Sadiq (2015) finds empirical evidence to indicate that countries with IMF-supported programs attract more FDI than those without such programs. Bal Gündüz and Crystallin (2014) show that IMF-supported programs addressing policy or exogenous shocks have a significant catalytic

[5] Results vary depending on member countries, time frames and nature of lending facilities under consideration. Perhaps more importantly, these conflicting conclusions are due to differences in the methodologies employed to control for other determinants of economic growth.

impact on both the size and the modality of official development assistance. However, countries experiencing sizeable initial macroeconomic imbalances or large exogenous shocks (high propensity scores) primarily drive the results and the catalytic impact is not significant for countries with low propensity scores. Finally, Oberdabering (2013) indicates a negative program effect on poverty and inequality outcomes of 86 low-and-middle income nations for the entire 1982-2009 sample, but a positive one for the 2000-2009 subsample.

4. THEORETICAL FRAMEWORK

The literature distinguishes between two main types of convergence: unconditional (absolute) and conditional *β*-convergence.[6] The concept of *unconditional β*-convergence, which assumes a common steady state, implies that poorer countries will grow faster than richer ones, thereby in the long-run all countries converge to the same level of income per capita (Barro and Sala-i-Martin, 2004). The Solow-Swan neoclassical exogenous growth model is the most influential theoretical framework used to explain this process. In this model, the steady-state income level of a country depends on the exogenous savings rate, population growth, technologies, and preferences.[7] Given that savings and population growth rates are constant in the long-run, the model predicts that exogenous technological progress determines long-run growth. The key assumption underlying the exogenous growth model is that capital is subject to diminishing returns because of which, poor countries with lower level of initial capital grow faster than countries with higher level of initial capital, allowing the former to catch up with the latter (Barro and Sala-i-Martin, 2004).

In contrast, *conditional β-convergence* implies that income per capita in each country tends to converge to its unique steady-state level determined by that country's fundamentals, including the savings rate, population growth rate, growth of human capital, institutions, and technologies. Thus, owing to the differences in the fundamental factors of economic growth, poor countries may not entirely catch up to rich ones. Barro and Sala-i-Martin (1992) and Mankiew *et al.*, (1992) first developed the concept of conditional convergence from the neoclassical growth model. Given a Cobb-Douglas production function, $y = f(k) = Ak^{\alpha}$, where $0 < \alpha < 1$, the log-linearized approximation for $\log[y(t)]$ is:

$$\log[y(t)] = \log[y(0)] * e^{-\beta T} + \log(y^{*}) * (1 - e^{-\beta T}), \qquad (4.1)$$

and therefore, the average growth rate of y over the interval period 0 and T is given by:

$$\frac{1}{T} log\left(\frac{y(T)}{y(0)}\right) = \boldsymbol{\psi X}_T + \frac{1-e^{-\beta T}}{T} log\left(\frac{\hat{y}*}{\hat{y}(0)}\right) \qquad (4.2)$$

[6] A third concept of income convergence known as σ-convergence refers to a specific type of conditional convergence according to which, a group of countries converge if the dispersion of their real per capita GDP levels decreases over time (Galor, 1996).

[7] As Barro and Sala-i-Martin (1992) proceed from the Solow growth model, given a Cobb-Douglas production function, the steady state level of per capita income, y^*, is given by: $y^* = A_0 e^{gt}[s/(n + g + \delta)]^{\propto/1-\propto}$ where s is the savings rate, g is the assumed exogenous growth rate of total factor productivity, A_0, and n is the exogenous growth rate of labor.

where, $\hat{y}$ is output per capita per unit of effective labor, k is capital per unit of effective labor, T is the period, $\boldsymbol{X}$ is the vector of other country characteristics that are held constant in the steady state of economy and β is the convergence factor. Increasing β implies increasing responsiveness of the average growth rate to the gap between $log(\hat{y}^*)$ and $log(\hat{y}(0))$. Conditional convergence is implied, as for given x and $\hat{y}^*$, growth rate is higher for lower $y(0)$, while unconditional convergence implies that all parameters in the equation (4.1) above are the same for different countries.

5. EMPIRICAL MODEL

The conditional β-convergence model detailed above is estimated with the following outcome equation:

$$\left[\frac{1}{T}\right]\log\left(\frac{y_{i,t}}{y_{i,t-T}}\right) = \alpha_i + \beta\log\left(y_{i,t-T}\right) + \gamma IMF_{i,t-1} + \delta\log\left(y_{i,t-T}\right) * IMF_{i,t-1} + x'_{i,t}\emptyset + \varepsilon_{i,t} \quad (5.1)$$

where, $y_{i,tI}$ is the 10-year period moving average of real GDP per capita for a five-year overlapping decade t, $y_{i,t-T}$ is the initial real GDP per capita for that interval, $IMF_{i,t-1}$ is a binary indicator variable equal to one if a country i is an extended participant in IMF-supported programs for that decade and zero otherwise, and x is a vector of corresponding 10-year period moving averages of exogenous variables. The parameter γ is the marginal effect of IMF-supported program and δ is the additional effect of IMF-supported programs on income convergence (or divergence) among extended participant countries. The choice of the control variables included in $\boldsymbol{x}$ is informed by the existing empirical literature and include government consumption/GDP, domestic investment/GDP, inflation rate, level of financial development (Credit/GDP), degree of trade openness, FDI/GDP, population growth, and a weighted index for democracy and corruption. These variables are commonly used, statistically significant predictors of growth (see Barro 1991).

The primary challenge of estimating the impact of IMF-supported programs on economic outcomes is the treatment of the selection bias that arises from the decision-making process of applying for and receiving IMF support. Selection bias affects estimates when there are systematically different initial macroeconomic and structural conditions for program and non-program countries. Countries that request IMF-supported programs are often already facing economic turmoil and have limited capacity to adequately deal with macroeconomic shocks.

Therefore, any attempt to estimate equation (5.1) using conventional estimation methods such as a Fixed Effects Model would yield biased and inconsistent estimates. The presence of the binary treatment variable creates two fundamental statistical problems. First, we cannot observe $y_i|D_i = 1$ and $y_i|D_i = 0$ for the country i at the same time. Second, extended participation in IMF-supported programs is endogenous. Ignoring these systematic

differences between program and non-program countries would bias the estimated effect of IMF-supported programs on macroeconomic indicators, as participation itself may have a direct impact on economic outcomes. To overcome this issue, we use the following two estimation methods: An Endogenous Treatment Effects (ETE) model and a propensity score Matched Treatment Fixed Effects (MTFE) model.

5.1 The Endogenous Treatment Effects Model

The ETE model allows us to obtain maximum likelihood selection-adjusted estimates of the outcome equation (5.1) and the selection equation (5.2) given by the following:

$$IMF_{i,t} = z'_{i,t}\Omega + \mu_{i,t} \qquad (5.2)$$

where z is a vector of exogenous variables and μ is the error term. Consistent estimation of the parameters in the ETE model requires the two-error terms μ and ε to be correlated. Based on recent literature, the determinants of selection equation include country-specific macroeconomic factors (primary fiscal balance, public external debt, external debt services, terms of trade, inflation rates and foreign reserves) and real-world GDP growth rate (see Oberdabernig 2013). The second step of the model involves augmenting the outcome equation (i) with a *hazard factor* derived from the selection equation (ii) to get consistent estimates for the treatment parameters, γ and δ.[8]

5.2 Matched Treatment Fixed Effects Model

Considering the possibility that the results of the regression-based ETE model outlined above could be sensitive to the selection and outcome equations' specifications, we also use the MTFE approach, which is propensity score matching followed by a treatment fixed effects regression, as an alternative method to correct for selection bias. The basic idea of propensity score matching is to compare long-run growth and income convergence for a group of countries that participated extensively in IMF-supported programs (treatment) to another group of countries, which only intermittently participated or did not participate in such programs at all (control). To that end, each IMF-supported program country observation is first matched to a counterfactual non-program observation with a similar predicted *propensity*[9] to participate in an IMF-supported program, following a standard unweighted single nearest-neighbor 1-1 matching procedure.[10] Since it is impossible to observe the outcome of the same country in both treatment and control conditions at the same time, standard procedure is to estimate the average difference (average treatment effect) in

[8] See Greene (2012, pp. 890-894). This model could also be estimated using Heckman's two step method.

[9] *Propensity score*, which is the probability of participation in IMF-supported programs, is computed using a pooled panel probit model with the same set of observed covariates as in the selection equation (5.2) of the ETE model.

[10] We matched the treatment and control groups using annual program participation data and computed decadal average propensity of participating in IMF-supported programs to determine extended predicted participation. A country is predicted to be an extended participant if the average decadal propensity is greater than or equal to 0.5. Unmatched subjects are dropped from the analysis and only matches within the common support (range of propensities used to compare treated and control observations) sample were used.

outcomes of interest for all matched pairs or between potential outcomes with and without a treatment. The average treatment effect (ATE) by itself, however, is insufficient to isolate the effect of IMF-supported programs on growth and convergence. Not controlling for other observed and unobserved factors of long-term growth renders ATE estimates prone to omitted variable bias.

Therefore, in the second step, we directly estimate the outcome equation (5.1) on the matched sample, additionally including country-fixed effects in the model. The MTFE methodology allows us to: (i) minimize statistically significant differences in observed determinants of program participation and (ii) estimate the causal effect of IMF-supported programs on the growth trajectory of the participant group, controlling for the effects of other observed and (time invariant) unobserved factors of economic growth.

6. DATA

The empirical analysis is based on an unbalanced panel dataset for 85 LICs over the period 1986-2015. Macroeconomic data come from IMF's World Economic Outlook database (2017) and the World Bank's World Development Indicators (2017). Democracy index, measured as the weighted sum of political and civil right indices, comes from Freedom House's database (2016). Data on IMF-supported programs come from IMF's database on program arrangements. Table 1 below reports the descriptive statistics for the annual averages of the macroeconomic variables used in this study.

Table 1. Summary Statistics (Annual Data for 85 LICs), 1986-2015

	Mean	Min	Median	Max
Growth	1.6	-69.8	2.1	65.3
GDP per capita	1770	115.8	1075.1	15437.5
GovCons	15.3	1.4	14	156.5
DomInv	22	-2.4	21.1	67.9
Credit	22.7	0.2	16.3	114.7
Openness	76.4	0.2	71.7	311.4
Inflation	63.2	-35.8	6.6	24411
FDI	4.3	-82.9	2.2	217.9
PopGr	1.9	-6.2	2.2	7.9
Dem	0.5	0	0.5	1
Reserve	3.7	-1.3	3.3	20.3
PrimFisc	-2.2	-498.5	-1.2	123.5
PubExt	65.2	0.5	49.7	1847.3
ExtServ	20.6	0.0	11.3	524.8
ToT	111.6	8.3	101.3	745.7
WdGr	3.6	-0.1	3.6	5.6

Source: Authors' calculations.

Notes:
Determinants of long-term real economic growth: *GovCons* is public consumption expenditure as a % of GDP, *DomInv* is gross capital formation as a % of GDP, *Credit* is domestic credit to private sector as a % of GDP, *Openness* is trade openness measured by ratio of sum of exports and imports over GDP, *FDI* is net inflows in foreign direct investment as a % of GDP, *PopGr* is population growth rate and *Dem* is a weighted index for freedom in political rights and civil liberties.
Factors of participation in IMF-supported programs: *Reserve* is total reserve assets in months of imports, *PrimFisc* is general government primary net lending/borrowing as a % of GDP, *PubExt* is general government gross debt as a % of GDP, *ExtSer* is total external debt service as a % of GDP, *ToT* is terms of trade, WdGr is world growth, inflation and FDI.

7. EMPIRICAL RESULTS AND DISCUSSION

Descriptive analysis indicates a positive impact of IMF-supported programs on growth of real GDP per capita. The boxplots in Figure A3 in the Appendix compare distribution of growth of real GDP per capita in and around the year of IMF-supported program approval, denoted by period $t = 0$. A country is categorized into a program group if it had an active IMF-supported program for at least 5 months in that year. Period $t + n$ denotes the end (or cancellation), where n is the duration of the program; *t-1*, *t-2* and *t-3* are 1, 2, and 3 years prior to the inception of the program, respectively; *t+1*, *t+2*, and *t+3* are years after the year

of program approval, respectively; and, years *t+n+1*, *t+n+2* and *t+n+3* are the post-program periods. Without any causal implication, the data indicate that IMF-supported programs appear to have a sustained positive effect on growth during the program years, most noticeably, at the year of program approval.

7.1 The Results of the Endogenous Treatment Effects Model

As mentioned previously, the presence of selection bias is one of the challenges of estimating the causal growth and income convergence effects of IMF-supported programs. Thus, we first conduct a simple treatment-control analysis to empirically test for the presence of self-selection in IMF-supported program participation. Countries are categorized into the treatment group if the predicted probability of seeking IMF support is greater than 0.5 (implying they are more likely to participate in IMF-supported programs) and into the control group, otherwise. The distribution of the log of real GDP per capita of countries in the two groups is then compared. As can be seen from Figure A4 in the Appendix, countries in the treatment group are significantly poorer relative to those that are in the control group, indicating that economically underperforming countries self-select into participating in IMF-supported programs.

The marginal effects estimate of the pooled panel probit regressions using annual data from the first-stage selection equation, modeling the probability of extended participation in IMF-supported programs, are reported in Table A1 in the Appendix. Intuitively, larger external debt service is statistically significantly associated with higher probability of participation. Likewise, increasing FDI inflow (as a percentage of GDP) and total reserve assets (in months of imports) are associated with decreasing likelihood of program requests. Contrary to the initial expectation that a growing world economy would lessen the need for IMF assistance, a higher world growth rate is shown to increase the propensity of long-term participation. Other factors including primary fiscal balance, external debt, terms of trade and inflation have negligible effects on LICs' decision on seeking IMF support, both in terms of magnitude and significance. Though estimating the participation equation is methodologically critical to correct the selection bias using the ETE model, the coefficients obtained should be interpreted with caution.[11]

What follows is the discussion of the results from both empirical models presented in Section 5 that are used to account for the self-selection issue in determining the impact of long-term engagement in IMF-supported programs on economic growth and income convergence. To reiterate, the analysis is based on five 10-year period moving averages of macroeconomic determinants of growth between 1986 and 2015 where periods overlap by 50 percent. A country is considered to have long-term IMF engagement in each five-year overlapping

[11] We should note that exploring the underlying motivation behind members' decisions to participate in IMF-supported programs, is beyond the scope of this research (see Bal Gündüz 2009).

decade if IMF-supported programs were active in five or more years in that decade, for at least five months in each year.[12]

The Maximum Likelihood Estimates from the outcome equation are presented in Table 2.[13] The dependent variable in the outcome equation is the compounded annualized growth rate of real per capita GDP. Column (i) presents the baseline results estimating pure growth effects of extended participation in IMF-supported programs. Results from column (i) provides significant evidence for conditional β-convergence among LICs as the neoclassical growth theory implies, controlling for the effects of other determinants of long-run economic growth. The statistically significant and negative estimate of the log initial income coefficient shows that initially prosperous economies grew slower, on average, relative to the poorer ones regardless of program participation. Specifically, a 10 percent increase in the initial real GDP per capita is associated with 0.09 percentages points decline in average growth rate over a decade. This result aligns well with many other studies that confirm that convergence in the context of developing countries is conditional on specific policies and institutional arrangements necessary for long-term sustainable growth.[14] Moreover, LICs with frequent participation in IMF-supported programs (with more than five years of program in 10 years) grew statistically significantly faster than non-frequent participants (or countries that never had requested programs) by approximately 4.3 percentage points, on average, over a decade. This result is consistent with existing empirical literature of the impact of IMF-supported programs on economic growth in member countries (as discussed in Section 2).

[12] This approach is similar to that used in Mumssen *et al*., (2012). Table A2 in the Appendix presents the Arellano-Bond GMM estimates for the long-term growth effects of extended participation in IMF-supported programs, which is comparable to the results shown in Table 3 of Mumssen *et al.,* (2012). We find statistically significantly positive program impact, robust to varying specifications.

[13] Since the determinants of growth are defined over five-year overlapping decades, likely serial correlation exhibited by the residuals is addressed by robust t-statistics.

[14] For example, Acemoglu and Robinson (2012) and Duttagupta and Narita (2017).

Table 2. IMF-Supported Programs and Income Convergence in LICs, 1986-2015: (Endogenous Treatment Effects Model)

	Growth rate of real GDP per capita	
	(i)	(ii)
PRGT	4.25***	4.27***
	(7.42)	(8.44)
Log initial income	-0.88**	-0.54
	(-2.80)	(-1.45)
PRGT-Log initial income		-0.74*
		(-1.98)
Government Consumption	-0.07***	-0.07***
	(-3.74)	(-3.65)
Domestic Investment	0.13***	0.13***
	(6.87)	(7.08)
Inflation	-0.03**	-0.03**
	(-3.01)	(-3.27)
Credit to Private Sector	0.01	0.01
	(1.85)	(1.87)
Trade Openness	0.37***	0.38***
	(4.95)	(4.96)
FDI Inflow	-0.64**	-0.71***
	(-2.99)	(-3.61)
Population Growth	-0.44	-0.95
	(-0.64)	(-1.34)
Democracy Index	-0.01***	-0.01***
	(-4.09)	(-4.19)
Constant	3.77	1.72
	(1.57)	(0.63)
N	228	228

Robust t statistics in parentheses

* p<0.05 ** p<0.01 *** p<0.001

Source: Authors' calculations.

Note: The analysis is based on five 10-year period moving averages of macroeconomic determinants of growth between 1986 and 2015 where periods overlap by 50 percent. The selection equation's dependent variable is the binary indicator for extended participation in IMF-supported programs. A country is considered to have long-term IMF engagement in each five-year overlapping decade if IMF-supported programs were active in five or more years in that decade, for at least five months in each year. The outcome equation's dependent variable is the compounded annualized growth rate of real per capita GDP. The determinants of participation in the selection equation include general government primary balance/GDP, public debt/GDP, total external debt service /GDP, terms of trade, world growth, FDI/GDP, inflation and total reserve assets in months of imports.

The selection-corrected estimates in column (ii) not only corroborate the positive growth effects of IMF-supported programs but also are indicative of the fact that these programs contributed to accelerating income convergence among LICs over 1986-2015. Conditional β-convergence is faster for countries that are long-term participants of IMF-supported programs. That is, a 10 percent increase in the initial real GDP per capita is associated with 0.13 percentages points decline in average growth rate over a decade for long-term participants (compared to just 0.05 percentages points for intermittent or non-participants). Though the log initial income interaction coefficient is not statistically significant, the sum of the coefficients on PRGT-log initial income interaction term is significant at the 1 percent level.[15] This means the difference between the coefficient on initial income for countries with and without extended IMF support is significant.

Among other growth determinants included in the model presented in column (ii), domestic investment and trade openness have positive and statistically significant effects on real per capita GDP growth. A one percentage point increase in domestic investment (as a percent of GDP) boosts growth rate by 0.13 percentage points and a unit increase in openness (ratio of sum of imports and exports to GDP) increases growth by 0.4 percentage points. Inflation and population growth have a dampening growth effect, as expected, although the coefficient on the latter is not significant. Counterintuitively, government consumption, FDI, and democracy index have negative impacts on long-term growth rate of per capita GDP.

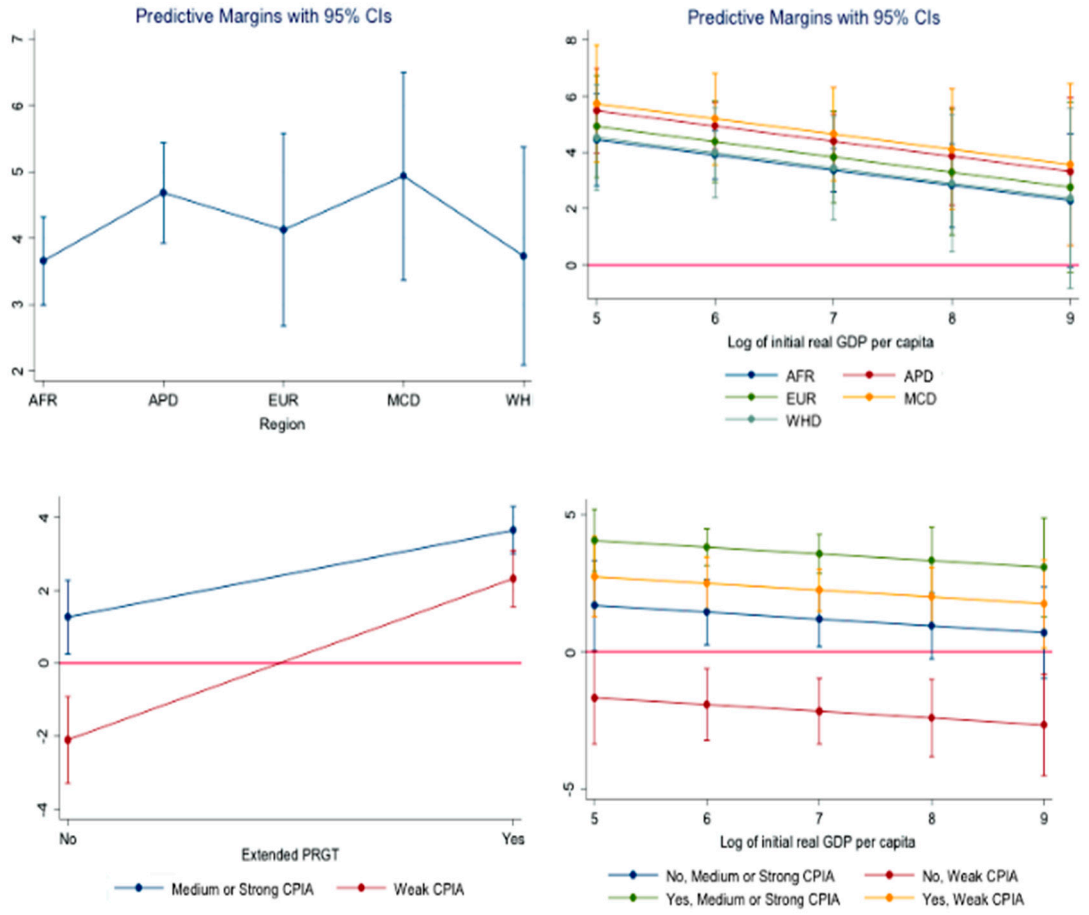
Taking into consideration the possible sensitivity of the ETE model to misspecifications of both the selection and the outcome equations, we conduct robustness checks using several alternative selection equations (see Table A3 in the Appendix). The estimated coefficient of extended program participation is statistically significantly positive and robust to differing participation models but that on the interaction term is significant only in the fully specified outcome and selection models previously shown in Table 2.

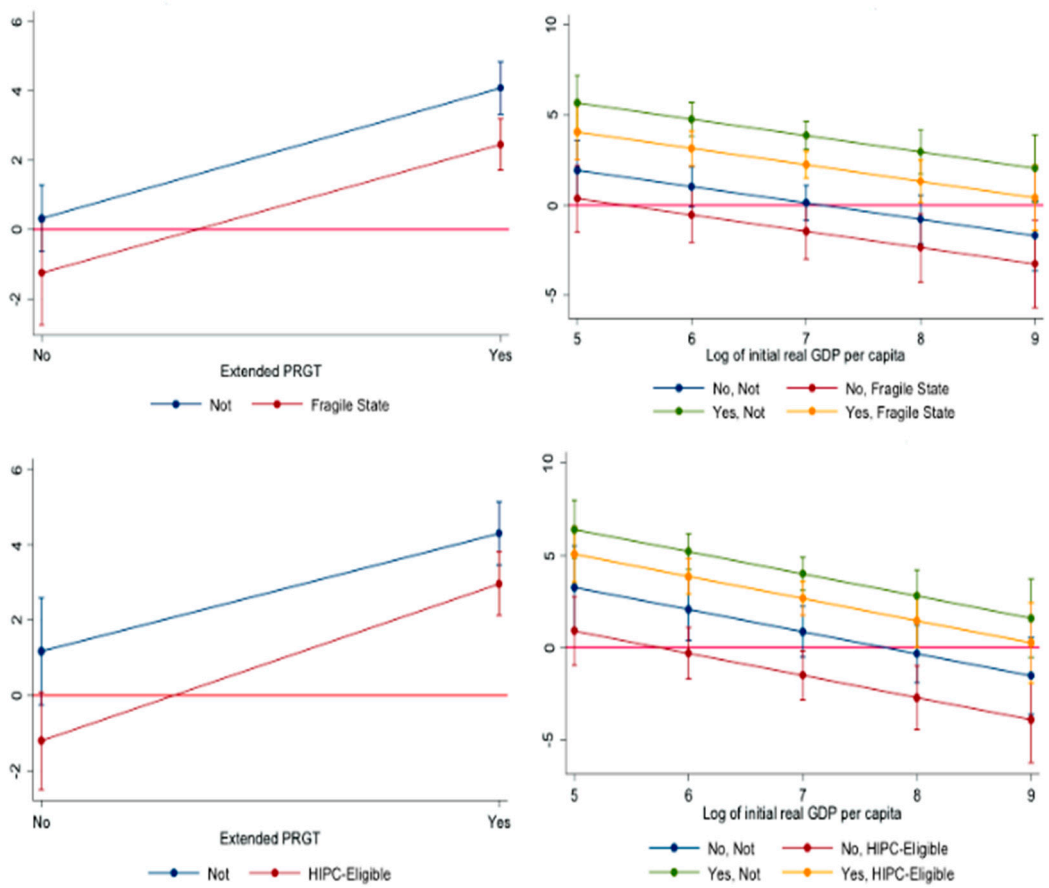
The analysis thus far assumes homogenous growth effects of different types of IMF-supported programs. However, programs may have different effects depending on the nature and degree of required adjustments and reforms, especially in the context of vulnerable LICs that require longer-term arrangements that are formulated to address protracted balance of payments needs and comprehensive structural and policy changes. Table A4 in the Appendix shows the results from the ETE model estimating the impact of long-term IMF-supported programs only (ESAF/PRGF and ECF) on growth and conditional convergence in LICs in 1986-2015. The implications of the results shown in Table A4 in the Appendix align with that in Table 2. Long-term IMF-supported programs boost growth in real GDP per capita as well as contribute to conditional income convergence among LICs. Though the magnitude of the positive coefficient on the extended program participation indicator is slightly smaller than that in Table 2, the estimate for the coefficient of the interaction term is larger. This suggests that the direct effect of long-term IMF-supported programs on economic growth is smaller, but these programs help poorer LICs converge faster.

[15] The z-score for the sum of coefficients on the log-initial income (-0.54) and the interaction term (-0.73) was -3.74 and the 95% confidence bound was [-1.95, -0.61].

As important as it is from a policy perspective to regularly evaluate the impact of IMF-supported programs in promoting sustainable economic growth in the most vulnerable member countries, it is equally critical to determine the pre-conditions for program effectiveness. Marginal analysis (shown in Figure 5) of the coefficients obtained from the ETE model in Table 2 depicts how growth and conditional convergence effects of extended participation in IMF-supported programs change with countries' characteristics. The top-left chart in Figure 5 shows the treatment-effect coefficient of extended program participation indicator (with 95% CI) across different regions and the top-right chart disaggregates this coefficient for increasing levels of log initial real GDP per capita. Accordingly, the degree of program effectiveness does not vary statistically significantly among countries from different regions of the world. Average growth effect of program participation consistently declines with the level of initial income across all five regions.

Figure 5. Impact of IMF-Supported Programs by Regions, Institutional Capacity, Political Fragility and HIPC-Eligibility





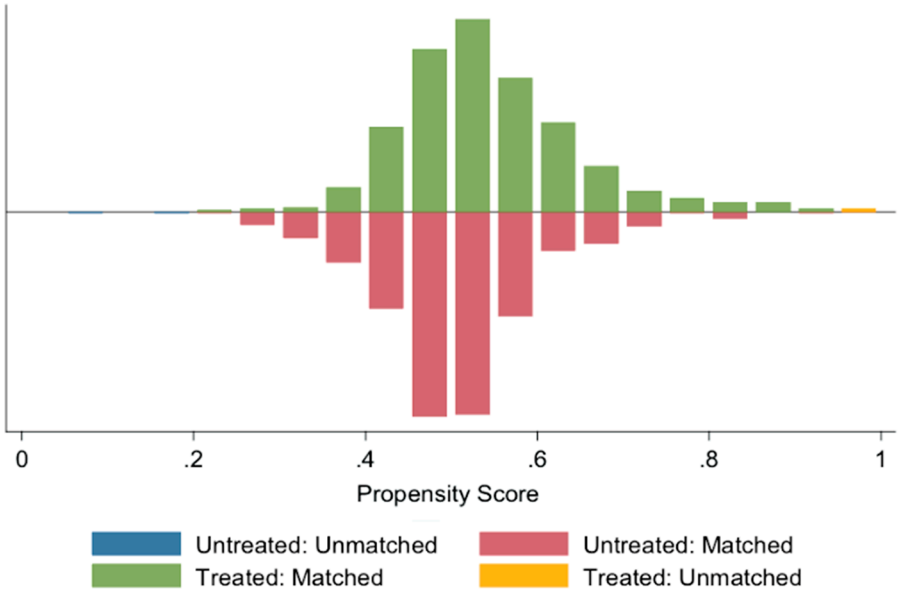
Source: Authors' calculation based on the coefficients obtained from ETE model presented in Table 2.

The heterogeneity in the size of the impact of long-term participation in IMF-supported programs across countries demands further analysis of what economic, policy and institutional qualities matter for program success. The plots in the second row of Figure 5 indicate that: i) program impact on growth is larger (statistically insignificant at the 95 percent level but significant at the 90 percent level) in LICs with better institutional capacity (medium or strong index of the World Bank's Country Policy And Institutional Assessment (CPIA)) relative to those lacking institutional capacity (weak CPIA) and ii) the size of the positive coefficient on extended program participation indicator declines with increasing initial income at all levels of average CPIA. Pinpointing institutional pre-requisites of program success (more specifically, identifying which comprising dimensions of the CPIA such as, economic management, structural policies, policies for social inclusion and equity, and public-sector management and institutions, are more important for program effectiveness) requires further, in-depth empirical investigation. In a similar vein, marginal coefficient plots in the left side of the third and fourth rows of Figure 5 respectively suggest that impact of extended participation in IMF-supported programs on average growth in real GDP per capita is significantly larger in non-fragile states than in politically fragile states, but insignificantly larger in countries that were considered ineligible for Heavily Indebted Poor Countries (HIPC) debt relief initiatives relative to HIPC-eligible countries.

7.2 The results of Matched Treatment Fixed Effects Model

To supplement the results from the ETE model, we also implement a propensity score Matched Treatment Fixed Effects regression as detailed in Section 6. Figure 6 demonstrates that matching in the second step was obtained satisfactorily; the density of treated and untreated (control) matched groups is symmetrical across all propensity of extended program participation. As stated before, this procedure consists of two steps: first, propensity scores for each LIC in the sample is estimated based on a predetermined set of observed covariates using a pooled panel probit model (as in the selection equation of the ETE model). Extended participants in IMF-supported programs (treatment) are then paired with comparable countries that are either intermittent participants or have never participated in such programs (control), according to their estimated propensity scores using the single nearest-neighbor 1-1 matching algorithm. Having removed the effects of observable factors of participation in IMF-supported programs via the matching procedure, the second step of the MTFE method is estimating a fixed effects treatment model using the matched sample to derive the average treatment effect of long-term IMF-supported program on average growth of real GDP per capita, controlling for the effects of other observable and unobservable (fixed) determinants of economic growth.

Figure 6. Density Across Propensity Scores for Program Participation



Source: Authors' calculation

Though the magnitudes of the coefficients of interest vary, the results shown in Table 3 confirm our findings about both the positive impact of IMF-supported programs on economic growth and income convergence among LICs. Extended participation in IMF-supported programs is associated with approximately 0.1 percentage point higher average growth in real GDP per capita over a decade. Also, conditional income convergence is faster among LICs that participate extensively in such programs in comparison to LICs without IMF support or LICs that rely on intermittent IMF support. Further robustness checks by altering the specifications of the MTFE model (as shown in Table A5 in the Appendix) supports the

positive growth as well as conditional convergence effects of extended participation in IMF-supported programs. Using other matching techniques, such as the kernel matching method, does not change the implications of the results.[16]

Table 3. IMF-Supported Programs and Income Convergence in LICs, 1986-2015: (Matched Treatment Fixed Effects Model)

	Growth Rate of GDP per capita	
	(i)	(ii)
PRGT	0.27	0.09
	(0.96)	(0.30)
Initial Income	-6.82***	-6.38***
	(-5.40)	(-5.08)
PRGT-Initial income		-0.57
		(-1.10)
Government Consumption	-0.05	-0.05
	(-0.71)	(-0.67)
Domestic Investment	0.16***	0.16***
	(4.07)	(4.10)
Credit to Private Sector	0.05	0.05
	(1.49)	(1.41)
Trade Openness	-0.01	-0.01
	(-0.37)	(-0.43)
Population Growth	-0.48	-0.52
	(-0.95)	(-1.06)
Democracy Index	4.13**	3.90**
	(2.93)	(2.81)
Inflation	-0.01**	-0.01**
	(-3.34)	(-3.36)
Constant	44.20***	41.52***
	(5.06)	(4.75)
N	197	197

Robust t statistics in parentheses

* p<0.05 ** p<0.01 *** p<0.001

Source: Authors' calculations

Note: The analysis is based on five 10-year period moving averages of macroeconomic determinants of growth as well as fiscal determinants of program participation between 1986 and 2015 where periods overlap by 50 percent. We matched the treatment and control groups using annual program participation data and computed decadal average propensity of participating in IMF-supported programs to determine extended participation. The set of observables on which the propensity scores were conditioned on include the same variables in the selection equation used in the ETE model. A country is predicted to be an extended program user if the average decadal propensity of participating in IMF-supported programs is greater than or equal to 0.5.

[16] The discussion of the results using alternative matching methods is omitted for brevity but are available upon request from the authors.

An important caveat to remember here is that estimating the ATE using the MTFE model does not identify which treatment case is matched with which control observation. Ideally, a matched pair of participant and comparable non-participant countries should be the unit of analysis. While not taking this into consideration does not affect the point estimate of the average treatment effect, the standard errors and thus the inference of the estimates will be incorrect. However, conducting the MTFE procedure is still an improvement (over simply estimating the average treatment effect as the average difference in growth rates of all pairs of treatment and control countries), as the comparison of means in this procedure is free of possible biases due to unobservable factors.

8. CONCLUSION

Increasing domestic and international macroeconomic shocks have diminished growth prospects among member LICs in recent years. The rate at which LICs are converging to leading economies is weak; consequently, there is a need for a significant boost to close the development gap between the two. Against this backdrop, this paper empirically examines whether IMF-supported programs promote pro-poor growth—in a macroeconomic sense—in LICs. While empirical evidence for positive growth impacts of IMF-supported programs is abundant, little has been done to ascertain if these programs encourage income convergence.

We use an unbalanced panel dataset for 85 LICs over the period 1986-2015 and employ two different econometric methods to address the selection bias problem. First, an Endogenous Treatment Effects model is used to simultaneously estimate the outcome and selection equations, which models the determinants of long-term average growth in real GDP per capita and the probability of extended participation in IMF-supported programs, respectively. Second, a propensity score Matched Treatment Fixed Effects model is used to estimate the average treatment effect of IMF-supported programs accounting for observable and unobservable determinants of economic growth.

Selection-corrected estimates indicate that extended participation in IMF-supported programs has a significantly positive impact on growth rate of real GDP per capita. Supplementary analysis shows that this impact is higher in countries that have better institutional capacity, and are politically non-fragile, and HIPC-ineligible. More importantly, IMF-supported programs have accelerated *conditional β-convergence* among LICs with comparable macroeconomic characteristics during the sample period.

Further investigation is needed to identify specific channels through which these programs work to boost economic growth. IMF-supported programs' conditionality formulated to stabilize member countries' macroeconomy, structural reforms necessary to increase market efficiency and technical assistance for improving institutional capacity help create an environment conducive for sustainable and inclusive economic growth. Determining the relative importance of each of these components in program effectiveness could inform future program design to better tailor IMF support initiatives to the context and circumstances of recipient countries.

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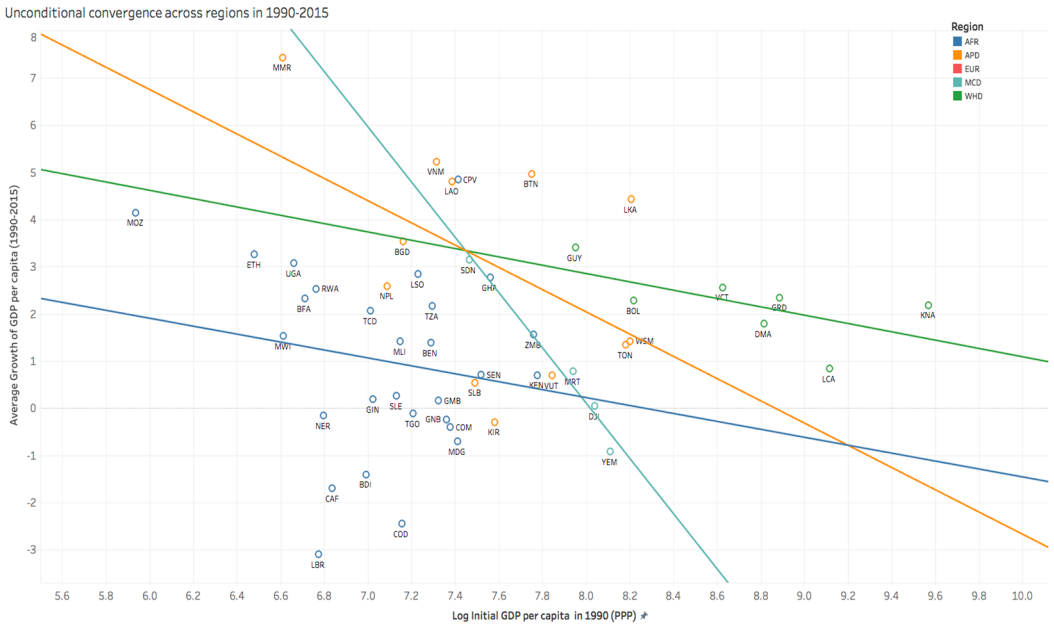
Appendix

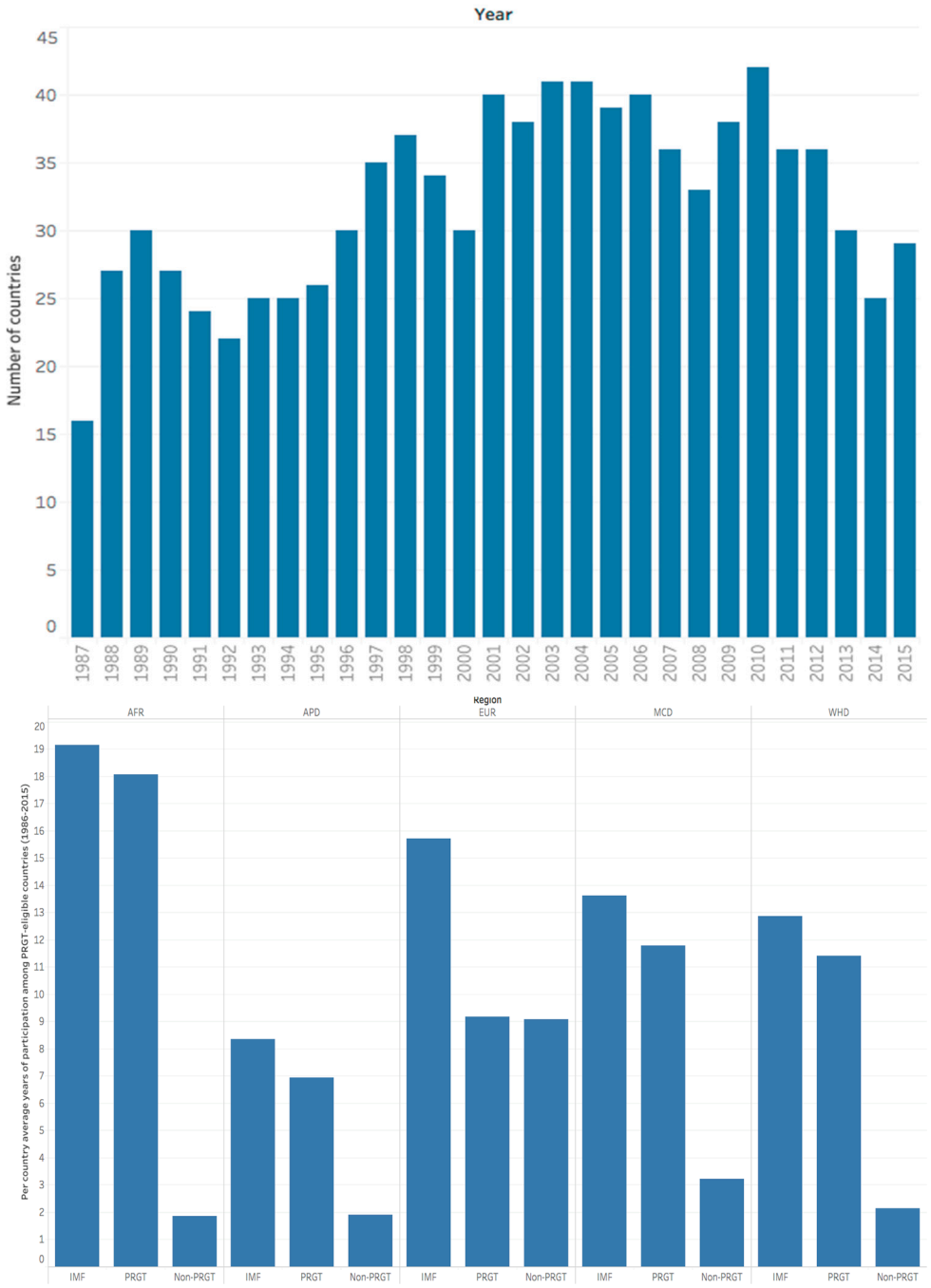
Figure A1. Within-Region Unconditional (Absolute β) Convergence in LICs (1990-2015)



Source: Authors' calculations based on data from the World Bank, World Development Indicators, 2017.

Note: Within-region unconditional income convergence is fastest among countries in the Middle East and Central Asia (MCD) (although there are relatively few countries that have limited variation in growth and initial income level) followed by those in Asia-Pacific (APD), Western Hemisphere (WHD), and Africa (AFR).

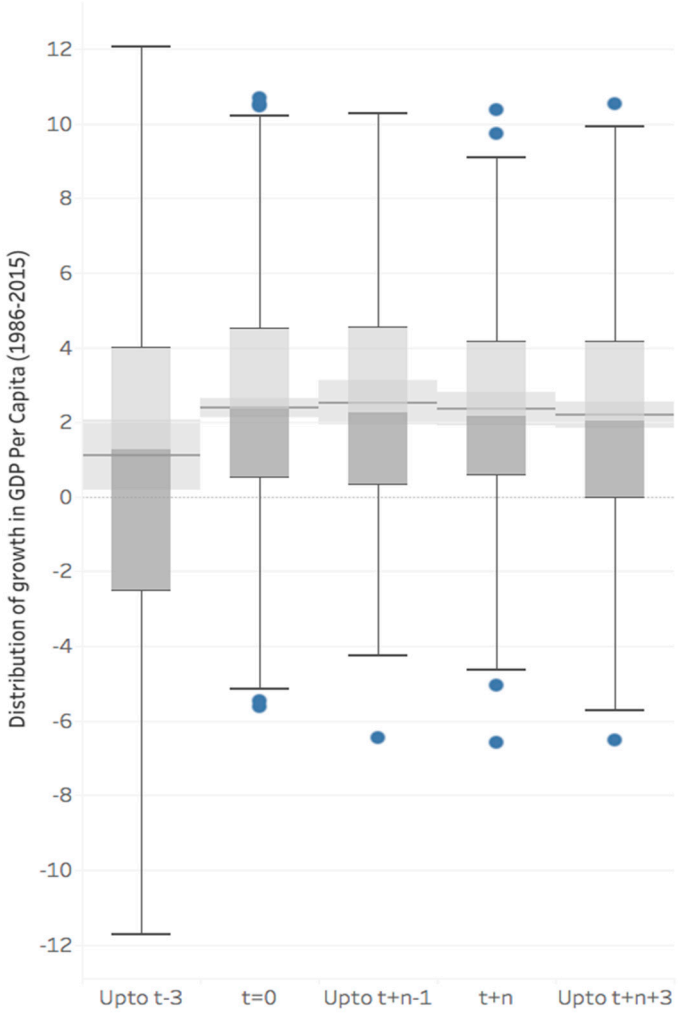
Figure A2. IMF-Supported Program Participation in LICs (1986-2015)



Source: authors' calculations based on data from Finance Department, IMF.

Note: Program incidence is measured as percentage of program years in 1986-2015 in which countries participated in one of IMF-supported programs.

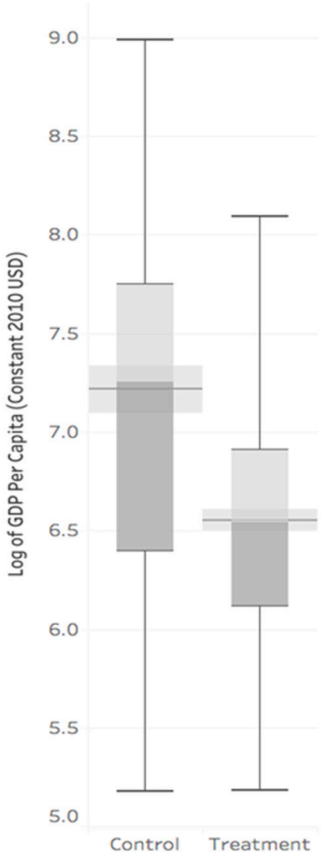
Figure A3. Distribution of Growth of GDP Per Capita in Years around the Year of Approval of IMF-Supported Programs (1986-2015)



Source: Authors' calculations based on data from the World Bank, World Development Indicators, 2017 and Finance Department, IMF.

Note: Mean is Blue line with 95% CI band, Median: border of light and dark shades of gray in the box, Q1 and Q3 are the lower and upper side of the box, respectively; and, Upper and Lower tails are ± 1.5*(Q3-Q1), respectively.

Figure A4. Log of Real Per Capita GDP by Likelihood of Participation in IMF-Supported Programs (1986-2015)



Source: Authors' calculations based on data from the World Bank, World Development Indicators, 2017 and Finance Department, IMF.

Note: To classify countries into treatment and control group as precisely as possible, we use a multilevel linear mixed effects model to determine the factors of IMF-supported program participation instead of standard pooled probit because the latter does not use observations from countries that never participated in IMF-supported programs when computing estimates for the parameters in the equation modeling the likelihood of IMF-supported program participation. Multilevel mixed effects model allows for time variant, unobserved factors of growth that are statistically independent of observed factors. Also, this model considers different levels of nested clusters of random effects, which are useful for modeling within-level type correlation; for instance, countries in the same region of the world are correlated because they share common region-level random effects and thus are more similar than economies in other regions.

Table A1. The Determinants of Participation in IMF-Supported Programs, 1986-2015

	Participation
Primary Fiscal Balance	0.00
	(0.24)
Public External Debt	0.00
	(0.34)
External Debt Service	0.01***
	(3.30)
Terms of Trade	0.00
	(0.98)
World Growth	0.40**
	(3.08)
FDI Inflow	-0.02*
	(-2.44)
Inflation	-0.00
	(-1.36)
Reserve	-0.06***
	(-3.60)
N	251

Marginal estimates for lagged covariates

Robust t statistics in parentheses

* p<0.05 ** p<0.01 *** p<0.001

Source: authors' calculations.

Note: The table shows the marginal effects estimate of the pooled panel probit regression using annual data from the first-stage selection equation, modeling the probability of extended participation in IMF-supported programs. The dependent variable is the binary indicator for extended participation in IMF-supported programs. All independent variables are lagged by one year.

Table A2. Arellano-Bond GMM Estimates for the Long-Term Growth Effects of IMF-Supported Programs, 1986-2015

	Growth in Real GDP Per Capita					
PRGT	1.89	2.22	2.12	2.60**	2.76**	2.67**
	(1.06)	(1.55)	(1.28)	(2.61)	(2.93)	(2.96)
Log initial income	7.88***	5.54***	6.05***	0.20	-1.27	-1.07
	(3.58)	(3.65)	(3.65)	(0.28)	(-0.95)	(-0.74)
Inverse Mills Ratio		-30.77***	-32.98***	-4.09	9.68	6.81
		(-3.54)	(-3.45)	(-0.95)	(1.02)	(0.80)
Inflation			-0.13	-0.12	-0.10	-0.09
			(-0.81)	(-1.02)	(-0.73)	(-0.62)
Primary				0.06***	0.08***	0.08***
				(3.62)	(5.49)	(5.14)
Volatility					-1.67	-1.76
					(-1.08)	(-1.06)
TOT						0.02
						(0.64)
N	518	518	518	492	492	492
n	83.00	83.00	83.00	80.00	80.00	80.00

Robust t-stats in parentheses

* p<0.05 ** p<0.01 *** p<0.001

Source: authors' calculations.

Note: Arellano-Bond GMM estimates for the long-term growth effects of extended participation in IMF-supported programs comparable to the results shown in Table 3 of Mumssen *et al*., (2013). We find statistically significantly positive program impact, robust to varying specifications. The Inverse Mills ratio or the non-selection hazard which is generated from the first-stage regressions. The estimated parameters are used to calculate the inverse Mills ratio, which is then included as an additional explanatory variable in the outcome equations.

Table A3. Changing Specifications in the Selection Equation of the Endogenous Treatment Effects Model

Growth rate of GDP per capita				
PRGT	2.48	2.97***	4.67***	4.27***
	(1.55)	(3.39)	(9.09)	(8.44)
Log initial income	-1.77**	-1.65**	-0.63	-0.54
	(-2.85)	(-2.74)	(-1.68)	(-1.45)
PRGT-Log initial income	0.74	0.64	-0.38	-0.74*
	(1.33)	(1.13)	(-0.97)	(-1.98)
Government Consumption	-0.08*	-0.07*	-0.09***	-0.07***
	(-2.42)	(-2.37)	(-4.36)	(-3.65)
Domestic Investment	0.12***	0.11***	0.12***	0.13***
	(6.00)	(6.14)	(7.74)	(7.08)
Credit to Private Sector	-0.01	-0.01	-0.03**	-0.03**
	(-0.38)	(-0.35)	(-2.92)	(-3.27)
Trade Openness	0.01	0.01	0.01*	0.01
	(0.45)	(0.38)	(2.25)	(1.87)
FDI Inflow	0.32***	0.38***	0.36***	0.38***
	(3.74)	(4.48)	(4.72)	(4.96)
Population Growth	-0.44	-0.50	-0.54**	-0.71***
	(-1.63)	(-1.81)	(-2.80)	(-3.61)
Democracy Index	0.61	0.63	-0.47	-0.95
	(0.72)	(0.73)	(-0.68)	(-1.34)
Inflation				-0.01***
				(-4.19)
Participation				
Primary Fiscal Balance	Yes	Yes	Yes	Yes
Public External Debt	Yes	Yes	Yes	Yes
External Debt Service	Yes	Yes	Yes	Yes
Terms of Trade	Yes	Yes	Yes	Yes
World Growth	Yes	Yes	Yes	Yes
FDI Inflow	No	Yes	Yes	Yes
Inflation	No	No	Yes	Yes
Reserve	No	No	No	Yes

Robust t statistics in parentheses

* p<0.05 ** p<0.01 *** p<0.001

Source: authors' calculations.

Note: The outcome equation's dependent variable is the compounded annualized growth rate of real per capita GDP. The analysis is based on five 10-year period moving averages of macroeconomic determinants of growth as well as fiscal determinants of program participation between 1986 and 2015 where periods overlap by 50 percent. A country is considered to have long-term participation in IMF-supported programs in each five-year overlapping decade if such programs were active in five or more years in that decade, for at least five months in each year.

Table A4. Long-Term IMF-Supported Programs (ECF, ESAF/ PRGF) and Income Convergence in LICs, 1986-2015
(Endogenous Treatment Effects Model)

Participation	
Primary Fiscal Balance	0.02*
	(1.96)
Public External Debt	-0.00
	(-0.24)
External Debt Service	0.00**
	(2.73)
Terms of Trade	-0.00
	(-1.09)
World Growth	0.43***
	(3.39)
FDI Inflow	-0.01*
	(-2.08)
Inflation	-0.00
	(-1.04)
Reserve	-0.06***
	(-3.47)
N	251
Marginal estimates for lagged covariates	
Robust t statistics in parentheses	
* p<0.05 ** p<0.01 *** p<0.001	

Growth rate of real GDP per capita		
PRGT	4.25***	4.22***
	(7.48)	(7.44)
Log initial income	-0.91*	-0.52
	(-2.50)	(-1.22)
PRGT-Log initial income		-0.86*
		(-2.35)
Government Consumption	-0.04	-0.04
	(-1.52)	(-1.57)
Domestic Investment	0.11***	0.11***
	(5.18)	(5.15)
Inflation	-0.02	-0.02
	(-1.62)	(-1.93)
Credit to Private Sector	0.01	0.00
	(0.69)	(0.65)
Trade Openness	0.38***	0.38***
	(4.77)	(4.81)
FDI Inflow	-0.71***	-0.78***
	(-3.55)	(-4.14)
Population Growth	-0.92	-1.29
	(-1.20)	(-1.61)
Democracy Index	-0.01***	-0.01***
	(-4.24)	(-4.36)
Constant	4.90	2.63
	(1.89)	(0.89)
N	228	228
Robust t statistics in parentheses		
* p<0.05 ** p<0.01 *** p<0.001		

Source: authors' calculations.

Note: See notes in Table 1.

Table A5. Changing Specifications of Propensity Score Matched Treatment Fixed Effects Model

	Dependent Variable: Growth Rate of GDP per capita									
PRGT	1.272**	1.477***	0.689	0.652	0.614	0.429	0.425	0.399	0.130	0.244
	(3.054)	(3.799)	(1.421)	(1.260)	(1.239)	(1.013)	(0.977)	(0.961)	(0.319)	(0.747)
Initial income		-9.195***	-8.070***	-7.938***	-8.126***	-9.481***	-9.578***	-9.611***	-9.642***	-7.358***
		(-6.236)	(-5.963)	(-4.734)	(-4.882)	(-5.397)	(-5.649)	(-5.804)	(-6.392)	(-4.394)
PRGT-Initial income			-1.530*	-1.571*	-1.369	-1.219	-1.179	-1.079	-0.920	-0.947
			(-2.309)	(-2.298)	(-1.953)	(-1.603)	(-1.530)	(-1.483)	(-1.427)	(-1.826)
Government Consumption				0.015	0.008	-0.043	-0.055	-0.049	-0.052	-0.111
				(0.126)	(0.077)	(-0.480)	(-0.631)	(-0.569)	(-0.637)	(-1.528)
Domestic Investment					0.150**	0.112*	0.106*	0.104*	0.119*	0.120**
					(3.085)	(2.579)	(2.356)	(2.219)	(2.573)	(3.140)
Credit to Private Sector						0.119**	0.118**	0.123**	0.109**	0.068
						(2.969)	(2.858)	(2.997)	(2.837)	(1.897)
Trade Openness							0.008	0.010	-0.005	-0.009
							(0.310)	(0.379)	(-0.177)	(-0.345)
Population Growth								0.385	0.190	-0.010
								(0.991)	(0.585)	(-0.041)
Democracy Index									5.653**	5.150**
									(2.828)	(2.821)
Inflation										-0.004**
										(-3.211)
N	164	155	155	152	152	151	151	149	149	149

t statistics in parentheses
* p<0.05 ** p<0.01 *** p<0.001

Source: authors' calculations.

Note: See notes in Table 3.