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Adjustment without Accumulation

EVIDENCE ON CAPITAL FORMATION FROM IMF PROGRAMS

DANIEL RINNER, KEVIN P. GALLAGHER AND REBECCA RAY

ABSTRACT

A central mandate of the International Monetary Fund (IMF) is to provide liquidity support to countries facing balance of payment difficulties. Lending programs aim to bridge financing gaps and restore trajectories for growth and stability. The IMF's core programs condition fiscal and other policy measures in return for such support, in hopes that reforms and new financing will catalyze new (especially private) investment into the economy. There is now a deep academic literature assessing the economic and social outcomes of IMF lending programs. This study adds to this literature by evaluating the extent to which IMF programs catalyze gross fixed capital formation (GFCF) in general and private capital formation in particular. An analysis of GFCF provides insight into investment channels of growth and the productivity of IMF-catalyzed capital. We leverage a novel empirical strategy, local projections difference-in-difference. Results indicate that IMF program participation has ambiguous or negative impacts on capital formation. These findings add to prior work on growth and investment within IMF programs. Results also support recent calls to rethink the value of fiscal consolidation for balance of payments problems.

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INTRODUCTION

The mission of the International Monetary Fund (IMF) is to promote international financial stability through liquidity support, surveillance, and capacity building. Emerging market and developing countries frequently turn to the IMF during balance of payments distress. International financial crises in the nineteen-eighties, 1997, 2008, and economic turbulence since the Covid-19 pandemic each generated demand for the IMF's resources (Grabel 2017; Ray et al. 2022). Frequent borrower recidivism prolongs IMF engagements (Easterly 2005; Iseringhausen et al. 2019), contributing to the IMF's persistent role as an overseer of development policy across the Global South (Grabel 2017; Kentikelenis et al. 2016).

IMF liquidity support comes with conditionalities that require borrowing countries to commit to a series of policy reforms. IMF conditionalities have often prioritized fiscal consolidation alongside wide-reaching liberalizations (Kentikelenis et al. 2016; Kentikelenis and Stubbs 2023a). The aim of such loan terms is to resolve structural weaknesses that required IMF support and catalyze foreign investment back into the country. IMF statements confirm these intentions: "The programs that accompany such lending help countries implement policies that restore long-lasting stability, and encourage private-sector-led growth and investments" (IMF n.d.)

There is a significant debate over the determinants and efficacy of IMF program conditionality in the academic literature (Breen 2014; Dreher et al. 2022; Kentikelenis and Stubbs et al. 2023a; Nelson and Wallace 2017). A substantial body of evidence finds that IMF programs push burdens of adjustment onto the world's poorest populations (Kentikelenis and Stubbs 2023a; Ocampo 2017; Stubbs et al. 2022; Ray et al. 2022). However, there is a broader debate over the causes of certain negative outcomes.

This literature includes assessments of IMF programs' macroeconomic outcomes, as well as their secondary social and environmental impacts. Studies on economic growth, inequality and poverty have attracted particular attention (Barro and Lee 2005; Balima and Sokolova 2021; Biglaiser and McGauvran 2022; Bird et al. 2021; Stubbs et al. 2022; Pan et al. 2026). There are also active literatures on democratization, state capacity, corruption, health, and beyond (Nelson and Wallace 2017; Thomson et al. 2017; Reinsberg et al. 2019; Reinsberg et al. 2020). With some exceptions, research shows that IMF programs have limited success with respect to their desired economic outcomes and ambiguous to negative impacts on social and environmental outcomes. However, the causal pathways for these results are more contentious. One view is that IMF borrowers are uniquely poor performing governments, and they continue to perform poorly within the program (Bas and Stone 2014). These government missteps may include failure to implement components of the IMF's program design (Dreher 2006). However, others argue that the IMF is largely responsible for poor program outcomes (Kentikelenis and Stubbs 2023a), and unrealistic or excessive program demands cause poor implementation (Reinsberg et al. 2021).

This study addresses a gap in the literature by evaluating the effect of IMF programs on gross fixed capital formation (GFCF) in low- and middle-income countries from 1990-2024. Results examine both total GFCF and private GFCF. Capital accumulation is an essential outcome and means of long-run growth (Meyer and Sanusi 2019). Based on IMF statements and known mechanisms of growth, IMF programs should improve the investment environment and catalyze GFCF, especially from the private sector.

This paper builds upon novel applications of local projections difference-in-difference (LP-DID) (Dube et al. 2025; Pan et al. 2026). LP-DID estimates show statistically significant negative impacts of IMF participation on total GFCF and private GFCF. Statistical significance is less frequent for private GFCF than total across specifications and time horizons.

These findings contribute to recent assessments of the IMF's impact on economic growth and complexity (Balima and Sokolova 2021; Demir 2022). Findings indicate that the investment channel of growth in IMF programs is absent or deteriorating. Without this contribution, the prospects for durable growth and development as a result of IMF programs are limited. This new evidence reinforces decades-long calls to rethink prevailing approaches to IMF program design (Kentikelenis and Stubbs 2023a; Taylor 1988). The next section identifies mechanisms for IMF lending to influence growth and investment with reference to existing evidence. We then transition to our empirical approach and results before concluding.

GROWTH AND INVESTMENT THROUGH IMF LENDING

Restoring the conditions for sustained economic growth is central to the success of an IMF program. Gross domestic product (GDP) growth stabilizes financial markets, eases debt burdens and indicates a strong economic recovery from crisis (IEO 2021). IMF documentation consistently identifies growth as a priority in program design, and program shortfalls are often attributed to underachieving growth projections (IMF 2019; IEO 2021). Stronger growth outcomes under IMF programs reduce borrowers' reliance and demand for continued IMF support (Iseringhausen et al. 2019). In low- and middle-income countries, there is an additional imperative for growth to satisfy broader development objectives. Meanwhile, declines in aggregate demand indicate severe hardship for borrowing country populations.

Despite the rhetorical importance attached to growth, IMF programs frequently exhibit poor output performance. There is a well-documented pattern of borrowers underperforming relative to IMF GDP projections (Bird 2005; IEO 2021; IMF 2019; Ismail et al. 2020). Studies have produced a wide range of estimates for a general effect of IMF programs on growth (Balima and Sokolova 2021; Barro and Lee 2005; Bas and Stone 2014; Dreher 2006). IMF staff analyses are responsible for some of the more favorable assessments, and high-income countries experience better results than lower-income borrowers (Balima and Sokolova 2021).

Several observers have suggested poor growth outcomes reflect contractionary fiscal policies within required IMF conditionalities (Biglaiser and McGauvran 2022; Kentikelenis and Stubbs 2023b; Stubbs et al. 2022; Ray et al. 2022). Cuts to public sector wage bills, reduced social support and higher taxes on consumption can shrink economies. The IMF's 2018 Review of Program Design and Conditionality determined that IMF staff had consistently underestimated fiscal multipliers (IMF 2018), meaning austerity measures produced more contractionary results than expected. While these findings speak to important program features, public and private consumption spending represents only a subset of contributions to aggregate demand. Findings for GFCF add to this literature by explicitly considering the investment channel of growth.

There are multiple pathways through which IMF programs aim to stimulate private investment. First, austerity-based recovery strategies aim to resolve crowding out effects of government spending levels perceived to be excessive. In benchmark macroeconomic models, government borrowing reduces the volume of savings available for private investment and increases the cost of capital. Under certain rigid assumptions, fiscal contraction could theoretically stimulate private investment and promote debt sustainability with neutral or positive output results (Blyth 2013; Blanchard 2008). Uncontroversially, the IMF perceives crowding out effects of public spending within some borrowers. IMF discussions of fiscal policy often reference the risk of expansionary policies reducing funds available to the private sector or explicitly mention crowding out private investment (Gaspar et al. 2025; IMF 2017).

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A second channel involves structural reforms to improve the investment environment. Other IMF conditionalities aim to stimulate private investment by removing policy barriers to enterprise. Free trade, capital account liberalization, deregulations and privatizations are among the most consequential conditionalities aiming to improve market function (Kentikelenis et al. 2016; Kentikelenis and Stubbs 2023a).

A third mechanism occurs if IMF programs promote investment through a signaling effect to private capital. Program participation could communicate to international investors that a government is making serious effort to reform, or at least the pro-business orientation of the IMF will act as a constraint on economic policy. According to the Fund, "IMF financing...catalyzes private-sector investments and additional financial support, signaling that underlying issues which led to the crisis can be resolved through reforms" (IMF 2025a).

However, empirical support for a catalytic effect of IMF programs is inconsistent. Several earlier studies concluded that IMF borrowing signaled country struggles more than reform ambition to investors (Bird and Rowlands 2002; Giannini and Cottarelli 2002; Edwards 2006; Jensen 2004). Other papers have tried to identify contingencies. Van der Veer and de Jong (2010) found a positive impact on private flows to middle-income countries, unless the country restructures debt. Krahnke (2023) argues that once programs exceed a certain loan size, the effect on private capital flows turns negative. Gehring and Lang (2020) examine investor perceptions of creditworthiness instead of financial flows and find that the signal of IMF participation is positive.

These examinations of the IMF's private investment outcomes do not necessarily question whether the catalyzed flows are productive for growth and stability. Capital inflow surges can conversely produce the crises that send countries to the IMF for support (Furceri et al. 2012; Ocampo et al. 2017; Ocampo 2017). Prior critiques have argued IMF policy preferences promote speculative, volatile finance (Grabel 1995). To achieve stability and promote development, IMF programs need to promote real investments that support sophistication and diversification of the economy. Our chosen outcome measure reflects real investment activity, not just potentially destabilizing flows.

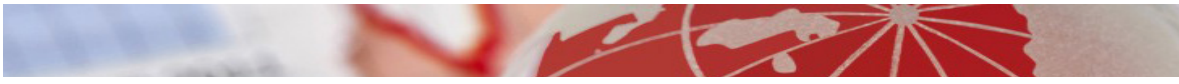
Understanding the impact of IMF programs on GFCF provides a crucial complement to existing research on the growth and investment outcomes. Real investment is a distinct channel of impact that could, theoretically, compensate for cuts to consumption. The results of this analysis add context to ambiguous growth outcomes of IMF borrowers and criticisms of the IMF's track record of austerity (Stubbs et al. 2022; Kentikelenis and Stubbs 2023a).

DATA AND METHOD

Data

The study sample includes low- and middle-income countries, according to current World Bank income group classification, from 1990-2024. Data sparsity requires different exclusions in different empirical specifications. All economic data is from the World Bank's World Development Indicators (WDI) database. Information on IMF lending is constructed using the IMF's Financial Data Query Tool. The sample excludes Resilience and Sustainability Trust (RST) programs because they have longer durations and distinct goals from conventional programs. Only countries with other IMF arrangements participate in RST programs, so their exclusion does not lose variation.

Cross-national GFCF data for the Global South is available from two sources. The WDI database includes GFCF in multiple currency units, including constant 2015 US dollars (USD). Private GFCF is available from WDI only as percentage of GDP. We use the nominal GDP in constant USD from

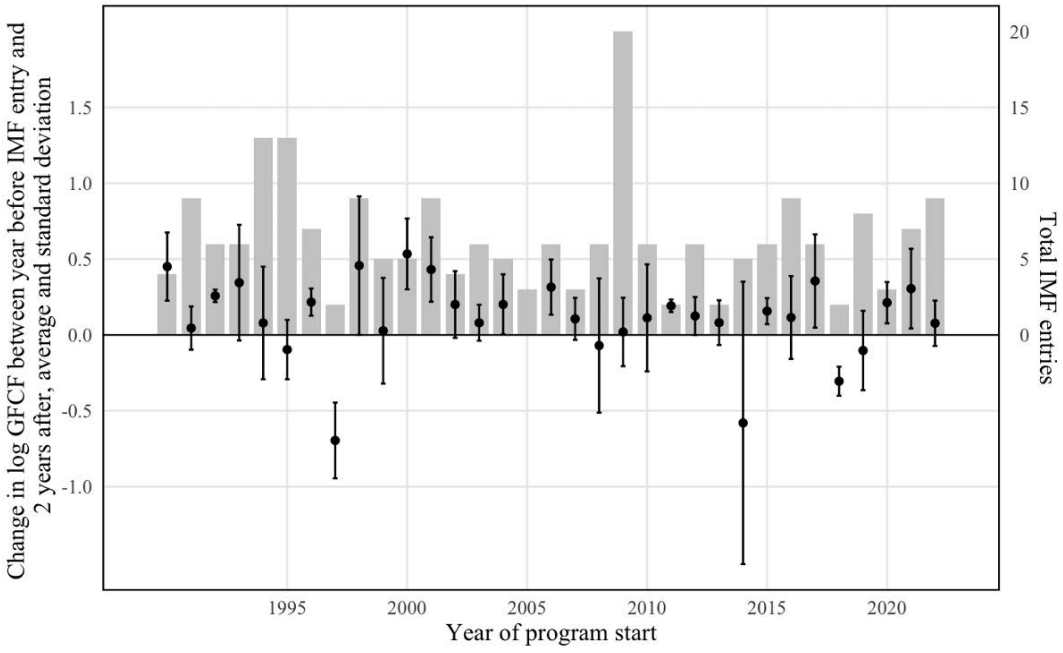


WDI to produce a nominal private GFCF indicator. Simultaneously, the IMF maintains the *Investment and Capital Stock Dataset*. The most recent update in 2021 contains data for private, public and public-private partnership GFCF in purchasing power parity adjusted international units. For available years, IMF data coverage includes more observations than WDI data, but both sources contain observations missing in the other. IMF data coverage ends in 2019 while WDI updates continuously. Although overlapping data is highly correlated between sources, it is not possible to perfectly reconcile differences without a reconstruction of IMF staff calculations. Data sources never appear simultaneously to prevent conflating slight methodological differences with meaningful fluctuations in GFCF. Main results rely on WDI data to prioritize more recent observations. However, there are not strong divergences in results between sources (Appendix C).

Figure 1 provides a descriptive picture of how low- and middle-income IMF participants' total GFCF changed from the year before IMF entry and two years after (later models test several time horizons, but this shows just one to simplify). Gray bars show the number of new IMF participants each year. Average log changes in GFCF, with bars of one standard deviation, appear in black. The GFCF change is located on the year of program start. Most often, IMF participants show higher rates of capital formation two years into a program than in the year prior to entry. Years with negative trends include the 2008 global financial crisis and programs starting in 2018 and 2019 before the onset of the COVID-19 pandemic. The strongest negative outliers are Indonesia and Thailand in 1997 during the Asian financial crisis.

IMF participants often exhibit improvements in capital formation following program entry, but this pattern alone does not provide clear evidence of program effectiveness. The pre-entry year could represent a low point in macroeconomic benchmarks, and this descriptive account does not compare

Figure 1: Change in IMF Entrants' Log of Total GFCF Between Year Before Entry and 2 Years After, Mean and Standard Deviation, 1990-2022



Source: Authors' calculations.

Note: IMF entrants are countries signing an IMF agreement that did not have one in progress during the prior year. Not all entrants have GFCF observations.

IMF participants to peer countries without IMF programs. Making such a comparison requires accounting for selection biases in IMF borrowers, primarily poor macroeconomic performance. This empirical approach attempts to isolate the GFCF changes attributable to IMF participation.

Local Projections Difference-in-Difference (LP-DID)

Local projections difference-in-difference (LP-DID) is a novel event study method with several useful features for IMF program evaluation. Dube et al. (2025) describe the econometric underpinnings in detail, while Pan et al. (2026) are the first to apply LP-DID to IMF programs and discuss its strengths relative to other prevailing methods. An event study framework yields multiple advantages. It is easy to observe dynamic treatment effects, in which the impact of IMF participation depends on the number of years since entry. It also does not require an outcome with inherent comparability across countries. Instead of comparing GFCF as percentage of GDP between IMF entrants and control countries, LP-DID evaluates the change in IMF borrowers' GFCF over time relative to what contemporaneous peer countries experienced. LP-DID estimations use the log of GFCF as outcome variable.

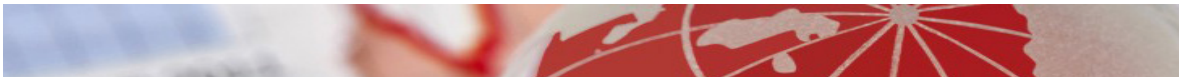
LP-DID improves upon foundational difference-in-difference estimations. Researchers typically yield a causal effect by measuring the change in the outcome variable for units subject to some treatment of interest, relative to the change in outcome for contemporaneous, untreated (control) units. The primary problem LP-DID solves is heterogenous treatment timing, in which units enter treated status at different times (Dube et al. 2025). Heterogenous treatment timing introduces the risk of comparing treated units to peers that are already in an IMF program or who enter one within the evaluation window. LP-DID compares newly treated units only to units that are valid control cases over the study window (Dube et al. 2025).

Another strength of LP-DID is the integration of pre-treatment control variables to improve the estimation. Many observable features that help predict GFCF, such as growth and interest rates, could also respond to IMF programs. Our LP-DID specification uses control variables only from the year before IMF entry. As a baseline, we control for GDP per capita, growth, debt service as percent gross national income (GNI) and exports as percent GDP. LP-DID innately compares treated cases to contemporaneous controls to filter out global trends. Controls were selected based on their relevance to both GFCF and IMF participation. However, the initial value of GFCF presumably reflects some additional time-invariant determinants of performance that do not appear in the regression. Interest rates are predictive of GFCF in the short run but significantly reduce sample size. LP-DID results include models with no controls, baseline controls, and baseline controls with interest rates.

The final LP-DID regression is the following, where h is the years since IMF entry; t is a time indicator; D indicates whether the country-year observation is in the treated or control group; and β_h is the estimated effect of IMF participation h years since starting a program. Treatment effects appear for years zero through five since IMF signing, with the year before IMF entry as a baseline. LP-DID results also include an estimate of the treatment effect two years before entry, to provide an indication of pre-treatment trends.

$$
\begin{aligned}
GFCF_{i,\,t+h} - GFCF_{i,\,t-1} = {} & \beta_h \Delta D_{i,t} && \text{Treatment effect} \\
& + \gamma^h x_{i,\,t-1} && \text{Covariate adjustment} \\
& + \delta^h{}_t && \text{Time effect} \\
& + e^h{}_{i,t} && \text{Error term}
\end{aligned}
$$

There are certain caveats to this implementation. Because the estimator requires observation of the outcome in the year before program start and in the year of evaluation, alongside any covariates in



year *t-1*, LP-DID is more demanding of data density than some other methods. Tradeoffs between covariate inclusion and sample size can be significant in cross-country samples with sparse data.

LP-DID also assumes no anticipation of treatment and no influence of treatment prior to program entry (Dube et al. 2025). This assumption is problematic for IMF programs where governments exercise some discretion on the timing of IMF entry, or whether to enter at all. Programs also often contain prior actions, when the borrowing government takes steps to satisfy IMF policy preferences before borrowing. Despite these concerns, expecting program effects to primarily materialize during the borrowing period, even with some blurriness to the start of IMF influence, remains a reasonable standard of evaluation.

A related concern is control group selection. Some studies use fully reversible binary indicators of IMF participation. This implies that IMF influence ends when there is not an active agreement. However, some program conditionalities may be difficult, if not impossible, to reverse once implemented: for example, the dissolution of a state-owned enterprise. Pan et al. (2026) exclude countries from their control sample permanently after the first post-1980 IMF program to avoid comparing new participants to peers that have already undergone structural adjustment. Their calculated program effect accounts only for the outcomes of a country's first IMF program in the sample period.

Concerns regarding unclean comparisons are important to confront. However, excluding all countries with past participation introduces severe constraints. First, following large waves of IMF participation, such as the 1980s debt crisis, there are few remaining control cases. 83 countries borrowed from the IMF between 1980 and 1989. Their exclusion from subsequent years could amplify differences between later-treated units and the countries available to serve as contemporaneous controls. At the same time, this approach excludes many later programs, because previous IMF participation is a strong predictor of future borrowing (Iseringhausen et al. 2019). Given the focus on more recent IMF performance, an alternative approach is necessary for this study's objectives.

A practical compromise between fully reversible and fully irreversible program effects is to choose a timespan of IMF non-participation that allows a country to re-enter the control pool. This also permits a subsequent program to contribute to the estimated IMF effects. LP-DID literature refers to this type of specification as a non-absorbing treatment (Dube et al. 2025). Absorption lag is the length of time in which a treatment effect presumably dissipates.

Some program evidence supports a reversible view of IMF program impacts. Rickard and Caraway (2019) find that IMF conditionalities targeting public sector reforms have significant downward effects on government wage bills in the short-term, but not the long-term. They suggest conditionality reversal is typical in this policy area (Rickard and Caraway 2019). Even when IMF policy reforms remain in place long after program completion, this persistence reflects domestic political economy dynamics rather than IMF design alone. Only the strongest interpretation of structural adjustment's aims and efficacy would suggest that causal effects are strictly interpretable from the initial program. The optimal approach likely depends on the outcome of interest.

The choice of absorption lag length is consequential. Choosing an absorption length that is too long risks selection bias towards less frequent borrowers, who likely perform better than borrowers returning to the IMF after a shorter window (Iseringhausen et al. 2019). A shorter window increases sample size, because new IMF arrangements to recent borrowers are so frequent (IEO 2002; Iseringhausen et al. 2019). On the other hand, if the absorption lag is too short, then the pre-treatment baseline outcome may be the product of a past IMF arrangement. There may also be control observations with outcomes influenced by recent IMF participation.

We report LP-DID estimates with absorption lags of three and five years of nonparticipation. Generally, negative program effects, where they do appear, are stronger at a shorter exclusion criterion. This suggests that the five-year absorption lag could be biased towards better performers, as hypothesized. The typical program length is one to three years, and observations reveal statistically significant impacts in year five of these results in some specifications. While this could signal that IMF outcomes are durable enough to warrant the longer absorption lag, many countries in our sample are returning to new IMF programs within the study window. The conclusion of null or negative IMF impacts is robust to either specification.

RESULTS

LP-DID estimates indicate that IMF participation has statistically significant negative impacts on both total and private GFCF. These findings remain robust to alternate control inclusions and two absorption lag specifications. Tables 1 and 2 show LP-DID estimates for IMF programs' impact on log total and private GFCF for a sample of low- and middle-income countries from 1990 to 2024. Baseline controls are GDP per capita, growth, debt service as percent GNI and exports as percent GDP. Results with no controls present a purely descriptive picture of how average IMF participants' GFCF changed relative to contemporaneous non-borrowers. Sample sizes are reported during the year of signing. Slight reductions in sample size are typical at longer time horizons.

Table 1: LP-DID Effect of IMF Participation on Log Total GFCF, Estimate and Standard Error, All IMF Programs Excluding RST, Estimate with Standard Error in Parentheses

Controls	(1) None	(2) Baseline	(3) Baseline and real interest	(4) None	(5) Baseline	(6) Baseline and real interest
Time since program start	***3-year non-absorbing lag***			***5-year non-absorbing lag***		
-2	0.071* (0.052)	0.039 (0.066)	0.093* (0.068)	-0.028 (0.028)	-0.020 (0.030)	0.008 (0.034)
-1						
0	-0.060 (0.051)	-0.062 (0.052)	-0.017 (0.076)	0.017 (0.076)	0.009 (0.072)	-0.009 (0.092)
1	-0.230*** (0.080)	-0.115* (0.088)	-0.207*** (0.080)	-0.165* (0.117)	-0.154* (0.097)	-0.164* (0.102)
2	-0.205** (0.095)	-0.137** (0.077)	-0.147** (0.089)	-0.180* (0.132)	-0.124* (0.090)	-0.177* (0.109)
3	-0.226*** (0.096)	-0.211** (0.091)	-0.243** (0.109)	-0.170* (0.126)	-0.145 (0.125)	-0.170* (0.129)
4	-0.282*** (0.095)	-0.306*** (0.085)	-0.329*** (0.099)	-0.182* (0.124)	-0.242** (0.118)	-0.234** (0.121)
5	-0.371** (0.204)	-0.366** (0.195)	-0.484** (0.270)	-0.128 (0.125)	-0.146* (0.113)	-0.156* (0.120)
Treated cases	79	75	46	64	60	35
Observations	2,645	2,334	1,554	2,480	2,189	1,474

Source: Authors' calculations

Note: * p≤0.10, ** p≤0.05, *** p≤0.01. Standard errors clustered by country in parentheses. Treated cases and observations reported for year of signing.

LP-DID results show a consistently negative impact of IMF entry on log total GFCF. Under baseline controls and a three-year absorption lag (model 2), the estimate is statistically significant beginning in the second year of participation. In year two, the effect of IMF participation is a 14 percent reduction in GFCF relative to counterfactual. By year five, the gap widens to over 36 percent. It bears reiterating that this is the difference between IMF participants and a local projection based on comparable control country paths, not the measured difference in outcome from pre-program performance. In model 2, a country in the third year of an IMF arrangement has about 21 percent lower GFCF than a comparable country not participating. Using a five-year absorption lag (model 5), the effect is less frequently significant and sometimes smaller in magnitude. It remains consistently negative.

Table 2 shows the same LP-DID model for private GFCF. The effect of IMF participation is less frequently significant than for total GFCF, but it remains the case that estimates are universally negative after the first year of IMF participation. Statistical significance is stronger in the sample with a three-year absorption lag than the five-year specifications.

Additional robustness checks and alternate samples are provided in the appendix. Results generated using the IMF's GFCF data instead of WDI produce comparable results. Magnitudes and significance are somewhat reduced, potentially due to purchasing power parity adjustment, but signs remain negative (Appendix C). Results also appear for non-precautionary programs, non-concessional programs, and concessional programs (Appendix B, Appendix C). In general, sample sizes are too small for distinction based on program features, especially for concessional programs.

Table 2: LP-DID Effect of IMF Participation on Log Private GFCF, Estimate and Standard Error, All IMF Programs Excluding RST, 1990-2024

Controls	(1) None	(2) Baseline	(3) Baseline and real interest	(4) None	(5) Baseline	(6) Baseline and real interest
Time since program start	***3-year non-absorbing lag***			***5-year non-absorbing lag***		
-2	-0.072 (0.091)	-0.094 (0.120)	0.084 (0.080)	-0.286** (0.135)	-0.248* (0.163)	0.019 (0.050)
-1						
0	-0.205* (0.131)	-0.129 (0.115)	0.019 (0.176)	-0.164 (0.247)	0.035 (0.185)	0.083 (0.270)
1	-0.364*** (0.105)	-0.159* (0.115)	-0.176 (0.171)	-0.351** (0.206)	-0.242* (0.183)	-0.256 (0.218)
2	-0.351** (0.210)	-0.253 (0.210)	-0.064 (0.166)	-0.667** (0.404)	-0.604* (0.373)	-0.252 (0.214)
3	-0.339** (0.175)	-0.330** (0.167)	-0.465** (0.215)	-0.282 (0.236)	-0.303 (0.256)	-0.301 (0.242)
4	-0.290** (0.135)	-0.323*** (0.125)	-0.321*** (0.131)	-0.296* (0.208)	-0.416** (0.189)	-0.343** (0.181)
5	-0.352** (0.167)	-0.396*** (0.144)	-0.366** (0.174)	-0.178 (0.215)	-0.245 (0.197)	-0.219 (0.185)
Treated cases	52	49	24	41	38	18
Observations	1,400	1,282	773	1,293	1,184	727

Source: Authors' calculations.

Note: * p≤0.10, ** p≤0.05, *** p≤0.01. Standard errors clustered by country in parentheses. Treated cases and observations reported for year of signing.

Finally, the propensity score matching procedure of Bird et al. (2021) provides an additional check (Appendix D). Matching techniques have previously produced more positive IMF assessments for growth than other methods (Balima and Sokolova 2021). For GFCF, the results are most often negative for total GFCF and positive for private GFCF (Appendix D). However, they almost never approach statistical significance. Matching results are also muddled by a GDP denominator in the outcome measurement.

Based on available evidence, the impact of IMF programs on GFCF has been at best ambiguous. There are several indications that IMF participation reduces total capital formation in participating countries. The analysis finds statistically significant negative impacts of IMF participation on both private and total GFCF. There is some sensitivity in statistical significance between empirical specifications. Samples that exclude countries three years after participation versus five years produce sharper estimates. However, both show a mix of significant and insignificant negative IMF impacts. There is no evidence indicating the IMF successfully stimulates total or private GFCF in low- and middle-income countries.

CONCLUSION

Capital accumulation is a primary mechanism of productivity increases, economic diversification and other developmental priorities. It's also an outcome of productive public or private investment flows. IMF programs that catalyze private sector dynamism and optimize public spending should accelerate GFCF. Yet there is no evidence these dynamics occur. Using a novel LP-DID approach, the impact of IMF entry on total and private GFCF is negative or indiscernible.

These results contextualize other findings in the IMF outcomes literature. Without successful real investment catalyzation, cuts to public consumption and social support programs have no countervailing impact on growth. The results of this analysis are also compatible with accounts finding a limited or no catalytic effect of IMF programs (Bird and Rowlands 2002; Giannini and Cottarelli 2002; Edwards 2006; Jensen 2004). However, GFCF stagnation may also indicate that even when the IMF does catalyze private capital, new flows do not finance real economy activity. In the absence of tangible investments, IMF borrowers do not experience the desired structural transformations (Demir 2022).

Deficiencies in IMF program design could explain these results. The IMF counts on private sector stimulus through liberalization and public sector consolidation. However, liberalizations can orient private investment further towards speculative, unproductive uses of capital (Grabel 1995). An expectation that fiscal contraction will produce investment uptick requires several rigid modeling assumptions that may not exist in real world contexts (Blanchard 2008; Blythe 2013). To the extent that the IMF is focused on public investment as a means of growth (IMF 2025b), lending programs are not successfully channeling public expenditures to promote capital accumulation. There could be a divergence between rhetoric and actual prioritization of public investment (Kentikelenis and Stubbs 2023a).

The IMF may also lack experience or retain biases regarding policies that improve investment channeling, whether public or private. Chief among them is a historical aversion to diverse industrial policies (Wade 2010; Cherif and Hasanov 2019). These results support existing calls for the IMF to reconsider core aspects of lending program design (Gallagher and Kozul-Wright 2022; Ocampo 2017; Taylor 1988).

Limitations to this study include insufficient data density to fully explore distinctions between concessional and non-concessional lending, along with other desirable subsamples. There remains significant space to better understand how specific program conditionalities contribute to GFCF outcomes. The analysis also raises questions regarding the relationship between catalyzed capital flows and real investment within IMF borrowers that warrant further consideration.

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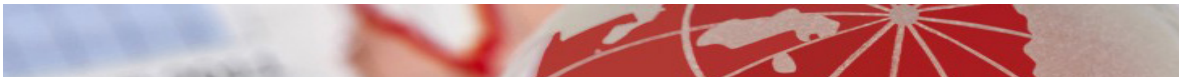


APPENDIX

Appendix A: Data sources

Table A.1: World Development Indicators Variables

Indicator	World Development Indicators ID
GFCF % GDP	NE.GDI.FTOT.ZS
GFCF constant USD	NE.GDI.FTOT.KD
Private GFCF % GDP	NE.GDI.FPRV.ZS
*GDP growth	NY.GDP.MKTP.KD.ZG
Real interest rate	FR.INR.RINR
Nominal GDP	NY.GDP.MKTP.KD
*GDP per capita constant USD	NY.GDP.PCAP.KD
Current account balance % GDP (*indicator if in deficit of 5% or more)	BN.CAB.XOKA.GD.ZS
GDP constant USD	NY.GDP.MKTP.KD
*Exports % GDP	NE.EXP.GNFS.ZS
*Inflation	FP.CPI.TOTL.ZG
Exchange rate LCU per USD	PA.NUS.FCRF
Population (*share of sample)	SP.POP.TOTL
Human capital	HD.HCI.OVRL
Government education expenditure % GDP	SE.XPD.TOTL.GD.ZS
*Reserves in months of imports	FI.RES.TOTL.MO
*Debt service % GNI	DT.TDS.DECT.GN.ZS
Net aid USD (*share of all countries in sample)	DT.ODA.OATL.KD
*External debt % GNI	DT.DOD.DECT.GN.ZS

Note: * Indicates variables included in the estimation of IMF participation equations (Appendix D).

Table A.2: Other Indicator Sources

Indicator	Source
IMF program participation, program type, *recent borrowing indicator	IMF. 2025. "IMF Financial Data Query Tool." Washington D.C.: International Monetary Fund. https://www.imf.org/external/np/fin/tad/query.aspx. Accessed March 18, 2025.
*Oil price index	IMF. 2025 Oil price index. Accessed August 30, 2025. https://legacydata.imf.org/?sk=471dddf8-d8a7-499a-81ba-5b332c01f-8b9&sid=1393552803658
*Agricultural price index	FRED. 2025. "Global price of Agr. Raw Material Index." Federal Reserve Bank of St. Louis. Accessed February 7, 2025. https://fred.stlouisfed.org/series/PRAWMINDEXM
IMF GFCF data	IMF. 2021. "IMF Investment and Capital Stock dataset." Washington D.C.: International Monetary Fund. https://data.imf.org/Datasets/ICSD

Note: * Indicates variables included in the estimation of IMF participation equations (Appendix D)

Appendix B: Results by program type

Some specifications in all lending types show statistically significant downward impacts, in alignment with larger lending categorizations for total GFCF. Concessional lending shows more erratic results in both positive and negative directions with sample sizes heavily constrained by missing data. Researchers should use heavy caution applying these methods to small samples.

Table B.1: LP-DID Effect of IMF Participation on Log Total GFCF, Estimate and Standard Error, Non-Precautionary Programs Only, 1990-2024

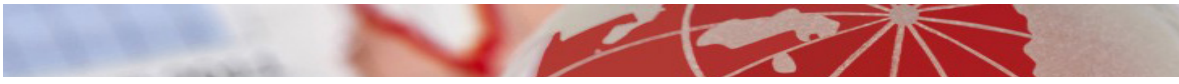
Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
Time since program start	*3-year non-absorbing lag*			*5-year non-absorbing lag*		
-2	0.075 (0.062)	0.031 (0.077)	0.062 (0.078)	-0.018 (0.027)	-0.023 (0.026)	-0.024 (0.029)
-1						
0	-0.092* (0.057)	-0.088* (0.057)	-0.076 (0.096)	0.005 (0.084)	-0.008 (0.077)	-0.015 (0.102)
1	-0.251*** (0.086)	-0.152** (0.092)	-0.222*** (0.092)	-0.191* (0.119)	-0.187** (0.099)	-0.192** (0.107)
2	-0.254*** (0.106)	-0.211*** (0.079)	-0.202** (0.102)	-0.178* (0.138)	-0.123* (0.095)	-0.175* (0.113)
3	-0.251** (0.120)	-0.234** (0.109)	-0.196** (0.115)	-0.137 (0.136)	-0.123 (0.122)	-0.152 (0.132)
4	-0.303** (0.166)	-0.345** (0.150)	-0.222* (0.138)	0.015 (0.168)	-0.079 (0.155)	-0.079 (0.160)
5	-0.201 (0.184)	-0.220* (0.159)	-0.082 (0.168)	0.090 (0.175)	0.002 (0.169)	0.034 (0.176)
Treated cases	69	66	40	56	53	30
Observations	1593	1337	908	1192	962	680

Source: Authors' calculations.

Note: * p≤0.10, ** p≤0.05, *** p≤0.01. Standard errors clustered by country in parentheses. Treated cases and observations reported for year of signing.

Table B.2: LP-DID Effect of IMF Participation on Log Total GFCF, Estimate and Standard Error, Non-Concessional Programs Only, 1990-2024

Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
Time since program start	*3-year non-absorbing lag*			*5-year non-absorbing lag*		
-2	0.078 (0.062)	0.038 (0.077)	0.068 (0.080)	-0.030 (0.034)	-0.060** (0.035)	-0.041* (0.029)
-1						
0	-0.094*** (0.036)	-0.084*** (0.036)	-0.076* (0.049)	-0.055 (0.052)	-0.041 (0.049)	-0.061 (0.062)



Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
1	-0.212*** (0.076)	-0.142** (0.063)	-0.163** (0.077)	-0.191** (0.115)	-0.136* (0.100)	-0.119 (0.104)
2	-0.217** (0.108)	-0.158** (0.083)	-0.144* (0.102)	-0.190* (0.128)	-0.075 (0.097)	-0.117 (0.109)
3	-0.210** (0.125)	-0.165* (0.123)	-0.127 (0.112)	-0.137 (0.125)	-0.087 (0.121)	-0.101 (0.125)
4	-0.214 (0.176)	-0.234* (0.153)	-0.094 (0.113)	0.004 (0.139)	-0.054 (0.110)	-0.053 (0.116)
5	-0.146 (0.179)	-0.166 (0.153)	-0.028 (0.123)	0.062 (0.147)	-0.004 (0.133)	0.010 (0.133)
Treated cases	69	66	40	56	53	30
Observations	1593	1337	908	1192	962	680

Source: Authors' calculations.

Note: * p≤0.10, ** p≤0.05, *** p≤0.01. Standard errors clustered by country in parentheses. Treated cases and observations reported for year of signing.

Table B.3: LP-DID Effect of IMF Participation on Log Total GFCF, Estimate and Standard Error, Concessional Programs Only, 1990-2024

Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
Time since program start	*3-year non-absorbing lag*			*5-year non-absorbing lag*		
-2	0.072** (0.033)	0.038 (0.033)	0.025 (0.038)	0.103*** (0.037)	0.071** (0.037)	0.059* (0.043)
-1						
0	0.222** (0.120)	0.196** (0.112)	0.479*** (0.052)	0.325** (0.146)	0.281** (0.141)	0.479*** (0.066)
1	0.106 (0.104)	0.355 (0.355)	-0.138** (0.080)	-0.053 (0.056)	-0.181*** (0.069)	-0.186** (0.083)
2	0.039 (0.049)	-0.086* (0.066)	-0.121** (0.060)	-0.009 (0.062)	-0.138* (0.085)	-0.143** (0.075)
3	0.082 (0.102)	0.028 (0.090)	-0.116*** (0.047)	-0.038 (0.060)	-0.100* (0.064)	-0.102* (0.064)
4	-0.143** (0.063)	-0.273*** (0.050)	-0.269*** (0.049)	-0.115* (0.072)	-0.245*** (0.065)	-0.240*** (0.057)
5	-0.006 (0.068)	-0.086* (0.055)	-0.078* (0.053)	0.018 (0.077)	-0.071 (0.066)	-0.053 (0.059)
Treated cases	35	35	19	27	27	13
Observations	1409	1162	802	1069	847	612

Source: Authors' calculations.

Note: * p≤0.10, ** p≤0.05, *** p≤0.01. Standard errors clustered by country in parentheses. Treated cases and observations reported for year of signing.

Table B.4: LP-DID Effect of IMF Participation on Log private GFCF, Estimate and Standard Error, Non-Precautionary Programs Only, 1990-2024

Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
Time since program start	*3-year non-absorbing lag*			*5-year non-absorbing lag*		
-2	0.011 (0.084)	0.018 (0.087)	0.113 (0.098)	-0.110 (0.086)	0.007 (0.083)	-0.007 (0.057)
-1						
0	-0.252** (0.144)	-0.136 (0.118)	-0.004 (0.199)	-0.197 (0.239)	-0.029 (0.179)	-0.003 (0.256)
1	-0.411*** (0.106)	-0.201** (0.120)	-0.230* (0.165)	-0.365* (0.226)	-0.348** (0.188)	-0.340** (0.193)
2	-0.317** (0.147)	-0.219** (0.118)	-0.194 (0.170)	-0.355* (0.248)	-0.358** (0.171)	-0.309** (0.181)
3	-0.346** (0.162)	-0.365*** (0.145)	-0.332** (0.165)	-0.301* (0.208)	-0.438** (0.217)	-0.347** (0.188)
4	-0.507*** (0.185)	-0.645*** (0.110)	-0.456*** (0.110)	-0.282** (0.157)	-0.498*** (0.147)	-0.167** (0.086)
5	-0.429** (0.231)	-0.623*** (0.135)	-0.295*** (0.121)	-0.078 (0.135)	-0.382*** (0.150)	-0.083 (0.098)
Treated cases	47	44	21	38	35	16
Observations	851	743	455	622	528	349

Source: Authors' calculations.

Note: * p≤0.10, ** p≤0.05, *** p≤0.01. Standard errors clustered by country in parentheses. Treated cases and observations reported for year of signing.

Table B.5: LP-DID Effect of IMF Participation on Log Private GFCF, Estimate and Standard Error, Concessional Programs Only, 1990-2024

Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
Time since program start	*3-year non-absorbing lag*			*5-year non-absorbing lag*		
-2	-0.031 (0.068)	-0.017 (0.064)	0.037 (0.069)	-0.149** (0.065)	-0.050 (0.090)	-0.023 (0.067)
-1						
0	-0.112 (0.131)	-0.064 (0.094)	0.019 (0.153)	-0.025 (0.232)	-0.016 (0.166)	0.027 (0.236)
1	-0.225** (0.109)	-0.092 (0.101)	-0.167* (0.123)	-0.165 (0.225)	-0.289* (0.186)	-0.248* (0.193)
2	-0.155 (0.135)	-0.153* (0.103)	-0.137 (0.158)	-0.150 (0.237)	-0.268* (0.173)	-0.213 (0.171)

Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
3	-0.149 (0.159)	-0.218* (0.153)	-0.241* (0.161)	-0.089 (0.236)	-0.360* (0.230)	-0.261* (0.191)
4	-0.403** (0.198)	-0.518*** (0.143)	-0.299*** (0.090)	-0.228 (0.186)	-0.430** (0.206)	-0.149* (0.115)
5	-0.319* (0.232)	-0.483*** (0.171)	-0.171* (0.113)	-0.021 (0.170)	-0.282* (0.211)	-0.085 (0.114)
Treated cases	31	28	14	26	23	12
Observations	600	495	329	441	350	251

Source: Authors' calculations.

Note: * p≤0.10, ** p≤0.05, *** p≤0.01. Standard errors clustered by country in parentheses. Treated cases and observations reported for year of signing. Private GFCF with WDI data is not available for concessional programs due to sample constraints.

Appendix C: IMF data LP-DID results

Results with IMF data are generally smaller in magnitude and less likely to be statistically significant than results with WDI data. However, coefficients remain negative with some time horizons, in some specifications, showing significance. The primary methodological distinction between data sources is that IMF data is PPP adjusted, which could collapse some year-over-year variation. WDI data also includes years 2020 through 2024 with high IMF participation and poor macroeconomic performance globally. However, LP-DID does compare these recent borrowers with contemporaneous peers.

Certain specifications suggest that the impact of IMF participation on GFCF for concessional borrowers is extremely high (Table C.4). There are several reasons to be skeptical of this result. First and most importantly, the sample sizes are exceedingly small. Second, no broader sample of IMF programs suggests results in the same direction. Third, the result is not robust across model specifications.

Table C.1: LP-DID Effect of IMF Participation on Log Total GFCF, Estimate and Standard Error, All IMF Programs Excluding RST, 1990-2019

Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
Time since program start	***3-year non-absorbing lag***			***5-year non-absorbing lag***		
-2	-0.052 (0.095)	0.091 (0.080)	0.144* (0.101)	-0.025 (0.055)	-0.019 (0.043)	-0.018 (0.026)
-1						
0	-0.081* (0.062)	-0.048 (0.056)	0.001 (0.073)	-0.095 (0.078)	0.002 (0.049)	-0.016 (0.051)
1	-0.095* (0.073)	0.027 (0.082)	-0.112 (0.087)	-0.096 (0.088)	-0.066 (0.102)	-0.100 (0.123)

Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
2	-0.165** (0.074)	-0.078 (0.071)	-0.066 (0.087)	-0.195** (0.084)	-0.145* (0.095)	-0.078 (0.117)
3	-0.163** (0.098)	-0.135* (0.095)	-0.201* (0.124)	-0.177* (0.120)	-0.208** (0.123)	-0.133 (0.157)
4	-0.202** (0.105)	-0.175* (0.120)	-0.219** (0.124)	-0.227** (0.131)	-0.282* (0.174)	-0.205* (0.158)
5	-0.143 (0.114)	-0.156* (0.118)	-0.207* (0.130)	-0.157 (0.137)	-0.254* (0.156)	-0.163 (0.142)
Treated cases	93	73	43	75	57	32
Observations	2796	2136	1427	2519	1944	1335

Source: Authors' calculations.

Note: * p≤0.10, ** p≤0.05, *** p≤0.01. Standard errors clustered by country in parentheses. Treated cases and observations reported for year of signing.

Table C.2: LP-DID Effect of IMF Participation on Log Total GFCF, Estimate and Standard Error, Non-Precautionary Programs, 1990-2019

Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
Time since program start	*3-year non-absorbing lag*			*5-year non-absorbing lag*		
-2	-0.128 (0.111)	0.007 (0.078)	0.053 (0.077)	-0.085* (0.060)	-0.075** (0.034)	-0.038* (0.024)
-1						
0	-0.150*** (0.053)	-0.092** (0.051)	-0.069 (0.055)	-0.196*** (0.065)	-0.012 (0.061)	-0.030 (0.058)
1	-0.156** (0.071)	-0.023 (0.096)	-0.157* (0.102)	-0.199*** (0.079)	-0.127 (0.138)	-0.122 (0.135)
2	-0.172** (0.087)	-0.077 (0.077)	-0.096 (0.101)	-0.203** (0.100)	-0.067 (0.099)	-0.062 (0.134)
3	-0.188* (0.120)	-0.091 (0.117)	-0.127 (0.142)	-0.240** (0.143)	-0.141 (0.147)	-0.157 (0.168)
4	-0.185 (0.146)	-0.101 (0.172)	-0.073 (0.180)	-0.177 (0.167)	-0.068 (0.159)	-0.137 (0.229)
5	-0.206 (0.181)	-0.151 (0.165)	-0.016 (0.176)	-0.176 (0.209)	-0.077 (0.175)	-0.102 (0.192)
Treated cases	82	65	38	65	50	28
Observations	1671	1157	808	1210	798	586

Source: Authors' calculations.

Note: * p≤0.10, ** p≤0.05, *** p≤0.01. Standard errors clustered by country in parentheses. Treated cases and observations reported for year of signing.

Table C.3: LP-DID Effect of IMF Participation on Log Total GFCF, Estimate and Standard Error, Non-Concessional Programs, 1990-2019

Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
Time since program start	*3-year non-absorbing lag*			*5-year non-absorbing lag*		
-2	0.056 (0.047)	0.019 (0.059)	0.046 (0.061)	0.013 (0.052)	-0.042 (0.048)	-0.024* (0.018)
-1						
0	-0.090* (0.068)	-0.055 (0.046)	-0.056 (0.051)	-0.110 (0.087)	-0.019 (0.050)	-0.020 (0.054)
1	-0.091 (0.093)	-0.012 (0.077)	-0.138* (0.089)	-0.048 (0.108)	-0.084 (0.103)	-0.070 (0.105)
2	-0.163** (0.099)	-0.087 (0.077)	-0.064 (0.107)	-0.109 (0.097)	-0.057 (0.086)	-0.035 (0.118)
3	-0.250** (0.147)	-0.169* (0.131)	-0.126 (0.132)	-0.166 (0.153)	-0.105 (0.140)	-0.098 (0.145)
4	-0.178 (0.160)	-0.166 (0.144)	-0.055 (0.126)	0.017 (0.106)	0.007 (0.119)	-0.016 (0.134)
5	-0.103 (0.173)	-0.142 (0.142)	-0.052 (0.116)	0.087 (0.144)	0.020 (0.138)	-0.034 (0.132)
Treated cases	59	46	27	51	38	21
Observations	1217	774	549	889	530	388

Source: Authors' calculations.

Note: * p≤0.10, ** p≤0.05, *** p≤0.01. Standard errors clustered by country in parentheses. Treated cases and observations reported for year of signing.

Table C.4: LP-DID Effect of IMF Participation on Log Total GFCF, Estimate and Standard Error, Concessional Programs, 1990-2019

Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
Time since program start	*3-year non-absorbing lag*			*5-year non-absorbing lag*		
-2	-0.186* (0.116)	0.000*** (0.000)	0.000*** (0.000)	-0.241** (0.132)	0.000*** (0.000)	0.000*** (0.000)
-1						
0	-0.251*** (0.096)	-0.065 (0.119)	0.166*** (0.043)	-0.383*** (0.080)	-0.000** (0.000)	-0.000*** (0.000)
1	-0.096 (0.114)	0.573*** (0.229)	0.236** (0.112)	-0.275*** (0.054)	-0.000 (0.000)	-0.000** (0.000)
2	-0.146 (0.126)	0.139* (0.107)	0.297*** (0.064)	-0.311*** (0.116)	-0.000 (0.000)	-0.000* (0.000)

Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
3	0.014 (0.237)	0.372*** (0.090)	0.509*** (0.066)	-0.193 (0.349)	-0.000 (0.000)	-0.000 (0.000)
4	-0.039 (0.358)	0.760*** (0.066)	0.737*** (0.081)	-0.214 (0.418)	0.000 (0.000)	-0.000 (0.000)
5	0.020 (0.462)	0.784*** (0.058)	0.771*** (0.076)	-0.228 (0.519)	0.000 (0.000)	-0.000 (0.000)
Treated cases	38	29	16	28	21	11
Observations	1473	970	690	1082	678	512

Source: Authors' calculations.

Note: * p≤0.10, ** p≤0.05, *** p≤0.01. Standard errors clustered by country in parentheses. Treated cases and observations reported for year of signing.

Table C.5: LP-DID Effect of IMF Participation on Log Private GFCF, Estimate and Standard Error, All IMF Programs Excluding RST, 1990-2019

Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
Time since program start	*3-year non-absorbing lag*			*5-year non-absorbing lag*		
-2	-0.046 (0.120)	0.083 (0.111)	0.212* (0.131)	-0.030 (0.079)	-0.051 (0.074)	-0.000 (0.068)
-1						
0	-0.072 (0.081)	-0.051 (0.082)	0.075 (0.119)	-0.012 (0.108)	0.022 (0.081)	0.016 (0.116)
1	-0.072 (0.104)	0.005 (0.086)	-0.127* (0.099)	-0.102 (0.137)	-0.108 (0.119)	-0.140 (0.134)
2	-0.193** (0.103)	-0.128 (0.113)	-0.004 (0.140)	-0.236** (0.131)	-0.286** (0.152)	-0.091 (0.148)
3	-0.412** (0.208)	-0.418* (0.268)	-0.183 (0.154)	-0.521** (0.309)	-0.706* (0.495)	-0.199 (0.186)
4	-0.266** (0.136)	-0.301** (0.153)	-0.308** (0.164)	-0.232* (0.159)	-0.376** (0.214)	-0.238* (0.165)
5	-0.156 (0.125)	-0.223* (0.136)	-0.203* (0.145)	-0.141 (0.150)	-0.308** (0.185)	-0.173 (0.164)
Treated cases	93	73	43	75	57	32
Observations	2796	2136	1427	2519	1944	1335

Source: Authors' calculations.

Note: * p≤0.10, ** p≤0.05, *** p≤0.01. Standard errors clustered by country in parentheses. Treated cases and observations reported for year of signing.

Table C.6: LP-DID Effect of IMF Participation on Log Private GFCF, Estimate and Standard Error, Non-Precautionary Programs, 1990-2019

Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
Time since program start	*3-year non-absorbing lag*			*5-year non-absorbing lag*		
-2	-0.124 (0.138)	0.050 (0.085)	0.090 (0.093)	-0.079 (0.069)	-0.029 (0.036)	-0.021 (0.036)
-1						
0	-0.163*** (0.064)	-0.119* (0.090)	0.046 (0.101)	-0.129* (0.093)	0.025 (0.095)	0.044 (0.121)
1	-0.165** (0.097)	-0.009 (0.110)	-0.137 (0.121)	-0.265** (0.118)	-0.201 (0.162)	-0.182 (0.157)
2	-0.215** (0.105)	-0.094 (0.095)	-0.018 (0.129)	-0.246** (0.128)	-0.101 (0.134)	-0.021 (0.185)
3	-0.162 (0.133)	-0.068 (0.130)	-0.141 (0.163)	-0.238* (0.152)	-0.160 (0.168)	-0.217 (0.189)
4	-0.135 (0.169)	-0.021 (0.192)	-0.043 (0.190)	-0.187 (0.184)	-0.066 (0.155)	-0.181 (0.211)
5	-0.209 (0.183)	-0.112 (0.171)	0.034 (0.178)	-0.221 (0.197)	-0.038 (0.170)	-0.026 (0.218)
Treated cases	82	65	38	65	50	28
Observations	1671	1157	808	1210	798	586

Source: Authors' calculations.

Note: * p≤0.10, ** p≤0.05, *** p≤0.01. Standard errors clustered by country in parentheses. Treated cases and observations reported for year of signing.

Table C.7: LP-DID Effect of IMF Participation on Log Private GFCF, Estimate and Standard Error, Non-Concessional Programs, 1990-2019

Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
Time since program start	*3-year non-absorbing lag*			*5-year non-absorbing lag*		
-2	0.038 (0.094)	0.074 (0.076)	0.111 (0.096)	-0.042 (0.124)	0.005 (0.060)	0.006 (0.032)
-1						
0	-0.088 (0.083)	-0.106* (0.083)	-0.027 (0.082)	-0.026 (0.118)	-0.005 (0.073)	0.012 (0.096)
1	-0.014 (0.128)	-0.009 (0.094)	-0.180** (0.107)	0.023 (0.166)	-0.122 (0.125)	-0.135 (0.136)
2	-0.160* (0.121)	-0.113 (0.096)	-0.091 (0.119)	-0.068 (0.132)	-0.109 (0.115)	-0.079 (0.141)

Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
3	-0.340** (0.153)	-0.159 (0.149)	-0.150 (0.144)	-0.296** (0.157)	-0.135 (0.165)	-0.146 (0.167)
4	-0.128 (0.172)	-0.127 (0.157)	-0.060 (0.143)	0.033 (0.125)	-0.004 (0.151)	-0.110 (0.155)
5	-0.054 (0.188)	-0.106 (0.159)	-0.041 (0.145)	0.123 (0.160)	0.043 (0.163)	-0.064 (0.160)
Treated cases	59	46	27	51	38	21
Observations	1217	774	549	889	530	388

Source: Authors' calculations.

Note: * p≤0.10, ** p≤0.05, *** p≤0.01. Standard errors clustered by country in parentheses. Treated cases and observations reported for year of signing.

Table C.8: LP-DID Effect of IMF Participation on Log Private GFCF, Estimate and Standard Error, Concessional Programs, 1990-2019

Controls	None	Baseline	Baseline and real interest	None	Baseline	Baseline and real interest
Time since program start	*3 year non-absorbing lag*			*5 year non-absorbing lag*		
-2	-0.086 (0.167)	0.000*** (0.000)	0.000*** (0.000)	-0.153 (0.145)	0.000** (0.000)	0.000** (0.000)
-1						
0	-0.207** (0.115)	-0.081 (0.257)	0.478*** (0.095)	-0.302*** (0.107)	-0.000 (0.000)	-0.000 (0.000)
1	-0.249* (0.152)	0.630*** (0.164)	0.568*** (0.149)	-0.469*** (0.096)	0.000 (0.000)	-0.000 (0.000)
2	-0.258** (0.149)	-0.012 (0.359)	0.546*** (0.070)	-0.421*** (0.096)	0.000 (0.000)	0.000 (0.000)
3	-0.109 (0.238)	0.414** (0.217)	0.690*** (0.088)	-0.428** (0.260)	0.000 (0.000)	0.000 (0.000)
4	-0.074 (0.368)	1.109*** (0.097)	0.993*** (0.096)	-0.357 (0.341)	0.000 (0.000)	0.000 (0.000)
5	-0.012 (0.456)	0.943*** (0.107)	0.860*** (0.130)	-0.338 (0.453)	0.000 (0.000)	0.000 (0.000)
Treated cases	38	29	16	28	21	11
Observations	1473	970	690	1082	678	512

Source: Authors' calculations.

Note: * p≤0.10, ** p≤0.05, *** p≤0.01. Standard errors clustered by country in parentheses. Treated cases and observations reported for year of signing.

Appendix D: Propensity Score Matching Results

The propensity score matching implementation follows the methodology of Bird et al. (2021). These authors use several predictors of IMF participation, based on prior literature consensus, to fit an estimate of each country-year's probability of IMF entry. Nearest neighbor matching based on predicted propensity score facilitates a comparison between IMF participants and observations with similar likelihoods of IMF entry. Comparable matching implementations are a common technique to address endogeneity in IMF program allocation (Balima and Sokolova, 2021). Other matching precedents include Bird and Rowlands (2017) and Nelson and Wallace (2017).

Matching techniques are susceptible to selection bias based on unobserved criteria. For IMF participants, an unobservable but relevant factor may be the government's will to implement productive policies. Some scholars with this concern have dismissed the validity of typical matching techniques for IMF evaluation altogether (Bas and Stone 2014; Stubbs et al. 2018). Propensity score matching also requires outcome variables suitable for cross country comparison. For this reason, we rely on GFCF as percentage of GDP within this technique. There is some risk that programs' GDP impacts, whether positive or negative, muddle GFCF interpretation.

Matching remains an appealing technique in the IMF literature because it does not require the identification of a valid exogenous instrument, like instrumental variable techniques (Stubbs et al. 2018; Pan et al. 2026). There are also many uncontroversial predictors of IMF participation to form a pro-pensity score. We consider matching results an incomplete but nevertheless useful benchmark for consideration.

Bird et al. (2021) form their participation equation by fitting a logit model of several lagged predictors of IMF participation, using robust standard errors. They iteratively drop the least significant predictor from the equation until only relevant covariates remain. We follow this same process. See Appendix A for all utilized predictors, some of which do not appear in any final participation equation.

In keeping with Bird et al. (2021), there are different participation equations for IMF programs in general, strictly concessional programs, and non-concessional. We also add a non-precautionary participation equation to exclude instances in which countries sign an IMF agreement without intending to draw on available funds. Presumably, precautionary programs have different motivations and designs than non-precautionary lending. The precautionary distinction is documented at program signing. Only countries signing a new IMF agreement or not participating in one appear in the matching sample. We exclude signings in which a country already had a program the previous year.

Table D.1 shows the marginal effect and Z statistic of coefficients in the estimated participation equations. In comparison to Bird et al. (2021), our models settle on fewer predictors. Our sample is also larger, because we include more countries and have a more recent end date.

Table D.1: IMF Participation Equations: Marginal Effect on Probability of Signing an IMF Agreement, Average Marginal Effect and Z-Score

Lagged predictor	All IMF	Non-concessional	Concessional	Non-precautionary
IMF history	0.0534*** (3.25)	0.0284** (2.24)		0.0357** (2.25)
Current account balance dummy	0.0364** (2.47)		0.0387*** (3.57)	
Crisis year dummy	0.0672** (2.47)	0.0408* (1.90)		0.0435 (1.59)
Exports % GDP	-0.0013*** (-3.31)		-0.0009*** (-3.09)	-0.0015*** (-3.57)
Inflation	0.0001** (2.16)			0.0001** (2.41)
Reserves in months of imports	-0.0121*** (-5.34)	-0.0079*** (-4.04)	-0.0054*** (-3.87)	-0.0140*** (-5.71)
Debt Service % GNI		0.0019*** (2.78)		
External Debt % GNI				0.0003** (2.27)
Observations	1,541	1,758	1,667	1,376

Source: Authors' calculations.
Note: *, **, *** indicate significance at 0.10, 0.05 and 0.01 respectively.

Table D.2 shows the average effect of treatment on the treated (ATT) from nearest neighbor matching using the IMF participation equation propensity scores. Estimates appear for 0, 1 and 2 years since program start. For all programs and non-precautionary programs, the effect is negative. However, it is never statistically significant. The effect is positive and nonsignificant for concessional programs. The magnitudes are most often small, less than one percent of GDP with the exception of non-concessional programs.

Table D.2: The Effect of IMF Participation on Gross Fixed Capital Formation % GDP, 1990-2023, Propensity Score Matching ATT and P-Value

Years since IMF entry	IMF	Non-concessional	Concessional	Non-precautionary
0	-0.9165 (0.363)	-1.0013 (0.457)	0.0394 (0.977)	-0.5380 (0.605)
1	-0.8286 (0.372)	-1.4090 (0.226)	0.5899 (0.682)	-0.4589 (0.644)
2	-0.1925 (0.839)	-1.6251 (0.163)	2.1702 (0.147)	0.2335 (0.824)
Observations (year of entry)	236	148	102	198
Countries	81	65	52	77

Source: Authors' calculations.

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Table D.3 shows propensity score matching results for private GFCF as percentage of GDP. In alignment with total GFCF, coefficients are not statistically significant, but they are universally positive. The lowest p-value is 0.066 for countries in the first year of a non-concessional IMF agreement. The coefficient indicates an increase in private capital formation of over 3 percent of GDP, but there are no statistically significant results in other years for the same program type or across other program types.

Table D.3: The Effect of IMF Participation on Private Gross Fixed Capital Formation % GDP, 1990-2023, Propensity Score Matching ATT and P-Value

Years since IMF entry	IMF	Non-concessional	Concessional	Non-precautionary
0	1.5553 (0.281)	3.0790* (0.066)	0.6246 (0.784)	0.9646 (0.556)
1	1.2300 (0.326)	2.0864 (0.111)	1.1279 (0.603)	0.7404 (0.600)
2	3.2349 (0.104)	1.8386 (0.150)	4.8399 (0.266)	3.0374 (0.182)
Observations (year of entry)	116	74	50	100
Countries	41	35	28	41

Source: Authors' calculations.

Interpreting matching results can be challenging because outcomes appear as percentage of GDP. Shrinking GDP with stable or falling capital formation can appear as an increase. If IMF programs raised GDP with significant increases in GFCF, the overall proportion of GFCF in GDP might not change in a coherent manner. However, elevated GFCF as percent GDP would indicate a shift in economies towards more capital intensive production and stimulated real investment. Matching provides no strong evidence such a shift typically occurs in IMF participants.