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# Stigma or cushion? IMF programs and sovereign creditworthiness

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ABSTRACT

Policymakers in crisis countries often hesitate to enter IMF programs out of the fear that they trigger adverse reactions on financial markets. We explain why credit ratings and investor assessments are reliable measures of creditworthiness during crises, and examine how IMF programs affect them with three distinct identification strategies. The first strategy exploits the differential effect of changes in IMF liquidity on loan allocation as an instrument, the second uses the exact timing of program agreements, and the third provides text-based evidence from rating agency statements. When accounting for endogenous selection, we find that IMF programs help countries regain their creditworthiness. Even though IMF programs tend to result in economic contractions, the agreement on a program is perceived as a positive signal on financial markets. Our text-based analysis supports this signaling effect and suggests that the content of programs matters for how they are perceived.

## 1. Introduction

In the early 2000s, the International Monetary Fund (IMF) was widely considered to be in terminal decline. The demand for its loan programs at a record low, the IMF reduced the size of its staff and focused on its "surveillance" activities (Reinhart and Trebesch, 2016). The 2008 global financial crisis and the ensuing sovereign debt crises, however, re-established the crucial role that the IMF plays for the global economy. With the IMF's financial commitments reaching new all-time highs in the 2010s, pressing questions about the role and effectiveness of the "most powerful international institution in history" (Stone, 2002, p.1) re-emerge.[1]

We take this resurgence of the IMF's lending activities as a motivation to evaluate how successful the IMF is in achieving one of its core mandates, namely helping countries overcome balance-of-payments problems. As these problems usually manifest themselves in both the government and private companies facing severe limitations in access to foreign capital, we focus on restoring market and investor confidence as a key outcome to evaluate the IMF's success.

We consider this an urgent task for development economists, not only because of the IMF's widespread engagement in the developing world (see Fig. 1), but also because the IMF's effectiveness in this regard has recently been questioned by policy-makers. Out of fear of a 'stigma' associated with the use of IMF resources triggering adverse market reactions, countries are often hesitant to enter IMF programs and question their benefits (Essers and Ide, 2019; IMF, 2017; Reinhart and Trebesch, 2016). Economists so far have no clear answer to this. This is not only due to the alleged decline of the IMF, which reduced scholarly interest in the topic, but also because of the empirical challenges associated with assessing its effectiveness (Stubbs et al., 2018).

We begin our analysis of this question by illustrating the problem of endogenous selection into IMF programs. To measure market confidence in a country's creditworthiness, we use a large monthly panel data set of sovereign credit ratings from the major rating agencies as well as assessments from professional investors and data on bond spreads. Combined with start dates of IMF programs, these data unambiguously indicate that countries typically sign IMF agreements while their creditworthiness is already in severe decline. Thus, there is a substantial negative selection effect that biases any estimates of the IMF's effect on creditworthiness downwards when estimation strategies do not adequately account for this.

We apply several empirical approaches to circumvent this endogeneity problem. Our main identification strategy is based on a Bartik-style instrumental variable (IV) that combines temporal variation in the IMF's liquidity with cross-sectional variation in a country's prior probability of participating in an IMF program (see Lang, 2016). The IMF's liquidity varies primarily because of an institutional rule that requires the IMF to review the financial contributions of its members ("quotas") every five years. It thus peaks in years in which these quotas are increased and is, as we show, unrelated to global financial cycles. For identification, we

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[1] Arguably, the World Bank is of comparable importance, but with a different policy focus. For related research on the World Bank, see Kersting and Kilby (2018).

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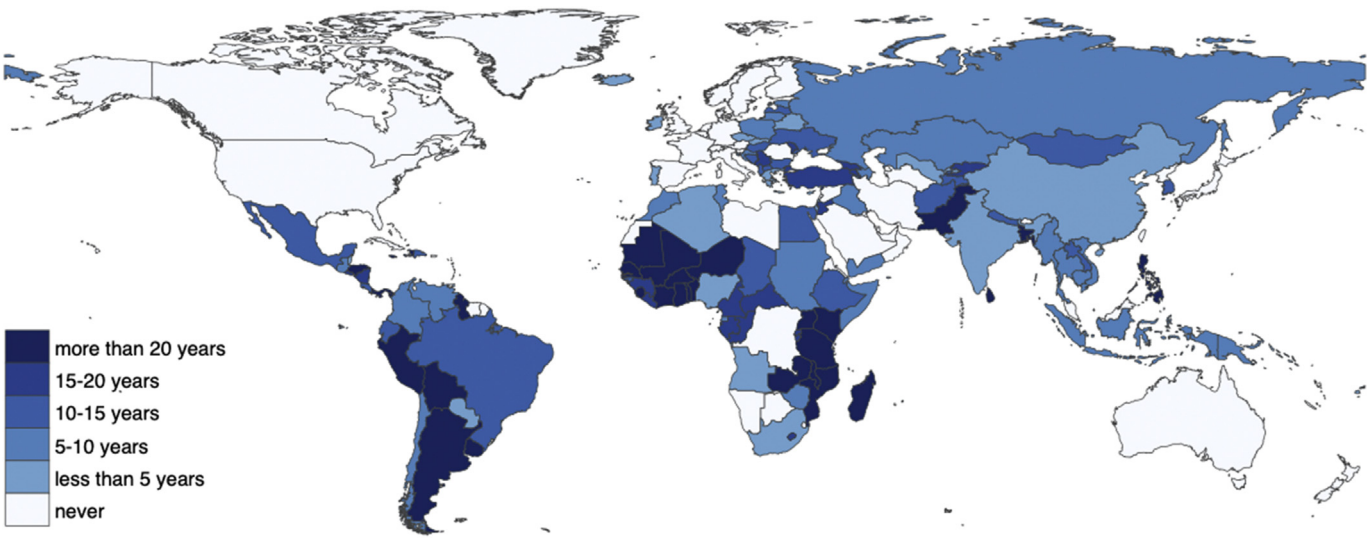


**Fig. 1.** IMF Lending, 1973–2013. Notes: years with an active IMF program in the 1973–2013 period. Own illustration. Data source: Dreher (2006, updated).

exploit the fact that the IMF tends to expand its clientele in years in which its liquidity is higher, so that countries with an initially lower participation probability are then more likely to receive a program. The identifying assumption underlying this approach, which we explain in more detail in section 3, thus follows a difference-in-differences logic.

Using annualized panel data for a maximum of 100 countries over the 1987–2013 period, we find that the simple correlation of IMF programs with sovereign debt ratings is strongly negative. As one would expect in the presence of a negative selection bias, the OLS coefficient, while remaining negative, moves increasingly close to zero when conditioning step-by-step on country fixed effects, year fixed effects, and lagged macroeconomic controls, as well as when using first-differences. We then show that the effect turns positive when switching to the IV approach. This pattern emerges irrespective of whether we focus on credit ratings issued by *Standard & Poor's*, *Moody's* or *Fitch* or when employing assessments by *Institutional Investors* based on surveys of professional investors and analysts at banks as well as money management and securities companies.

When turning to the mechanisms, we find that the aggregate estimate masks important underlying dynamics. Our evidence suggests that the immediate economic adjustments under IMF programs substantially reduce economic growth in the short run. As such contractionary effects would usually result in lower credit ratings, the overall positive effect suggests that IMF programs convey a positive signal. This signal creates positive expectations about the country's future policy path and 'cushions' the drop of creditworthiness that countries undergoing such contractionary adjustments would usually suffer from.

We, then, further examine this signaling effect. First, we use credit ratings at a monthly frequency along with information on the exact date of IMF agreements, and isolate variation within country-years with the help of country-times-year fixed effects. Event-based specifications then show that rating dynamics deteriorate before IMF agreements, but, on average, begin to improve exactly one month after programs start. These immediate improvements cannot plausibly be attributed to the success of economic adjustments and reforms, and further support the existence of a positive signaling effect.

Second, to better understand the nature of this signaling effect this, we conduct a systematic text analysis of statements about the IMF's influence on sovereign credit ratings available on the news database *Dow Jones Factiva*. Out of 117 statements from rating agencies that mention the IMF, 84 indicate a positive influence of an active IMF program on their assessment, while 32 are neutral and only one mentions a negative influence. A majority of these statements refer to the anticipated positive effects of policy reforms, implemented as part of the programs, on investor confidence. In sum, all three methods have different strengths and limitations, but together they paint a coherent picture of a positive effect of IMF programs on sovereign creditworthiness.

In the remainder of this paper, we first develop theoretical expectations regarding potential mechanisms and show how our paper contributes to the existing literature in section 2. Section 3 presents our data and identification strategies. We report and discuss the empirical results in section 4. Section 5 concludes. Online appendices A-L provide additional information on data, analyses, and robustness checks.

## 2. Potential channels and existing literature

To increase creditworthiness, IMF programs need to increase investors' confidence in the "ability and willingness of an issuer […] to meet its financial obligations in full and on time" (Standard and Poor's 2016; see also Panizza et al., 2009; Tomz and Wright, 2007). We differentiate between two main channels. A*djustment* effects are consequences of short-term changes in the country's economic and political fundamentals under IMF programs. *Signaling* effects are ratings changes caused by changes in expectations about the country's expected future policy path that the presence of an IMF program sends to credit rating agencies and investors.

### 2.1. Adjustment effects

A substantial share of differences in sovereign creditworthiness – as measured by credit ratings – is explained by a country's economic indicators like gross domestic product (GDP) per capita, GDP growth, inflation, external debt as well as political aspects like political stability and rule of law (Afonso, 2003; Cantor and Packer, 1996; Fuchs and Gehring, 2017; Hill et al., 2010). If IMF programs improve (or impair) these economic and political variables, they could improve (or impair) creditworthiness via these "adjustment effects."

The previous literature on the IMF examines how several of these indicators are influenced by IMF programs (see reviews in Dreher and Lang, 2019 and Steinwand and Stone, 2008). Regarding monetary and

financial stability, as measured by the likelihood of experiencing banking or currency crises, the literature tends to find positive effects of IMF programs (e.g., Dreher and Walter, 2010; Papi et al., 2015; Steinwand and Stone, 2008).

The IMF's track record is more negative as far as its effect on economic growth is concerned. While some studies find a positive (Bas and Stone, 2014) or insignificant (Atoyan and Conway, 2006) effect, the majority of empirical studies suggest immediate negative effects on total economic output (Barro and Lee 2005; Dreher, 2006; Easterly, 2005; Marchesi and Sirtori, 2011; Przeworkski and Vreeland, 2000). What is more, these burdens of economic adjustments are often unequally distributed, leading to rising inequality (Forster et al., 2019; Lang, 2016; Oberdabernig, 2013; Vreeland, 2002). These adverse distributional effects, in turn, are often considered to be the reasons for why studies focusing on political outcomes, also largely find negative effects: IMF programs were found to lead to a higher risk of civil war (Hartzell et al., 2010), of coup d'états (Casper, 2017), and of government crises (Dreher and Gassebner, 2012).

In sum, this literature suggests that IMF programs could affect creditworthiness through a range of political and economic effects, but does not unambiguously indicate whether this effect via the *adjustment* channel will be positive or negative.

### 2.2. Signaling effects

Sovereign credit ratings, as assessments of a future default probability, are based not only on information about a country's current economic and political performance, but also on expectations of the country's future development (Fuchs and Gehring, 2017). As economic indicators, like GDP and inflation are imperfect and noisy measures, it is rational for investors and rating agencies to use other signals to infer information and adapt their assessment. Any signal that gives an indication about the country's future policy path will influence this expectation. IMF programs can plausibly serve as such a signal.

On the one hand, turning to the IMF may reveal negative information about a country'seconomic conditions indicating that problems are more severe than its indicators suggest (Andone and Scheubel, 2017; Bas and Stone, 2014; Ito, 2012). The IMF (2014) itself is worried that countries under its loan programs carry a "stigma" that triggers adverse market reactions (see also Reinhart and Trebesch, 2016, Essers and Ide, 2019).[2] Our background research and interviews with IMF staff at the IMF's headquarters revealed that, in the recent past, several countries did indeed hesitate to sign Fund agreements out of fear of such a stigma.[3] In a recent statement on lending reforms the IMF, 2017 states: "[a] key objective of the lending reform is to reduce the perceived stigma of borrowing from the IMF."

On the other hand, IMF programs can function as a "seal of approval" (Polak, 1991). The Fund itself claims that "IMF resources provide a *cushion* that eases the adjustment policies and reforms that a country must make to correct its balance of payments problem" (IMF, 2016a, emphasis added). With regard to the perception of those reforms, the IMF functions as a "screening device" about reform quality (Marchesi and Thomas, 1999), that can "lend credibility" (Stone, 2002) and function as a commitment device to overcome time consistency problems (Dreher, 2009).[4] Thus, the IMF could positively affect expectations about the reforms' effects on macroeconomic performance (Edwards, 2006; Mody and Saravia, 2006; Corsetti et al., 2006; Morris and Shin, 2006).

Existing empirical studies linking IMF programs with creditworthiness have produced often negative, but overall inconsistent results. In an early literature review, Bird and Rowlands (2002) conclude that IMF programs reduce capital inflows. Subsequent studies found negative effects (Bird and Rowlands, 2009; Edwards, 2006; Jensen, 2004), insignificant results (Rowlands, 2001) or evidence for heterogeneous effects on capital inflows (Bauer et al., 2012; Biglaiser and DeRouen, 2010; Woo, 2013). Jorra (2012) finds an increased probability of sovereign default as a consequence of IMF lending. In the literature that uses bond spreads as the outcome, Mody and Saravia (2006) and Eichengreen et al. (2006) find an association with lower bond spreads in some IMF program countries. Chapman et al. (2015) report that implementing an IMF program is associated with higher bond spreads, but find loan size and conditionality to lead to important heterogeneities.

In line with the literature reviews by Steinwand and Stone (2008) and Bauer et al. (2012), we argue that the inconsistency in this literature, is likely due to a) issues with the proxies that are used as outcome variables and b) issues with the way that selection bias is accounted for. In the subsequent section, we describe how our approach attempts to solve these two problems.

## 3. Data and identification

### 3.1. Measuring creditworthiness: sovereign credit ratings

Our main proxy to measure the creditworthiness of a country is its sovereign's long-term foreign-currency rating.[5] Sovereign credit ratings possess several features that make them good proxies for sovereign creditworthiness. First, they predict sovereign defaults (Reinhart, 2002). This makes them an informative measure of creditworthiness for countries with severe payment problems, an important feature for our research question. Second, they influence debt value and bond volatility (Kliger and Sarig, 2000) and are closely related to changes in government bond spreads for countries that have bonds traded on financial markets (Afonso et al., 2012). They thus indicate the terms at which a country can access international capital markets.

Third, many investors, particularly pension funds, insurances and, to some degree, banks, are bound by internal regulations that restrict investments to bonds that rating agencies rate as "investment-grade." This "hard-wiring" is another reason why rating changes directly affect refinancing costs of governments. Fourth, ratings serve as a de-facto ceiling for credit ratings of private companies from the respective country (Borensztein et al., 2013), and hence also capture the private sector's ease of access to foreign capital.

For our baseline analysis, we use hand-collected ratings from *Standard and Poor's* (S&P), which offers the broadest country coverage over the longest time period.[6] In additional analyses, we use ratings from the other two of the "Big Three" agencies – *Moody's* and *Fitch* – to show that differences across agencies do not drive the results. All ratings are translated to a 21-point scale, assigning the highest value for a "AAA" rating, while "C" and below translates into a value of one. This is a standard approach in the literature (Hill et al., 2010).[7] In normal times,

[2] Note that some observers also use the term "IMF stigma" to refer to the notion that policy-makers fear entering IMF programs because it weakens their political reputation by indicating that they implicitly admit to having made mistakes. Our definition focuses on the potentially negative signals that IMF programs send to financial markets.

[3] Conversations with several IMF employees in the period between November 2016 and November 2017.

[4] This conjecture is in line the literature on the effects of membership in international organizations more broadly (Dreher and Lang, 2019). Membership in international organizations can improve borrowing conditions and increase inflows of foreign capital (Dreher et al., 2015; Dreher and Voigt, 2011; Gray, 2009, 2013).

[5] Many developing countries issue foreign-currency debt to be able to access international financial markets (Caballero and Krishnamurthy 2003).

[6] S&P covers most high- and middle-income countries, and more low-income countries compared to other agencies. The IMF itself – jointly with the World Bank – rates the risk of debt distress of low-income countries under the Debt Sustainability Framework (see Lang and Presbitero, 2018).

[7] Robustness tests in Appendix G show that results hold for alternative ways to translate ratings into numerical scales.

agencies update ratings regularly at a monthly, biyearly or yearly frequency, and ratings show little short-term fluctuations. In times of crisis, however, multiple changes within a year are common. Appendix B provides more background. The yearly regressions use the rating at the end of the year, the monthly regressions the one at the end of the month.

Alternative measures of creditworthiness that have been used in the previous literature are foreign direct investment (FDI), indicators of sovereign default, and governments bond spreads. In our view, credit ratings have advantages over these measures. FDI flows are certainly influenced by creditworthiness, but also by many other factors like economic openness. While FDI flows are a useful measure for several research questions on IMF programs, ratings are the more direct and precise proxy for creditworthiness. Defaults, as a second alternative, are very rare events that only capture an extreme end of the distribution of countries' creditworthiness. Compared to defaults, which ratings also capture, ratings provide a more fine-grained assessment and indicate a wider spectrum of balance-of-payments problems.

Bond spreads are the third and, arguably, the best alternative measure. As market prices, they aggregate the opinions of all market participants. However, their main disadvantage relative to ratings is that they cover fewer countries and years, and are available only for countries that have already (re-)accessed international capital markets. Moreover, bond spreads of developing countries can be heavily affected by general market conditions such as shifts in demand for different asset classes (e.g., fixed income vs. equity) and risk categories (e.g., flight into quality). Furthermore, in times of crisis, liquidity for some bonds from developing countries can be low, making prices less informative. Finally, prices are influenced by demand and supply. During the types of crises that require an IMF engagement, countries often – endogenously – stop or reduce the issuance of bonds, which influences supply, and makes bond spreads a noisier signal. Nevertheless, to also make use of the advantages of bond spreads as market outcomes, we replicate the main analyses with bond spreads as the dependent variable in Appendix J.

### 3.2. Treatment variable

The explanatory variable of interest – or "treatment" variable – *IMFprogram*, is an indicator that takes the value of one if country *i* was under an IMF program for at least five months in year *t* (as in Dreher, 2006).[8] Following the previous literature, our definition encompasses all IMF programs under any of the following facilities: Stand-By-Arrangements (SBA), the Extended Fund Facility (EFF), the Structural Adjustment Facility (SAF), or the Poverty Reduction and Growth Facility (PRGF).[9] In alternative specifications, we also use the variable *IMFagreement,* which indicates only the year in which an IMF program was initially approved. In our analyses at a monthly frequency, we additionally use information on the exact date an IMF program was approved. The latter we coded based on the IMF's Monitoring of Fund Arrangements database (IMF, 2016b).

### 3.3. Endogenous selection into IMF programs

We want to know whether the presence of an IMF program in country *i* during year *t* affects the country's credit rating at the end of year *t*. The fundamental methodological issue with this question is that selection into IMF programs is obviously not random. On the contrary, "treated" countries typically experience an economic crisis when entering into a program. The more severe the crisis, the more likely that a country is under an IMF program. As a consequence, simple comparisons between

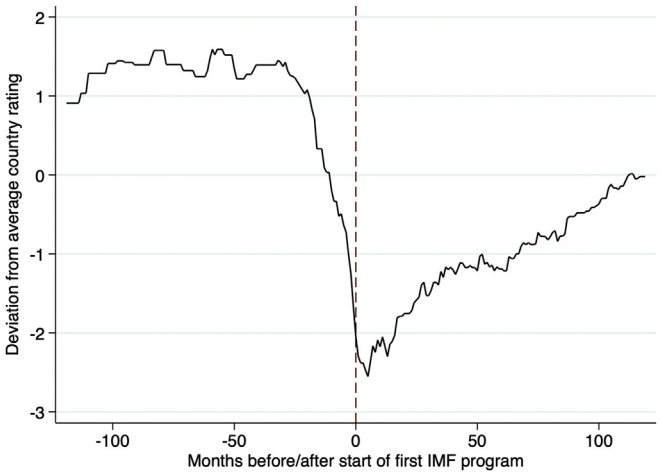


**Fig. 2.** Rating Dynamics Around Starts of IMF Programs. Note**s:** The figure plots the mean across countries of the month-specific deviation from each country's average S&P credit rating in the 1990–2013 period. The number of months around the start of the country's first IMF program of this period is on the x-axis. Sample restricted to countries with at least one IMF program. Fig. A1 in Appendix E zooms into the 12 months before and after the start of the IMF program.

treated and non-treated country-year observations will not yield causal effects, but instead will capture the negative bias resulting from omitted variables and reverse causality. The deteriorating economic conditions that make a country more likely to enter an IMF program negatively affect a country's creditworthiness, and a country with lower creditworthiness is thus more likely to receive an IMF program.

To illustrate the problem graphically, we use our monthly panel data on sovereign credit ratings as well as data on the exact date that countries enter into an IMF arrangement. Fig. 2 plots the average behavior of credit ratings around such *IMFagreements*. Specifically, on the y-axis the figure depicts the unweighted average of the month-specific deviations from each country's mean credit rating in the 1990–2013 period over all countries that received an IMF program at least once in this period.

Several important observations are evident. First, credit ratings appear to capture balance-of-payment crises well. As one would expect, countries enter into IMF programs several months after economic crises hit and creditworthiness collapses. On average, countries' credit ratings deteriorate by about three notches in the approximately one and a half years preceding the IMF program's beginning. Second, IMF programs start at a low point, but creditworthiness continues to fall for several months thereafter. After about a year, ratings begin to recover. Third, this recovery process is on average rather slow; it takes several years until creditworthiness is restored to pre-crisis levels.

Fig. 2 also illustrates the problem of endogenous selection into treatment. During the early months of IMF programs, credit ratings are at a low level, and in an ongoing process of decline, for reasons at least partly unrelated to the IMF program itself. Given that the average IMF program in our sample lasts for about three years (with large variance), simple regressions of credit ratings on variables indicating the start or presence of an IMF program are biased by the fact that programs typically start when ratings are low and trending down.

A basic model designed to estimate the effect of *IMFprogram* in year *t* on the *Rating* at the end of that year based on controlling for selection-on-observables looks like the following:

$$Rating_{i,t} = \beta\, IMFprogram_{i,t} + \boldsymbol{X}'_{i,t-1}\gamma + \delta_i + \tau_t + \varepsilon_{i,t} \quad (1)$$

In a regression equation of this type $\boldsymbol{X}$'is a vector of country-year specific observable control variables, $\delta_i$ and $\theta_t$stand for country fixed

[8] Robustness tests (Appendix G) show that results hold with an alternative variable that uses a threshold of one month in year *t* (taken from Kentikelenis et al., 2016).

[9] Appendix G shows that results hold without the PRGF, which is a longer-term form of financial assistance.

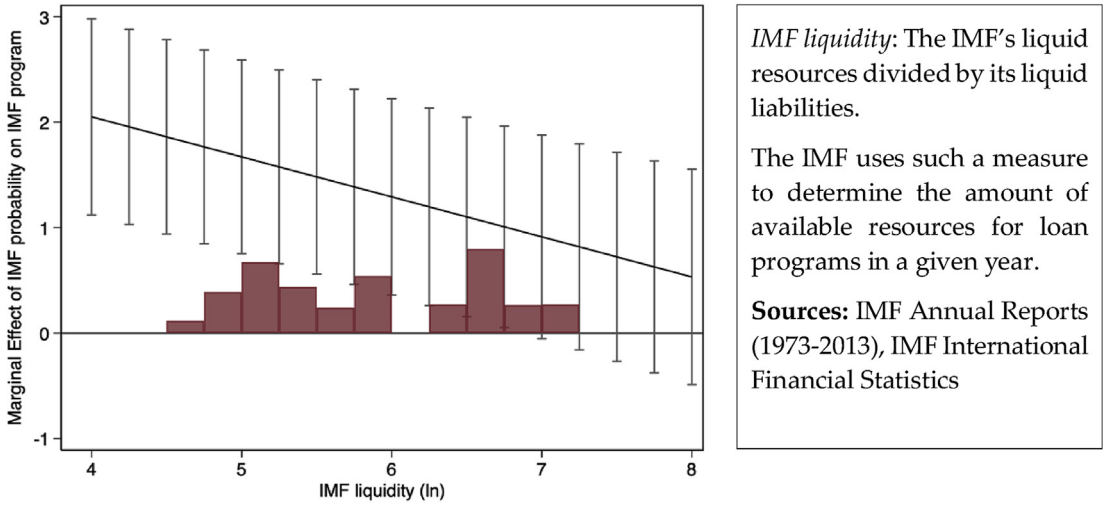


**Fig. 3.** First-Stage Effect. Notes: The figure plots the marginal effects of *IMFprobability* on *IMFprogram* for varying levels of *IMFliquidity* (along with 95% confidence intervals). It corresponds to the first-stage regression of the baseline IV regression, as reported below in column 6 of Table 1. The histogram shows the variation in liquidity over time. It becomes visible that a country's history of program participation in a strong predictor of present program participation in low-liquidity years, whereas in high-liquidity years this relationship is insignificant. This creates exogenous variation in the likelihood of receiving a program.

effects and year fixed effects, which control for unobserved time-invariant country characteristics and for year-specific global shocks that affect all countries equally. $\varepsilon_{i,t}$Is the i.i.d. error term.

We expect that the bias introduced by endogenous selection into the program is reduced but not eliminated by the fixed effects and controls variables. Formally:

$$E(IMFprogram_{i,t}\varepsilon_{i,t}) < E(IMFprogram_{i,t}\varepsilon_{i,t}|\delta_i,\ \theta_t) < E(IMFprogram_{i,t}\varepsilon_{i,t}|\boldsymbol{X}^{'},\ \delta_i,\ \theta_t) < 0 \quad (2)$$

It is natural to expect that these fixed effects reduce the negative bias in this estimation: Global financial cycles could affect both creditworthiness and the demand for IMF programs. More importantly, typical IMF program countries tend to be economically weaker and thus less creditworthy because of time-invariant country characteristics. Country-year-specific control variables can further reduce this bias because they make treatment and control groups more comparable in terms of observables. Nevertheless, such an empirical strategy is insufficient and problematic for at least three reasons.

First, the available cross-country panel data on macroeconomic and political fundamentals are unlikely to capture all information that ratings agencies, national policy-makers, and IMF staff evaluate when making decisions about creditworthiness and IMF participation. This includes information on context-specific economic vulnerabilities or political events that are taken into account. Second, even if all relevant economic and political fundamentals could be observed and measured at the country-year level, this would not solve the entire problem. Most of these indicators are available only at the yearly level – if they are available for a large panel at all – and ignore the crucial dynamics *within* a year that are highlighted in Fig. 2. Economic fundamentals in countries that will enter into IMF programs are likely to further deteriorate during the year. A focus on the available country-year-level observable controls would hence not control for these differences between treatment and control group. Third, as IMF programs last for several years and can affect the same economic and political fundamentals that also correlate with ratings, control variables need to be lagged by a substantial time period to avoid "bad control" problems. This limits their function to increase the comparability of treatment and control group.

In sum, estimation strategies that rely on controlling for selection on observables alone cannot adequately address the question at hand. Ideally, we would want a mechanism that randomly assigns countries that are on comparable trajectories to an IMF program. We approach such an ideal assignment mechanism by employing an instrumental variable (IV) that changes the likelihood that a particular country receives a program based on factors that are plausibly exogenous to the creditworthiness trajectory of this particular country.

### 3.4. Instrumental variable and first-stage results

It is well known that countries that have received IMF programs in the past are more likely to receive them in the present (Bird et al., 2004; Sturm et al., 2005). Measures indicating a country's prior probability of having participated in an IMF program – in our case the variable *IMFprobability* (defined below) – are thus strong predictors of *IMFprogram* participation. What we exploit for identification is that the influence of the prior *IMFprobability* on current *IMFprogram* participation differs conditionally on the amount of liquid resources that are available to the IMF in a given year, *IMFliquidity* (see Lang, 2016).

Specifically, in years with relatively low levels of *IMFliquidity*, IMF resources go to the more regular IMF clientele, i.e., countries that have received more IMF programs in the past. The reasons include path dependency and "recidivism" of program countries (Bird et al., 2004), political favoritism of the Fund's major shareholders (Copelovitch, 2010; Thacker, 1999), and staff incentives and preferences (Nelson, 2014). Accordingly, *IMFprobability* is a strong predictor of *IMFprogram* in these years.

However, during years in which the IMF's liquidity is high, a country's IMF participation history matters to a much lesser degree. A plausible explanation for this pattern lies in the political economy literature on the IMF that shows that international bureaucracies aim to maximize their budgets, remits, staff, relevance, and political influence (Babb and Buira, 2005; Dreher and Lang, 2019). These bureaucratic incentives contribute to the expansion of international organizations in size, power and responsibilities in an increasing number of countries (Barnett and Finnemore, 2004; Vaubel, 2006). When the IMF has substantial amounts of unused resources during high-liquidity years, this increases both bureaucratic incentives and financial opportunities to look for additional program countries beyond the more regular clientele. Anecdotal evidence from conversations with IMF staff reflects that inside the IMF there is a concern to lose relevance when many IMF resources are unused. Several IMF staff members described attempts to make loan programs more attractive for new program countries in recent, high-liquidity years (conversations in Washington, D.C., November 2016 and November 2017). Such efforts are in line with political economy models of

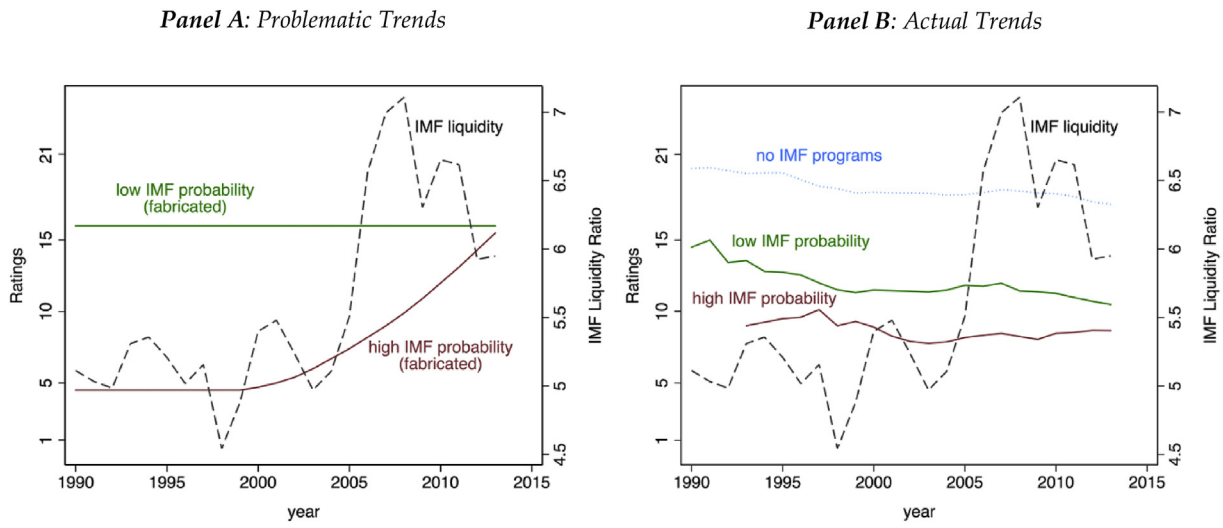


**Fig. 4.** The IMF's Liquidity Ratio and Trends in Credit Ratings. Not**es:** The dashed line is the time series of the IMF's liquidity (ln). The remaining lines plot mean credit ratings in the group of countries that have a low probability of receiving a program (green line, below 85th percentile), and a high probability (red line, above 85th percentile). **Panel A** shows a fabricated, potentially problematic case. If there is a long-term trend in high-probability countries that – for reasons unrelated to the IMF – overlaps with the long-term trend in *IMFliquidity*, this would cause a bias in our estimates of *IMFprogram* (see Christian and Barrett, 2017). Panel B shows the actual trends. There are no strong differences in low- and high-probability regions that overlap with the long-term trend in IMF liquidity. Trends are similar when using other percentiles as cutoffs. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

international organizations and increase, if successful, the probability to receive programs for countries beyond the more regular clientele.

To capture this relationship, we construct the following IV (see also Lang, 2016):

$$IV_{i,\,t} = IMFprobability_{i,\,t} \times IMFliquidity_t \tag{3}$$

*IMFprobability* is defined as the share of past years that a country was under an IMF program.[10] *IMFliquidity* denotes the IMF's time-varying liquidity ratio, which is defined as the organization's liquid resources divided by its liquid liabilities. The IMF uses such a measure to determine the amount of available resources for loan programs in a given year. It is collected from IMF Annual Reports (1973–2013) and the IMF International Financial Statistics.

We then run two-stage least squares (2SLS) panel regressions over an unbalanced sample of 100 countries in the 1987–2013 period:

$$1^{st}\ Stage:\ IMFprogram_{i,t} = \alpha_1 \left(IMFprobability_{i,t} \times IMFliquidity_t\right) + \alpha_2\, IMFprobability_{i,t} + \boldsymbol{X}'_{i,t-4}\gamma + \delta_i + \tau_t + u_{i,t} \tag{4}$$

$$2^{nd}Stage:\ Rating_{i,t^*} = \beta_1 \widehat{IMFprogram}_{i,t} + \beta_2 IMFprobability_{i,t} + \boldsymbol{X}'_{i,t-4}\gamma + \delta_i + \tau_t + \varepsilon_{i,t} \tag{5}$$

This means that we control for the initial, pre-determined *IMFprobability* in both stages while year fixed effects absorb the level effect of *IMFliquidity*. Hence, for identification we only need to assume the exogeneity of the interaction term conditional on its two constituent terms (as well as the fixed effects and the control vector $\boldsymbol{X}$, which is described below).

$$E(\varepsilon \times IMFprobability \times IMFliquidity \mid IMFprobability,\ IMFliquidity, \boldsymbol{X},\ \delta, \tau) = 0 \tag{6}$$

Fig. 3 illustrates the first-stage effect by plotting the marginal effects of *IMFprobability* on *IMFprogram* conditional on the level of *IMFliquidity*.

This strategy follows a difference-in-differences logic as in Nunn and Qian (2014) or in Temple and Van de Sijpe (2017), and is similar to shift-share or Bartik instruments (see Goldsmith-Pinkham et al., 2020). For the exclusion restriction to be violated, omitted variables would have to follow a similar time trend as the year-specific *IMFliquidity* and affect creditworthiness *differently* in countries with *different* levels of *IMFprobability*. We think this is unlikely for the following reasons.

The main source of variation of the IMF's liquidity ratio is an institutional rule in the IMF's Articles of Agreement, which requires the Fund to review the quota subscriptions of its members every five years.[11] As these quota reviews usually recommend quota increases, member countries then negotiate the specifics and get domestic approval. Once the quota increase is decided, members commit more resources, hence causing a spike in the Fund's liquid resources. Due to the predetermined schedule, the timing of these spikes is thus plausibly exogenous to creditworthiness dynamics in individual countries.

However, since the process from quota review to actual commitment of resources can take several years, the result and timing of the process

[10] We start the count of years of past IMF participation in 1973 and thus 15 years before our observation period starts. This ensures that the variable does not fluctuate strongly from one year to the next for the early years of the sample and increases the plausibility of the exclusion restriction because it is determined by earlier periods.

[11] The second source of variation in the liquidity ratio are changes in the Fund's liquid liabilities. However, only the purchases and repurchases of very few extraordinarily large loans for large countries have a sizeable effect on the IMF's overall liquid liabilities. Furthermore, most of these transactions are agreed upon years in advance and follow predetermined schedules. It is thus unlikely that the Fund's liquid liabilities are associated with future creditworthiness of individual countries. We also show that the results are robust to omitting these few cases (Appendix G). There are two additional minor sources of variation in the liquidity ratio. Changes in the Fund's basket of currencies that it considers "useable" and the Fund's borrowing from its members. Changes in the basket of useable currencies are rare and have negligible effects. Similarly, total borrowing by the Fund is zero in many years and its average share of liquid liabilities is approximately 15%.

**Table 1**
Baseline results (Standard & Poor's).

| Estimation Method | OLS (1) | OLS-FE (2) | OLS-FE (3) | OLS-FE (4) | OLS-FD (5) | IV (6) |
|---|---|---|---|---|---|---|
| IMF program | −5.858 | −1.508 | −1.356 | −0.990 | −0.135 | 2.334 |
| | [0.525] | [0.335] | [0.364] | [0.244] | [0.118] | [1.110] |
| | {0.000} | {0.000} | {0.000} | {0.000} | {0.256} | {0.036} |
| Observations | 1345 | 1345 | 1345 | 1343 | 1238 | 1343 |
| Adjusted R-squared | 0.224 | 0.096 | 0.135 | 0.311 | 0.066 | 0.100 |
| Country FE | No | Yes | Yes | Yes | No | Yes |
| Year FE | No | No | Yes | Yes | Yes | Yes |
| Controls (t-4) | No | No | No | Yes | Yes | Yes |
| **First Stage Results** | | | | | | |
| IMFprobability X IMFliquiditity | | | | | | −0.382 |
| | | | | | | [0.081] |
| | | | | | | {0.000} |
| IMFprobability | | | | | | 3.483 |
| | | | | | | [0.604] |
| | | | | | | {0.000} |
| K–P underid. p | | | | | | 0.000 |
| K–P weak id. (F-statistic) | | | | | | 22.164 |

**Notes:** The dependent variable is the country's long-term foreign-currency rating on a 21-point scale by Standard and Poor's at the end of the year. Standard errors clustered at the country level are displayed in brackets, p-values in curly brackets. Appendix D provides a comprehensive list of all economic and political controls added in column 4. Table A5 shows the full results including the controls.

could be endogenous to the state of the financial cycle and thus sovereign creditworthiness. For any such unobserved trend the following point is crucial: The identifying assumption is not directly threatened by unobserved trends that correlate with both *IMFliquidity* and credit ratings. The exclusion restriction is only in danger if such a long-term trend differs between countries with different levels of *IMFprobability*, and dominates year-on-year variation (Christian and Barrett, 2017). We illustrate an example in Fig. 4.

Assume the (fabricated) trend for low-probability countries is flat, whereas ratings of high-probability countries systematically increase over time (Panel A). This spuriously correlates with the long-term trend in *IMFliquidity*, and would create a bias in our IV estimates. Panel B shows that the actual long-term rating trends are parallel and for none of the three groups are correlated with the long-term trend in *IMFliquidity*.

We also compare the liquidity series with other global financial cycles such as global GDP cycles, capital flows to emerging economies, and the global number of systemic banking crises. As shown in Fig. A2-A7 in Appendix G, there do not seem to be problematic overlaps with these financial cycles; the correlation coefficients are −0.17, 0.22, and −0.21, respectively. Nonetheless, we further address this concern by adding interactions of these global cycles with *IMFprobability* as control variables to all our regressions to ensure that the IV only picks up variation of the liquidity ratio net of these cycles. Furthermore, we add 25 macroeconomic and political control variables that could determine credit ratings (following Fuchs and Gehring, 2017, see Appendix F) as well as the interactions of all these variables with *IMFliquidity* to account for their potentially heterogeneous influence. In sum, the control variables contain:

$$X_{i,t}'\gamma = \sum_{c=1}^{25} C_{c,i,t}\kappa_c + \sum_{c=1}^{25} C_{c,i,t} \times IMFliquidity_t\,\lambda_c + \sum_{g=1}^{3} G_{g,t} \times IMFprobability_{i,t}\eta_g \quad (7)$$

where $C_{c,i,t}$ contains the 25 macroeconomic country-year-specific controls described in Appendix D and F, while $G_{g,t}$ contains the 3 year-specific global cycles (global growth, systemic banking crises, global capital flows) described above. In addition to including these controls, the robustness section presents exercises and placebo tests.

## 4. Main results

### 4.1. Baseline: country-year level

Table 1 shows the results of six regressions of *S&P ratings* on *IMFprogram*, which eliminate selection effects step by step. In Fig. 5, we plot those results together with results of the same specifications for the other agencies and *Institutional Investor*. Overall, selection effects seem to be strong. Once the regressions take these into account, the negative relationship between IMF programs and creditworthiness disappears and turns positive.

The first specification shows the simple correlation between the treatment variable *IMFprogram* and the outcome *S&P rating*, relying on variation between and within countries. The large coefficient of nearly six rating notches to a large extent demonstrates how different countries

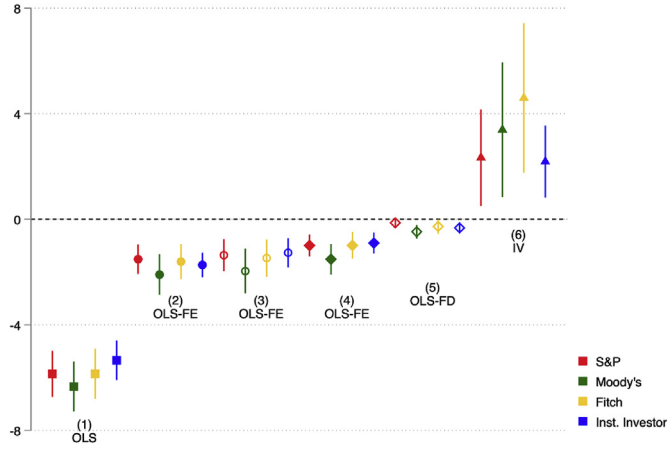


**Fig. 5.** Baseline Results (All Agencies). Notes: The figure plots the coefficients on *IMFprogram* estimated in different regressions along with 90 percent confidence intervals. Specifications 1–6 correspond to those reported in Table 1 and each specification is estimated for four different outcome variables: Ratings from S&P (red), ratings from Moody's (green), ratings from Fitch (yellow), assessment from Institutional Investor (blue). Institutional Investor assessments are rescaled to be comparable to ratings in the same graph. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

**Table 2**
Channels.

| Dependent Variable at end of year t: | GDP Growth | Inflation | Change in Government Debt | Current Account Balance | Debt restructuring |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| IMF program | −0.794 | 0.013 | 5.148 | 2.623 | 0.039 |
| | [1.454] | [0.038] | [4.248] | [4.651] | [0.052] |
| | {0.585} | {0.733} | {0.226} | {0.573} | {0.455} |
| Observations | 1343 | 1252 | 1247 | 1241 | 1343 |
| K–P underid. p | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| K–P weak id. F | 22.136 | 18.101 | 19.640 | 18.038 | 22.136 |
| Dependent Variable at end of year t+1: | GDP Growth | Inflation | Change in Government Debt | Current Account Balance | Debt restructuring |
| | (1) | (2) | (3) | (4) | (5) |
| IMF program | −3.336 | −0.002 | 1.388 | 1.505 | 0.023 |
| | [1.478] | [0.038] | [3.761] | [4.018] | [0.047] |
| | {0.024} | {0.963} | {0.712} | {0.708} | {0.621} |
| Observations | 1343 | 1162 | 1157 | 1151 | 1343 |
| K–P underid. p | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| K–P weak id. F | 22.136 | 16.748 | 17.862 | 16.455 | 22.136 |

**Notes:** Results are based on the baseline IV regression (Table 1, column 6), but with other dependent variables. All regressions include country and year FE, as well as the controls in t-4. Standard errors clustered at the country level in brackets, p-values in curly brackets.

that typically receive IMF programs are from those that do not. This becomes evident in specification 2, which conditions on country fixed effects, using only variation within countries over time. The negative point estimate of about 1.5 allows a better assessment of the extent of selection bias in OLS, still suggesting that credit ratings of a given country drop by one to two notches due to an IMF program.

Controlling for global time trends that affect both ratings and countries' likelihood of receiving an IMF program by including year fixed effects in specification 3 further lowers the point estimate in absolute terms, although to a much more limited extent. Adding controls in specification 4 to condition on the state in which countries enter into an IMF program further reduces selection bias, but the effect remains negative and statistically significant.[12] Similarly, when eliminating the influence of county-specific time-invariant omitted variables with first-differences instead of fixed effects in specification 5 – both being theoretically consistent panel estimators – the coefficient is much smaller in absolute terms compared to the pooled cross-section approach in column 1, but still negative.[13] In sum, these regressions show that we can reduce the selection problem by conditioning on observables and by applying panel methods to control for country- and time-specific omitted variables. This increases the coefficients, but they remain negative.

Then, we implement our instrumental variable approach. In the first stage, which is reported in the bottom panel of the table, the interaction term is negative and statistically significant at the one percent level. As discussed above, this shows that a high IMF liquidity increases the likelihood of IMF assistance more for the countries with an otherwise lower probability of receiving an IMF program than for those who already had a high initial probability. The IV passes the underidentification test with a p-value of less than 0.001. The Kleibergen-Paap (K–P) F-statistic is about 22, well above the rule of thumb of 10, as well as above the more conservative threshold of 16.66 proposed by Stock and Yogo (2005).

The effect of the IMF program in the second stage now turns positive with a value of 2.3. The confidence interval of the IV estimate does not contain the prior OLS estimates. Such a big difference would raise concerns in some settings, but here the change is exactly as one would expect in the presence of a large negative selection bias. The IV coefficient is less precisely estimated than the OLS coefficients, but statistically significant at the five percent level. The confidence intervals are quite wide, suggesting some heterogeneity in the effect of programs.

As Fig. 5 shows, using ratings from *Moody's* or *Fitch* yields not only the same pattern of removing selection bias by conditioning on fixed effects, controls or with first differences, but we also find a similar, positive effective when using the IV. We also examine assessments from *Institutional Investor*, which are based on surveys among investors and finance analysts (see Appendix C for details) and find the same pattern and a similar, positive IV effect.

In sum, this analysis suggests that there is no negative effect ("stigma") on perceptions of creditworthiness. Rather, IMF programs improve sovereign creditworthiness. The next section examines the underlying channels behind this positive effect.

### 4.2. Channels: adjustment vs. signaling

As discussed above, we distinguish between two main channels of how IMF interventions can influence creditworthiness. First, as IMF programs often lead to far-reaching economic reforms, they can influence a country's creditworthiness via immediate economic *adjustments*. Second, an IMF program is also a signal that can affect expectations. Independent of its actual economic effects, agreeing on a specific program with the IMF conveys information about the country's future policy path to those assessing its creditworthiness.

We begin to differentiate between these two channels by investigating the short-term *adjustment* effects of an IMF program on the most important economic factors determining creditworthiness. We focus on GDP growth, inflation, the change in government debt and the current account balance. These are cited as the most important predictors of sovereign credit ratings (Archer et al., 2007; Cantor and Packer, 1996; Hill et al., 2010) and data coverage is good.[14] As an additional, specific form of adjustment, we also consider debt restructurings. IMF programs

[12] As average IMF programs in our sample last about three years, we lag the variables by four years to mitigate bad control concerns. Appendix F describes all controls and their coefficients in this regression.

[13] Compared to the fixed-effects model, the first-difference treatment variable captures only starts and ends of IMF programs, rather than all years in which the program was active.

[14] Note that we can replicate the explanatory power of these variables in our sample. We find significant associations with S&P ratings for all variables except the change in government debt. In a simple OLS regression of S&P ratings these variables explain 75 percent of the variance. Interestingly, most of the variation is explained by the variables indicating level and growth rate of GDP. These two variables alone explain 71 percent of the variation in an OLS rating regression and 27 percent of the within-country variation in a fixed-effects regression.

potentially increase the probability of a debt relief or restructuring, which could improve a country's creditworthiness.

It is difficult or often impossible to estimate the precise contribution of specific mediating variables econometrically.[15] Our aim here is more modest. If we find that IMF programs improve relevant macroeconomic conditions in the short run, this is a potential explanation for the improvements in ratings. In this case, it would not be possible to disentangle *adjustment* from *signaling* effects. In contrast, if there is no significant improvement – or a deterioration – in macroeconomic conditions in the short term, it is unlikely that economic *adjustments* are the main channel through which ratings improve. This would suggest that the effect is driven more by *signaling* and changes in expectations.

Table 2 shows the baseline IV results with these five macroeconomic measures at the end of the same year (t) and one year later (t+1) as outcomes. We find no evidence for consistent short-term improvements in these key economic indicators. The only consistent effect that is statistically significant at the five percent level in t+1 is a *reduction* in the growth rate of GDP. According to this specification, IMF programs reduce growth rates by about three percentage points.[16] In the average IMF program country in our sample – where growth rates fluctuate substantially more than in the average country – this is equivalent to a change of about three fourths of a standard deviation and thus similar to results in some of the previous literature (Barro and Lee, 2005; Dreher, 2006).[17]

Several economic policies that IMF programs typically entail – like cutting public sector employment (Rickard and Caraway, 2018), budget cuts, or tax increases – could cause these short-run contractionary consequences. In fact, IMF staff recently argued that the IMF underestimated the size of the fiscal multiplier in past crises and thus projected smaller negative effects of fiscal austerity on GDP than those that eventually materialized (Blanchard and Leigh, 2013). Many program countries also rely on debt-financed growth in the years before they start IMF programs, and cannot maintain such growth under a program because the IMF often sets limits on new debt (Kentikelenis et al., 2016).

As all official rating agency manuals highlight changes in GDP as an important factor influencing credit ratings,[18] it is thus remarkable that the effect of IMF programs on ratings is positive. This suggests that IMF programs cause negative economic adjustments that would usually lead to a declining creditworthiness, but also have a positive effect that prevents this decline. We argue that this additional positive effect is due to the signal IMF programs send to financial markets. The next section tries to better understand this *signaling* effect.

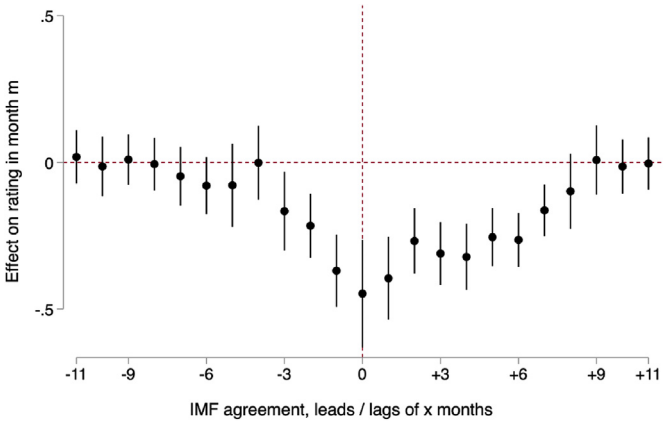


**Fig. 6.** Event-based Identification: Rating Levels around Program Start within Country-Year. Notes: The figure plots the coefficients and 90 percent confidence intervals of different lags and leads from a regression of monthly S&P ratings on *IMF agreement*. See regression equation (6). Detailed results are displayed in Appendix H, Table A11.

### 4.3. Examining the signaling effect: event-based evidence at the monthly level

#### 4.3.1. Agreements on IMF programs

In this section, we use monthly rating data in combination with the timing of the *agreement* on a program with the IMF. The aim and strategy used here differs from our previous approaches. With monthly data we can exploit variation within years for a given country, and use country-times-year fixed effects to capture any differences between countries with and without programs, as well as all differences between years for a given country. Using monthly data is useful as the short-term effect of the *agreement* is more likely to capture *signaling* effects, because economic adjustments usually take more than a few months.

A limitation of the monthly approach is that we cannot use quasi-exogenous variation in the probability to receive an IMF program. Thus, it can only show a temporal correlation in an event-study like setting, which allows us to examine the timing and temporal pattern of rating changes in more detail. Looking at these patterns can help to examine (i.) whether ratings further decline until the agreement even within a year, (ii.) whether ratings start to recover at the time of the agreement, (iii.) whether there is a measurable improvement in ratings following the agreement within a country-year.

Our dependent variable is the *S&P rating* at the end of month *m*. The treatment variable $IMFagreement_{i,m,t}$ indicates the month within a year in which an IMF program officially started. We employ an event-time specification and add *IMFagreement,* as well as 11 lags and 11 leads (indicated by *l*) of the same variable.[19] Moreover, we include month fixed effects $\mu_m$ and country-times-year fixed effects $\theta_{i,t}$. We then estimate:

$$Rating_{i,m,t} = \sum_{l=-11}^{11} \beta_1 \, IMFagreement_{i,m+l,\,t} + \theta_{i,t} + \mu_m + \varepsilon_{i,m,t} \quad (8)$$

The coefficients $\beta_r$ estimate the extent to which the rating in the months around the start of an IMF program deviate from the mean rating of country *i* in year *t*. Note that ratings are rarely adjusted every month for an individual country. Hence, the estimated monthly coefficients capture the average timing and reaction over all IMF program countries. Fig. 6 plots all those coefficients.

We discuss the coefficients in 'chronological' order. First, even though all variation between treated and non-treated country-years is

[15] Adding the adjustment variables as "bad" controls, which are themselves influenced by IMF programs, to the same equation does not necessarily yield the conditional causal effect of IMF program.

[16] Note that IMF programs usually last for multiple years, and thus most of the country-year observations with an active program are years in which IMF programs were already active in the year(s) before. The estimates, thus, also includes lagged effects of previous program years.

[17] As in our sample there are only 14 debt restructurings, it is not surprising that the coefficient on IMF program in the debt restructuring regressions does not reach conventional levels of statistical significance. However, an examination of the raw data shows that about three quarters of observed debt restructurings (data by Cruces and Trebesch (2013)) occur while the country receives an IMF program. The relationship between IMF programs and debt restructurings could thus be a promising avenue for future research.

[18] According to the manual published by Standard & Poor's a credit rating can be best understood as a scoring model. There is an economic and a political dimension, which are each composed of different factors. For each factor the country gets assigned a grade, and the factors are summed up to a grade for the given dimension.

[19] We do this to model a full year before and after program agreement. The patterns of the results are very similar when using fewer lags and leads.

absorbed, a negative pre-trend begins to emerge three months before the agreement with the IMF. The most plausible reason for this, as we argue above, is that deteriorating economic conditions make an agreement more likely. This underlines the necessity for our IV approach in the main specification.

Second and most importantly, the negative trend in ratings begins to reverse exactly one month after the agreement with the IMF. As credit rating agencies usually take at least one month to react to new information and update their ratings (Fuchs and Gehring, 2017), and economic adjustments cannot take place so quickly, this is in line with a positive *signaling* effect. As mentioned above, this is not guaranteed to capture a causal effect of the program start, but the simultaneity of the trend reversal and the program start suggest that it is the program itself that is perceived as a positive signal. Third, in the subsequent months, ratings further improve. About eight months after program approval ($l = 8$), the negative deviation from the mean rating of the country-year is no longer significantly different from zero.

Building on this, we also estimate how long it takes until the positive signal significantly improves the rating compared to its lowest level at the time of the agreement. To do so, we compute and use the changes between the rating in the month of the agreement compared to the rating $x$ months before or after the agreement. We then estimate:

$$\begin{aligned} \Delta Rating_{i,\ m+x} &\equiv (Rating_{m+x} - Rating_{m}) \\ &= \beta\ IMFagreement_{i,m} + \theta_{i,t} + \ \ \mu_m + \varepsilon_{i,m+x} \end{aligned} \tag{9}$$

Fig. 7 plots the results. Each coefficient comes from a separate regression estimating equation (9) for varying values of x, capturing changes within one year before and after the agreement. Again, we observe the deterioration in the rating compared to the time of the agreement before the program is announced. After the agreement, ratings start to improve. Starting seven months after the agreement, ratings become statistically significantly better than at the time of the agreement with the IMF. These results are again in line with our interpretation that there is a positive *signaling* effect associated with IMF interventions, despite some negative short-term economic adjustments. These results further underline that there is no financial market stigma associated with IMF programs themselves.

#### 4.3.2. Program agreements vs. program negotiations

A related, but slightly different question is whether a country, by turning to the IMF and beginning to negotiate about a potential program, conveys negative information regarding its creditworthiness. It is plausible that when this information becomes public, investors perceive it as an information that a country's economic situation is worse than was

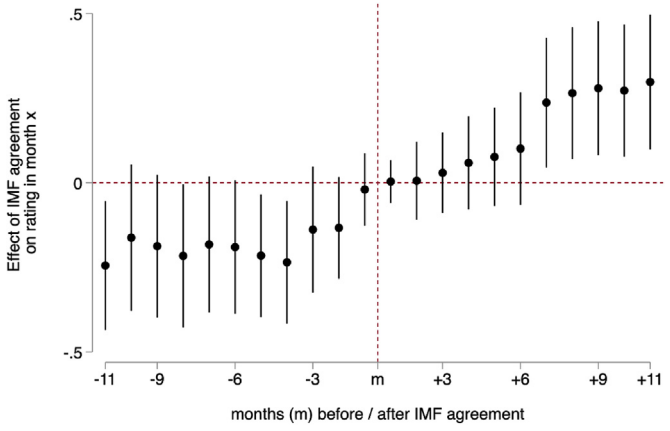


**Fig. 7.** Event-based Identification: Rating Changes around Program Start within Country-Year. Notes: The figure plots the coefficients from individual regressions of changes in monthly S&P ratings on *IMF agreement*. Each rating change is computed as rating (m + x) – rating(m). See equation (9).

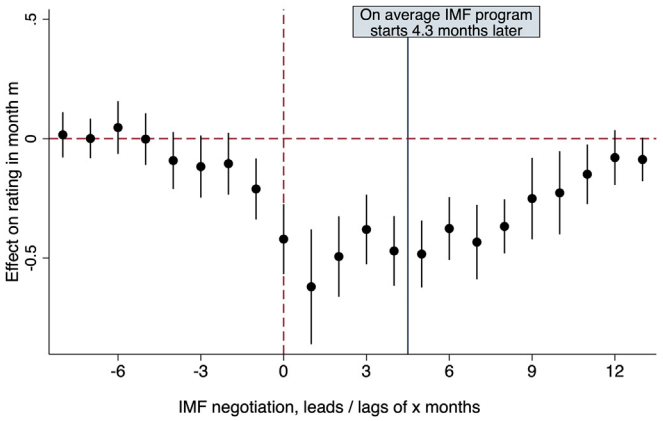


**Fig. 8.** Event-based identification: Rating levels around negotiation start and program start.

previously known based on observable publicly available data. At the same time, there is still uncertainty (i.) whether the two parties will agree on a program, (ii.) how long the negotiation will take, and (ii.) whether the program will be designed in a way that is perceived as a positive signal by investors.

Coding the start of negotiations is more challenging than using the official dates of the program start. We collected these data and coded the begin of negotiations based on information from IMF websites, LEXIS NEXIS, and local language newspapers. The coding procedure is described in detail in Appendix I. This way, we were able to receive information on negotiation starts for 137 out of 160 agreements. Those dates in all likelihood still contain significant measurement error. For the following analysis we assume the measurement error is randomly distributed, but this limitation should be kept in mind.

We find that most negotiations are finished rather quickly. The average duration is 4.3 months. However, there is significant heterogeneity as some take up to a year or even more, leading to a period of considerable uncertainty (we plot the full distribution in Appendix I,Figure A11). We employ this information by re-estimating equation (8) with the begin of negotiations (rather than of the program itself) as the treatment variable. The results, plotted in Fig. 8, indicate how the begin of negotiations overlaps with the decline during a year, and when ratings start to improve again. In line with the previous results, the estimates suggest that creditworthiness is in decline during the year already before the country turns to the IMF. However, the begin of the negotiations is associated with an additional visible drop in ratings. After the begin of the negotiations, the effect remains negative at a similar level for about five months, mirroring the average duration of the negotiations. In line with our previous results, when the average negotiation is successfully completed and the programs starts, we begin to observe a steady improvement in ratings during the subsequent months.

If this improvement is due to the program start, we should also be able to observe a significant difference in ratings between the negotiation period and the subsequent early program period. To test that, we use a simple regression that compares ratings during the months with ongoing negotiations with the ratings during the first program year in Table 3.

**Table 3**
Negotiation Period vs. Program Period.

| | (1) |
|---|---|
| IMF program | 0.399 |
| | [0.164] |
| | {0.015} |
| Observations | 1402 |
| Sample | negotiation period & first program year |

**Notes:** OLS regression. Dependent variable: S&P ratings.

The results show a significant improvement during the first program year relative to the negotiation period, indicating that ratings are on average 0.4 rating notches higher in the first months of the program after the negations ended successfully.

This regression compares only the months during ongoing negotiations with the first 12 months of the programs.

In sum, the analysis at the monthly level shows that ratings decline before an IMF program starts. The lowest point is reached when the country approaches the IMF and starts negotiating about a potential program. Average ratings remain at this low point during the negotiation period and start increasing when the IMF program begins This suggests that the positive signal relies on the successful completion of the negotiations and the design of the respective programs. The next section uses an exploratory text analysis of statements by rating agencies to investigate whether these verbal statements help to further understand how IMF programs and their design influence creditworthiness assessments.

### 4.4. Text analysis: how agencies assess IMF program agreements

Naturally, there are limits to understand the *signaling* effect caused by an IMF program in a framework that focuses on one condensed number alone, in our case credit ratings. For this reason, we augment our quantitative analysis by examining verbal rating agency statements published along with the ratings. This helps to (i.) critically examine the plausibility of the econometric results, and (ii.) better understand what we can generalize about the type of signal that IMF programs convey.

We evaluate rating statements that are issued when a rating or its outlook is changed, based on the *Dow Jones Factiva* database. The statements we can extract represent only a small subset of the universe of statements but we see no reason to expect a systematic bias in the statements we can access. Initially, we study these statements in an exploratory way (see Appendix K and L for details and a list of exemplary statements.) It becomes evident that rating agencies indeed often associate the IMF's presence with a positive signal about the country's future policy path. Examples include statements like: "[w]e think the new IMF program [ …. ] will help in addressing fiscal and external imbalances" (S&P on Ghana in 2015), or "the International Monetary Fund program will serve as a policy anchor for fiscal consolidation" (S&P on Albania in 2014).

Some statements emphasize the IMF's role in helping countries to overcome short-term liquidity problems; others emphasize the increased likelihood of successful reform implementation. For example, with regard to Sri Lanka, Moody's stated in 2016 that "the IMF program will alleviate Sri Lanka's external liquidity pressures." However, liquidity alone often does not seem to be sufficient. Many statements mention the importance of the IMF to "support the implementation of fiscal and economic reforms" (Moody's on Egypt in 2016). If liquidity is mentioned, it is often jointly with reforms, for instance as providing "the fiscal space for needed reforms and infrastructure investment" (S&P on Bosnia and Herzegovina 2016).

Based on this initial inspection, we then conduct a more systematic analysis. We extract all available articles on *Factiva* using all possible combinations of the search terms "IMF/International Monetary Fund," "rating," "program," "reform," in English or German, focusing on the industry category "Rating Agency." We then use a *Python* script to extract the paragraphs before and after statements mention the IMF. This approach yields 117 statements. Two research assistants then coded these statements following a pre-defined codebook (see Appendix L for details). The aim of this coding procedure was twofold: First, to distinguish between negative, neutral/mixed, and positive assessments associated with IMF programs. Second, to differentiate between texts mentioning the pure liquidity provision aspect of IMF programs, the reform dimension, or a combination of both. The codebook was designed to be conservative in the sense of biasing against support for our priors resulting from the econometric analysis. In ambiguous cases, the statement was categorized as "no clear association with rating." If it was not obvious whether the statement relates to liquidity or reform aspects of IMF programs, it was put in a residual category.

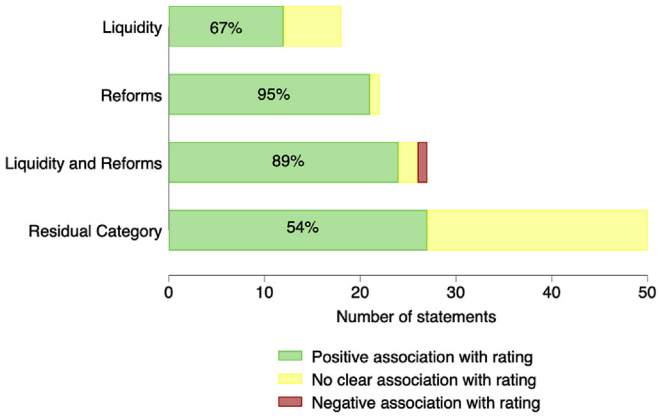


**Fig. 9.** Text Analysis of Rating Statements. Notes: The bar chart plots the absolute number of statements depending on whether IMF liquidity or IMF-mandated reforms (or both, or none) were mentioned as having an effect on the rating. The different colors indicate whether the mentioned effect was positive, negative or whether there was no clear association with the rating. The percentages inside the bars indicate the share of statements that mention a positive effect. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

Fig. 9 graphically illustrates the results of this exercise. The first and most noticeable finding is that, out of the 117 statements, the large majority of statements across all categories attributes a positive effect to IMF programs. 32 statements show no clearly positive or negative association. Only one statement notes that an IMF programs had a negative influence.

The second finding is that statements mentioning reforms under IMF programs have the highest positive share (95%), followed by statements linking reforms and liquidity provision (88% positive). Statements concerning solely the provision of liquidity are more mixed (66% positive). The residual category, quite naturally, captures a number of neutral statements, in which no clear association could be noted (54% positive). It seems that rating agencies associate more with IMF programs than just the temporary increase in liquidity. The expectation of successful reforms appears to be a crucial part of the IMF's positive *signaling* effect on creditworthiness assessments.

Overall, the text analysis is in line with the results of the econometric analysis. Exemplary statements like the following illustrate this: "We view the risk of another default in the next two to 3 years as diminished due to the Ukrainian authorities' commitment to the reforms set out in the International Monetary Fund (IMF) program." Standard & Poor's made this statement in October 2015 during a period of substantial GDP contraction under multiple consecutive IMF programs in Ukraine. The country's growth rate stood at −6.6 percent in 2014 and at −9.8 percent in 2015. Nevertheless, S&P raised Ukraine's credit rating because of positive expectations associated with the reforms under the IMF program.

Our results in their entirety suggest that this piece of anecdotal evidence is representative of a general pattern. IMF programs, rather than coming with a *stigma*, arouse positive expectations. Thereby, they send a positive signal that – despite the economic contractions under a program – *cushions* against further deteriorations in sovereign creditworthiness.

### 4.5. Robustness

The subsequent section provides a summary of the tests we conduct to examine the robustness of the results. Appendix G provides a more detailed description and contains all tables and figures that are not shown here.

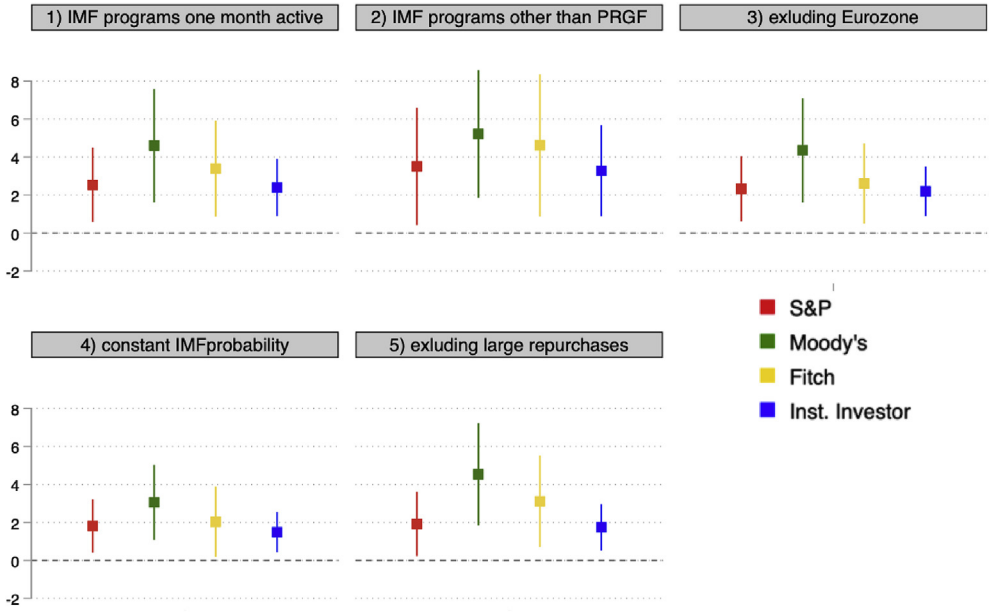


**Fig. 10.** Results of Various Robustness Tests
**Notes:** Coefficient plot of the regression results described in the text. Each plotted point estimate (and its 90 percent confidence interval) corresponds to the coefficient on the treatment variable from a separate regression. The different colors indicate the different agencies whose ratings are used as outcome variables. Ratings from S&P (red), ratings from Moody's (green), ratings from Fitch (yellow), assessment from Institutional Investor (blue). (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

The first set of robustness tests employ **alternative outcome variables**. We already showed above that the results hold for sovereign credit ratings from all major credit rating agencies (*S&P*, *Moody's*, *Fitch*), as well as for the assessments by *Institutional Investor*. To challenge the results along another dimension, in Table A8, we modify the coding rule of ratings that assigns letter-based credit ratings to a numerical score. While the baseline follows the literature's standard by assigning letter-based ratings to numbers ranging from 1 to 21 (Fuchs and Gehring, 2017; Hill et al., 2010), we now assign only 10 or 7 categories. Additionally, we provide results for two binary dependent variables with the ratings BBB and A, respectively, as the cutoff (see Appendix B, Table A1 for details on the rating letter system). All results remain positive and statistically significant.

Despite lower coverage, we repeat the main analyses at the country-year and monthly level with **bond spreads** (relative to US treasuries) gathered from Bloomberg and Haver Analytics in Appendix J. At both levels of analysis, this produces the same pattern of results as with ratings. OLS coefficients point to higher bond spreads (lower creditworthiness) for countries under IMF programs, while the IV coefficients in Table A12 and Fig. A12 suggests that IMF programs reduce bond spreads (increase creditworthiness). The monthly analysis with bond spreads also yields the same pattern as for ratings (Figs. A13 and A14). All estimates based on bond spreads are, however, less precisely estimated than before, leading to results at the yearly level that are not statistically significant at conventional levels. This reflects the less comprehensive data coverage, which shrinks the sample by approximately a third.

Building on these results, we then examine whether the sample for which bond spread data are not available is considerably different as compared to the sample for which they are available. Table A10shows no evidence that the results for credit ratings differ significantly between these two samples. In both samples the coefficients are positive and their confidence intervals overlap substantially. To further examine potential heterogeneities, we test (in the same table) how the baseline IV effect differs in countries with different economic fundamentals. We find that the effect is more positive and statistically significant in countries with lower GDP per capita rates, suggesting that the signal sent by the IMF's "seal of approval" is more valuable for poorer economies.

Having modified the outcome variable, the next step tests the robustness of the results to **modifications of the treatment variable**. First, we code countries as receiving IMF programs as soon as they spend at least one month (rather than five as in the baseline) under a program in year *t*. Second, we exclude all IMF programs that are organized under the Poverty Reduction and Growth Facility, which one might expect to bear less of a stigma. Third, we exclude all countries that were members of the Eurozone in year *t*, as IMF programs in these countries were potentially atypical.[20] Fig. 10 below plots these results for ratings from all agencies in panels 1–3. As can be seen, the results hold for all these modifications.

The next set of tests further examines the **validity and robustness of the instrumental variable strategy**. First, we modify the two constituent terms forming our interaction instrument. Regarding the first constituent term, *IMFprobability*, panel 4 in Fig. 10 shows that the results are robust to using a constant probability, which is multicollinear with country fixed effects, instead of our preferred cumulative probability. Regarding the second constituent term, *IMFliquidity*, panel 5 in Fig. 10 demonstrates that excluding the observations with the largest purchases and repurchases of IMF loans, which could affect the IMF's liquidity, does not affect the estimates.

As described above, all regressions control for a set of global financial cycles and their interactions with *IMFprobability*. This ensures that the IV only picks up the variation in IMF liquidity that is orthogonal to these global cycles. As an alternative way to rule out the influence of those global cycles on our first stage, we use these interactions as **placebo IVs**. Table A9 shows that none of these placebo IVs produces a strong first stage, as indicated by the low Kleibergen-Paap F-statistics.

Next, Figure A10 (in Appendix H) shows the coefficient of *IMFprobability* variable interacted with leads and lags of *IMFliquidity*. If the relationship we exploit in the first stage is driven by long-term trends rather than **year-on-year variation**, this should be visible in significant pre- or post-trends. However, the figure shows that only the interaction with liquidity in *t* is negative and significant, in line with our suggested mechanism.

Lastly, we run a second set of placebo regressions that consist of **simulations** with 1000 repetitions where we randomly assign either (i) the liquidity across years or (ii) the probability across countries in the first stage as placebo tests, as suggested by Christian and Barrett (2017).

[20] In addition, and more generally, Table A7 shows that the results are also robust to excluding individual, atypical observations. To identify the most influential observations we calculate the DFBETA value of all observations and then drop those with the largest absolute values in the first and second stage. DFBETA values measure the difference in the estimated parameters with and without the observation.

The coefficients that these placebo tests yield are close to normally distributed and centered around zero, further supporting the assumption that the IV specification does not pick up any spurious trends (see Figs. A8 and A9).

## 5. Conclusion

As the international lender of last resort, the IMF's main objective is to help countries resolve their balance-of-payments problems. Its loan programs need to restore the creditworthiness of countries with severely limited access to external financial resources. In light of the IMF's resurgence as the most important multilateral actor in the global financial system (Reinhart and Trebesch, 2016), this study investigates the IMF's effectiveness in achieving this key goal. To do so, we use new data and new identification strategies, and provide evidence on the channels through which the IMF helps to prevent the creditworthiness of crisis countries from deteriorating.

As we show, the fear that IMF programs convey a negative stigma to investors can be explained by the endogenous selection of countries with already deteriorating economic conditions into programs. Our results, rather than pointing to a financial stigma, paint an alternative, more nuanced, picture. While IMF programs differ in many dimensions (Stone, 2008), we find that they, on average, do not negatively affect the creditworthiness of a program country. Although short-term adjustments under programs are often contractionary, the IMF sends a positive signal to financial markets that cushions against the decline of a country's creditworthiness.

Based on our results we do not want to make claims about the long-term benefits of reforms under IMF programs. The successful implementation of reforms that provide a sustainable solution to the country's underlying economic problems comes with many obstacles along the way. Our study only highlights that the IMF's engagement sends a positive signal regarding creditworthiness that provides countries with important time and maneuvering room to overcome crises. This is a precondition, not a guarantee for success.

## Author statement

Kai Gehring and Valentin Lang both contributed equally to all parts of the manuscript.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jdeveco.2020.102507.

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