If Life Sends You Lemons: Adverse Selection and Growth under IMF Programs

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Abstract

The dominant approach to studying the effects of IMF programs has emphasized moral hazard, but we find that adverse selection has more impressive effects. We propose a novel strategic selection model to study the growth effects of IMF programs, which allows for the possibility of adverse selection. We find that adverse selection occurs: the countries that are most interested in participating in IMF programs are the least likely to have favorable growth outcomes. Controlling for this selection effect, we find that countries benefit from IMF programs on average in terms of higher growth rates, but that some countries benefit from participation, while others are harmed. Moral hazard predicts that long-term users of Fund resources benefit least from participating in programs, while adverse selection predicts the opposite. Contrary to previous findings, we find that IMF programs have more successful growth performance among long-term users than among short-term users.

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As the shockwaves spread from the international financial crisis of 2008, panic selling leapt seemingly at random around the world, touching down in Russia, Indonesia and Ireland. Caught up in the jet stream of the crisis, a series of countries lined up to request balance of payments support from the International Monetary Fund, including Iceland, Hungary, Ukraine, Pakistan and Latvia, and IMF missions crossed the globe. The resulting programs promised fiscal restraint, contraction of monetary policy, exchange rate corrections and structural reforms, particularly in the heavily affected banking sector. The leaders of these countries apparently believed that IMF assistance would improve their countries' prospects for economic recovery, in spite of the resounding lack of evidence that this is the case.

The International Monetary Fund was not originally intended to promote economic growth, to engage in long-term lending, or to oversee economic reform programs. Its original purpose was to safeguard the system of fixed exchange rates foreseen under the Bretton Woods agreements by pooling resources to provide short-term balance of payments support to deficit countries. As the Fund gradually expanded its sphere of activities, however – conditionality was formally introduced in 1952, medium-term lending was established in 1974, and lending at concessional interest rates for poor countries was introduced in 1986 – it has increasingly been judged according to its success or failure at promoting economic growth. Critics argue that IMF programs in fact retard growth, either by promoting inappropriate economic policies or by creating perverse incentives. A growing concern is that long-term use of IMF resources may be particularly harmful because it creates patterns of dependency. This paper seeks to resolve the debate about the economic-growth effects of IMF programs by introducing methodological innovations.

The 2008 financial crisis illustrates the fundamental problem of assigning effects to IMF programs, which is selection bias. If not for exogenous events – the collapse of the market for mortgage-backed securities in the United States and the consequent meltdown in the U.S. stock market – it is probable that none of these countries would have turned to the IMF for assistance. Indeed, the global bubble economy that lasted through the summer of 2008 had caused demand for IMF loans to dry up, so much so that the Fund was compelled to reduce its staff for the first time in decades to balance its books. The international market downturn that drove countries once again to seek IMF programs, however, also depressed their growth prospects because it depressed global demand. If we observe declining economic performance in these countries, therefore, it is difficult to determine what to attribute to the financial crisis and what to attribute to the impact of IMF financing and policy

guidance.

Scholars acknowledged the problem of selection bias in evaluating the effects of IMF programs long before they succeeded in adequately addressing it (Goldstein and Montiel 1986). In recent studies of IMF program effects it has become standard practice to use some kind of selection correction, whether a Heckman-type parametric selection model, an instrumental variables approach, or matching (Steinwand and Stone 2008). Przeworski and Vreeland (2000) point out that program initiation requires the consent of two agents, a government and the IMF, and propose use of a bivariate probit model with partial observability to account for these separate decisions. We propose an alternative approach that incorporates strategic interaction into a partial observability model.

The key implication of our strategic model is that the IMF faces a problem of adverse selection (Akerlof 1970). Countries that apply to participate in IMF programs have unobservable attributes that are correlated with their future economic performance, which might be related to the policy preferences of the government, to social instability, or to the role of the military in politics. For the sake of simplicity, we will refer to applicant governments as being either of a "good" or a "bad" type, where good governments are expected to promote growth and bad governments are unlikely to do so. The IMF need not offer support to every country that applies, but it cannot separate the worthy from the unworthy applicants, and any observable attribute that it might use to distinguish among them is correlated with the objective need for support. Meanwhile, the best candidates for successful growth are countries that choose not to apply. As a result, the pool of countries available to participate in IMF programs is skewed towards the type that is unlikely to successfully implement reforms and return to growth. Just as the best used cars are rarely offered for sale, the countries with the best growth prospects rarely approach the Fund for assistance. Those that do ask for support tend to be lemons.

Our results indicate that the poor performance of IMF programs is due to adverse selection, and that the failure to find evidence that these programs promote growth in the quantitative literature is due to the failure to adequately model this strategic selection process. We show that the countries that are most strongly interested in participating in IMF programs are in fact the least likely to grow. When we control for this selection effect, we find that IMF programs have a significant positive effect on growth. Furthermore, contrary to concerns about recidivism and long-term use of Fund resources, we find that the selection effects are mitigated and the growth effects are stronger for countries that are already participating in IMF programs. Consistent with our theory of adverse selection into IMF

programs, we find that the growth effects are strongest for the countries that have participated for the longest periods of time. This suggests that the IMF gradually discovers the borrower's type by observing its compliance with conditionality and adjusts its programs in ways that compensate for the problems posed by bad governance.

Moral Hazard and Adverse Selection

The literature on IMF programs is replete with discouraging findings. In a review of 24 studies of the effect of IMF programs on growth published through 2000, Stone (2002) reports that only one found statistically significant results that supported the view that IMF programs promote growth; two found significant results that indicated that IMF programs retard growth; the rest were inconclusive. In a review of twelve studies published between 2000 and 2008, Steinwand and Stone (2008) find two statistically significant and positive results, seven significant negative results, and three inconclusive results. These studies use data sets with varying coverage and employ a wide range of methodological approaches. The results are generally discouraging, although the inconsistencies suggest that the question is not yet resolved.

Reasons offered for these disheartening findings differ. A substantial body of scholarly opinion holds that IMF programs are ineffective at promoting economic recovery and laying the groundwork for long-term growth because the IMF promotes an inappropriate mix of policies. As Ngaire Woods bluntly puts it, "There is no incontrovertible evidence that the IMF and the World Bank know what is good for their borrowing countries" (Woods 2006, 6). Joseph Stiglitz argues that IMF conditionality follows a uniform pattern of macroeconomic contraction, privatization and deregulation that is inappropriate for most developing countries, and that bad economic policies are responsible for poor growth outcomes (Stiglitz 2002). The claim that IMF conditionality follows a cookie-cutter pattern that varies little from country to country has been rejected by empirical studies, which find that it varies widely and responds to local circumstances (Ivanova et al. 2003, Gould 2006, Stone 2008). Nevertheless, the possibility remains that conditionality is harmful to growth. James Vreeland (2003) argues that IMF programs are harmful to economic growth because countries do not participate in order to promote growth. Instead, politicians pursue IMF programs in order to redistribute income from the poor to the rich by depressing real wages. This begs the question, however, of why left-leaning governments that prefer the opposite pattern of redistribution participate in IMF

programs.

A broader difficulty with arguments that attribute poor growth results to poor policy advice, however, is that conditionality is frequently not implemented. A recent IMF working paper found that 70 percent of IMF programs are interrupted at some point because of non-implementation (Ivanova et al. 2003). If so much of conditionality is not implemented, it can be difficult to determine whether poor outcomes are due to implementing harmful conditionality or not implementing beneficial conditionality. In the post-Communist countries it was the countries that followed conditionality most closely that most quickly overcame the crisis of the transition and subsequently grew most rapidly (Stone 2002). Regardless of whether IMF programs themselves promote growth, there is substantial evidence that pursuing the type of policies the IMF promotes does promote long-term growth. IMF programs have been widely criticized for focusing on reducing inflation, but inflation is negatively correlated with growth; the effects are substantial and the results are robust.[1] Similarly, the IMF has sought to dismantle market distortions such as export marketing boards in Africa, which by all accounts have posed substantial obstacles to the economic development of those economies. Much of IMF policy advice is intended to reduce vulnerability to financial and banking crises, and when these crises occur, the consequences for growth are severe.

A more persuasive argument for the negative effects of IMF programs is the problem of moral hazard. Moral hazard is an incentive problem created by insurance: if agents do not pay for the consequences of their actions because they are insured, they have weak incentives to mitigate them. Concerns about moral hazard have been at the forefront of policy briefs that have called for reining in the Fund and restricting its activities to short-term balance of payments lending rather than long-term development and structural adjustment lending (Hills et al. 1999, Meltzer et al. 2000). Three kinds of problems have been identified: currency crises, debt rescheduling, and recidivism.

Morris Goldstein argues that the Fund's engagement in long-term adjustment lending, and particularly its support for governments that were committed to defending fixed exchange rates during the 1990s, promotes moral hazard that makes crises more likely (Goldstein 2001). If countries can rely upon the IMF as a second source of economic reserves and capital market participants come to believe that certain countries are "too big to fail"as was often claimed for Russia and Argentina until

[1]Kormendi and Meguire 1985, Grier and Tullock 1989, Barro 1991, De Gregorio 1992, Roubini and Sala-i-Martin 1992. Although Levine and Renelt (1992) argue that some of these findings are not robust, other studies find that the negative effect of inflation is one of the most robust findings in the growth literature (Gylfasson and Herbertsson 1996, Andres, Domenech and Molinas 1996, Andres and Hernando 1997).

they did failthe incentives for governments to pursue sensible fiscal policies are weakened. Capital will flow to these countries in spite of their weak fundamentals because of the expectation that a rescue will be forthcoming if the investment climate turns stormy. Governments that benefit from these capital inflows face temptations to defend their currency pegs long after they might have otherwise abandoned them, because this allows them to put off policy adjustment. The overvalued exchange rates that result from defending fixed parities, while simultaneously following inflationary policies, leads to a decline of competitiveness, which hurts growth and contributes to the eventual collapse of the currency. Indeed, the debates within the Fund about how to respond to crises always balance a concern to contain financial instability with a concern about not promoting moral hazard. For example, IMF Staff and Executive Directors worried out loud and argued during the Mexican crisis in 1995 and the Asian Crisis in 1997 whether an overly aggressive response would promote moral hazard (Blustein 2001, Copelovitch forthcoming).

The difficulty with this argument is that it presumes that the IMF provides effective insurance against market instability. The growth of IMF resources over the last six decades has not kept pace with the growth of the global economy, however, much less with the scale of international trade or the pace of global financial transactions (Fischer 1999). The IMF provides only a portion of a borrowing country's financing needs, which must be supplemented by other sources of official, multilateral or private financing in order to close the "financing gap," or the difference between expected capital outflows and inflows (Gould 2006). In a sense, then, an IMF program is more like a calculated risk than an insurance policy. The empirical record is unclear as to whether IMF programs make financial crises more or less likely. There is anecdotal evidence that programs have delayed the inevitable in some cases, but there is little support for the notion that IMF support can prevent misaligned exchange rates from realigning. Breaking public exchange rate commitments, furthermore, significantly shortens a government's tenure in office, so the political incentives to avoid currency crises are potent (Cooper 1971, Frankel 2005, Leblang 2005).

A second concern is that IMF activism in promoting debt rescheduling may encourage banks to lend and countries to borrow in ways that leads to excessive indebtedness, destabilization of the banking industry, and the need to additional rescheduling episodes. The IMF became deeply involved in rescheduling debt during the 1980s debt crisis, making its lending contingent on the agreement of private banks to roll over their loans (Lipson 1985, Aggarwal 1996). Every major debt rescheduling operation by the Paris and London Clubs is supported by an IMF program. The Korean crisis in 1997

was finally resolved by linking IMF lending to bank commitments to roll-over their loans. (Blustein 2001, Copelovitch forthcoming). Ex post, these interventions facilitate debt restructuring that is Pareto improving, since exogenous shocks can lower the value of outstanding debt and make existing contracts untenable. However, the IMF role may lower the cost of restructuring sufficiently that it encourages the unwise borrowing and lending practices ex ante that create the problem in the first place. In addition, IMF intervention may delay the negotiations over rescheduling and transfer most of the benefits to the creditors (Bulow and Rogoff 1990). To the contrary, some scholars argue that IMF participation in the process helps to overcome informational asymmetries by allowing borrowers to signal their commitment to repayment (Marchesi and Thomas 1999), and lending in arrears can speed resolution of crises (Wells 1993). Recent empirical work seems to support a positive evaluation of IMF influence over rescheduling (Easton and Rockerbie 1999, Marchesi 2003).

There is a fine line to be walked between stabilizing international financial markets sufficiently to promote the free flow of capital, which is a fundamental IMF purpose, and promoting unwise international lending by lowering its risks. However, the moral hazard problem is mitigated to the extent that debt rescheduling is costly. Debt rescheduling requires creditors to take a "haircut," or a nominal loss to their portfolios, and the experience of the 1980s was costly enough to cause new bank lending to the developing world to dry up in the early 1990s. Nor did governments find the rescheduling process painless. The sharp fiscal contractions that were required to service Latin American countries' debts caused a wave of regime change in the 1980s and continued to pose the most serious challenge to the survival of the newly elected governments. Debt rescheduling mitigated the costs of financial instability to some degree for creditors and debtors alike, but was not attractive enough for either party to create strong incentives to run up unsustainable debts.

A third concern is that IMF financing may reduce the incentives for governments to solve long-term structural problems that contribute to slow growth and underdevelopment. As the Independent Evaluation Office evaluation of prolonged use of IMF resources concludes, "[T]he drawbacks associated with prolonged use are sufficiently serious to warrant a greater effort to reduce its extent" (IEO 2002, 81). Bird et al. (2004) argue that repeat users of IMF resources constitute an underclass of the international system that has become a clientele dependent on the IMF. "Recidivism," as they label this phenomenon, is associated with extreme poverty, weak external accounts and high levels of foreign debt. This may help to explain the extremely poor growth performance of African countries under IMF programs. Governments are concerned with survival, and if they depend upon narrow

bases of support, they will use free resources to provide private goods that keep them in power rather than public goods that promote development (Bueno de Mesquita et al. 2003). A number of studies have found that countries that have used IMF programs in the past are more likely to use them again, suggesting that recidivism is a real phenomenon (Atoian and Conway 2006, Jensen 2004, Pop-Eleches 2009, Sturm et al. 2005).

The problem with this view is that it assumes that IMF support weakens the incentives to carry out economic reforms. Compliance with IMF conditionality is a severe problem, as we noted above, and this is nowhere more the case than in sub-Saharan Africa. Furthermore, studies of the enforcement of IMF conditionality indicate that it is politicized, which implies that the incentives for countries that benefit from intervention by important IMF shareholders to implement conditionality are weak (Stone 2002, 2004, Pop-Eleches 2009). Are these incentives weaker than in the absence of IMF financing, however? This seems unlikely, and has not been demonstrated by any empirical study to date. Even in Russia, where IMF influence was notoriously weak, the IMF influenced the framework of economic policy and convinced policymakers to adopt particular reforms that were politically costly to implement. On the other hand, studies of enforcement demonstrate variation in enforcement, which implies that the incentives to implement conditionality are significantly greater for weak countries that lack international influence than for countries that can rely on U.S. support. With few exceptions, countries that have been labeled recidivist are in the former category.

This paper proposes an alternative to the prevailing moral hazard view. Poor economic performance under IMF programs is not due to perverse incentives, but to adverse selection. The incentives to avoid currency crises, defaults and long-term development traps are not appreciably weakened by IMF intervention, so the association between these phenomena and IMF programs is not causal. However, the participants in IMF programs differ systematically from non-participants in ways that are not easy to observe but that have significant implications for their future economic performance.

Adverse selection occurs when one partner to a transaction has private information that affects the other partner's payoff if the transaction occurs. In the classic example, used-car sellers have better information about the value of their wares than used-car buyers. The price that buyers are willing to pay is based on their priors about this private information, so selling is unattractive to the owners of high-quality cars and attractive to the owners of low-quality cars. As a result, the distribution of quality in the cars actually offered for sale is skewed downwards, which further depresses the market price. In equilibrium, therefore, mutually beneficial transactions fail to be made.

We argue that a similar problem arises in IMF programs. The potential sellers in this example are the countries that offer to implement economic reforms in return for IMF support, and the buyer is the IMF, which has difficulty separating the credible reformers from the non-credible ones. The price is the degree of conditionality imposed in the adjustment program. The IMF seeks to support successful economic reform programs and avoid failures, and from the IMF perspective, the risk of program failure is a function of the government's typeits level of commitment to economic reformand of the degree of conditionality. Multiple binding policy conditions that specify detailed procedures rather than general targets increase the likelihood of identifying and preventing policy slippage, but make the program more intrusive and politically risky from the perspective of the borrower.

The problem is that the IMF imposes a relatively high price of participation because it is uncertain of the type of its borrowers. If all of the Fund's borrowers were committed reformers, it could offer less constraining programs, which all of the countries would be willing to accept. Because many of potential borrowers are not committed to reform, however, the IMF offers conditionality packages that are intrusive and constraining. This interpretation is consistent with the marked increase in conditionality that occurred in the 1980s – the average number of performance criteria climbed from 7 between 1974 and 1982 to 12 between 1983 and 1990 – as lending expanded in Latin America and Africa (Gould 2006, 60). Some of the committed types are unwilling to participate when conditionality is intrusive, so the distribution of borrowers is skewed towards the type of government that is not committed to implementing reform. Three factors exacerbate the adverse selection problem: enforcement problems, vulnerability, and capital market expectations.

If IMF programs were enforceable contracts, it might be possible for the IMF to screen potential borrowers by offering schedules of conditionality that ensured that only committed reformers would participate. However, the IMF's only instrument to ensure compliance is to withhold installments of financing, or tranches, and it finds it difficult in practice even to do that for long. Consequently, the borrowers that find IMF conditionality most costly are the ones that actually intend to implement the promised reforms, and the ones that have no such intention find it relatively costless to agree to the IMF's terms. Rather than resolving the IMF's information problem, strategic screening exacerbates it and strengthens the tendency of the worst candidates to step forward.

Second, it might be possible to screen out the less committed if it were the case that committed reformers had greater need for IMF support than faux reformers. The opposite is the case, however. Among the key variables that are difficult for the IMF to observe are the level of usable international

reserves (which potential borrowers often disguise through elaborate accounting tricks) and the vulnerability of the domestic banking sector. Poor values on these variables make borrowers highly vulnerable to international financial shocks and therefore eager to participate in IMF programs to shore up their weak external accounts. Governments that underreport their vulnerability, however, are unlikely to be committed reformers, so those countries that are more vulnerable than they seem are likely to be poor candidates for IMF programs.

Third, if committed reformers stood to gain more from participating in IMF programs than other countries, they might tend to apply for programs at higher rates. One such argument that the Fund routinely makes is that IMF programs represent a "seal of approval" for a government's policies, which catalyze private capital flows. By implication, the IMF has superior information that allows it to separate worthy from unworthy borrowers and convey this information to capital markets. However, the recent quantitative literature is virtually unanimous in finding that IMF lending does not catalyze private capital flows (Bird and Rowlands 2002, Eichengreen et al. 2007, Jensen 2004). Instead of representing a "seal of approval," an IMF program appears to signal to markets that a crisis is looming. Instead of promoting capital inflows, IMF programs provide opportunities for private investors to get their capital out of the country on favorable terms. Once again, this suggests that the best-managed countries should avoid IMF programs, which may sour their capital markets, and that the countries that have the least to lose from accepting assistance are those that have limited access to private international capital markets in any case.

The above argument leads to three testable hypotheses. First, a selection model that allows for the possibility of strategic adverse selection should find that countries that are most interested in participating in IMF programs are the worst candidates for growth. Second, if adverse selection rather than moral hazard accounts for the negative correlation between participation in IMF programs and growth, a selection model that controls for adverse selection should show that the effects of IMF programs are beneficial for growth. Finally, a further implication of the adverse selection view is thatcontrary to the critique of recidivism – prolonged use of IMF resources – should be more beneficial than short-term use, because over a longer time horizon the IMF is able to screen countries and determine which are willing to commit to policy reform, gradually mitigating the problem of asymmetric information that lies at the heart of the IMF's performance problem.

Method

It has long been recognized that the fundamental empirical problem in assessing the effects of IMF programs is selection, although initial contributions were agnostic as to whether selection made the IMF's effects appear more or less beneficial than they really were (Goldstein and Montiel 1986). IMF programs are not applied at random, so the sample of program participants differs in systematic ways from the sample of non-participants. This means that any comparison of the two groups may be subject to selection bias (Heckman 1979). The effects of the bias can be mitigated by using parametric selection-correction or non-parametric matching techniques, and the choice should depend on theoretical expectations about whether selection occurs on observable or unobservable factors.

Assuming that we have data on growth (Y), program status (P), and a set of factors that we believe to affect growth rates (X), the first model specification that comes to mind is:

$$Y_i = X_i\beta + \delta P_i + \epsilon_i \tag{1}$$

where ϵ is the error term capturing unobserved factors affecting growth rates of countries, normally distributed with mean zero and variance σ^2_ϵ. This specification makes several important assumptions: first, it is assumed that program status affects growth only through changing the intercept, and the effects of the other regressors are the same. Second, the assignment of IMF programs to countries is assumed to be random, or not correlated with the dependent variable. If these assumptions are satisfied, this model can be estimated via OLS. The second assumption is likely to be violated, however, since IMF programs are not sought and signed randomly, and unobservable factors determining selection into an IMF program are likely to be correlated with unobservable factors affecting growth levels. If such a correlation exists, estimating equation 1 with OLS will result in biased estimates. To deal with this selection problem, we model growth with a "switching regression" growth model described in Maddala (1983) Vreeland (2003):

$$Y_{1i} = X_{1i}\beta_1 + \epsilon_{1i} \quad \text{iff} \quad P = 1 \tag{2}$$

$$Y_{2i} = X_{2i}\beta_2 + \epsilon_{2i} \quad \text{iff} \quad P = 0 \tag{3}$$

where Y_{1i} represents the growth rate for countries that are under a program, and Y_{2i} represents growth

countries not under a program in a given year. To estimate the effect of IMF programs on growth, we need to ask the counterfactual question, "what would the growth rate of a participating country have been, had that country not participated in an IMF program"[2] We consider two alternative ways that are discussed in Maddala (1983) and Cameron & Trivedi (2005): First, the gross benefit for participant i can be calculated as

$$GB = Y_{1i} - E(Y_{2i}|P = 1) \tag{4}$$

where we calculate the difference between the observed growth rate of a country under a program and the counterfactual growth rate that we predict would have resulted had that country not been under a program. Second, the estimated expected benefit from an IMF program for participant i is

$$EB = E(Y_{1i}|P = 1) - E(Y_{2i}|P = 1) \tag{5}$$

where we calculate the predicted difference between the growth rates of the country when under and, counterfactually, not under a program.

If selection into programs is not random and is correlated with ϵ_i, running two OLS regressions to estimate equations 2 and 3 will not result in accurate estimates. We need to calculate appropriate corrections for expectations $E(\epsilon_{1i}|P = 1)$ and $E(\epsilon_{2i}|P = 0)$.

We use a parametric technique because we want to test for the presence of a particular type of selection effect: strategic adverse selection (Akerlof 1970). Two reasons justify this choice. First, if the source of selection bias is adverse selection due to the private information unobservable to the IMF and to us as analysts, a matching approach that corrects selection based on observable factors will not be appropriate. Second, the interaction between a government and the IMF is strategic: the problem from the IMF's perspective is that some of the countries that it would like to support do not apply, so it never has the opportunity to offer them support. This suggests a particular strategic form to estimate, which is illustrated in Figure 1, below. The potential borrower moves first, deciding whether to apply for IMF support or not, and applies if the expected utility of applying (and possibly being rejected) exceeds the utility of non-participation. The IMF then decides whether to approve or reject the applicant based on observable factors, conditional on its interim expectation about the

[2]This is the well-known treatment effects problem that has been utilized widely in the econometrics literature, and discussed in Maddala (1983), Greene (2003), and Cameron & Trivedi (2005).

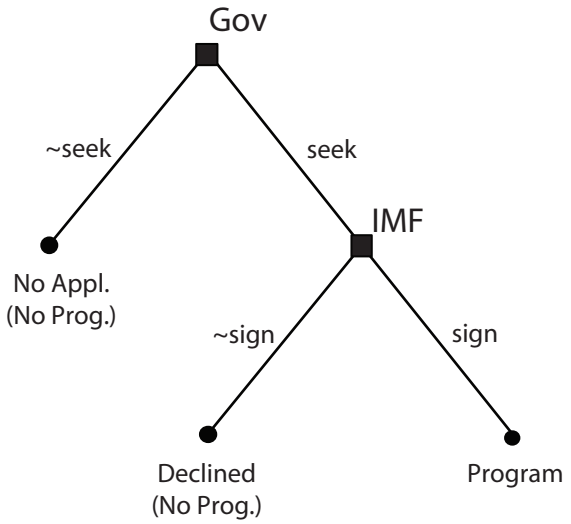

Figure 1: Strategic Selection into an IMF Program

set of countries that applies.[3]

Strategic Probit with Partial Observability

In this paper, we develop a strategic probit model with partial observability. This estimator incorporates the strategic interaction hypothesized by our theory into the likelihood function to be estimated, which should improve the efficiency of our results and remove any bias due to strategic misspecification (**?**, **?**). We argue that when deciding to seek an agreement with the IMF, the government takes into account the IMF's probability of signing an agreement, and makes a decision strategically based on its expectations about what the IMF will do. This interaction is represented in Figure 1. It is assumed that both the government and the IMF have utilities associated with the outcomes resulting from their choices, and the following two latent equations determine selection into IMF programs:

$$G^*_{SP} = p_{sign}U_G(Prog) + (1 - p_{sign})U_G(Decl) - U_G(NoApp) + \varepsilon_G \quad (6)$$

$$I^*_{SP} = U_I(Prog) - U_I(Decl) + \varepsilon_I \quad (7)$$

[3]In practice, rejection takes the form of insisting on the adoption of conditions that the borrower is unwilling to fulfill, but in that case the analyst observes only non-participation.

where ε_G and ε_I are normally distributed random variables[4], and p_{sign} is the IMF's probability of agreeing to an agreement with government, estimated using the equation 7. The utilities are linked to regressors, such that $U_G(NoApp) = \Pi_1\eta_1$, $U_G(Decl) = \Pi_2\eta_2$, $U_G(Prog) = \Pi_3\eta_3$; and $U_I(Decl) = Z_1\alpha_1$, $U_I(Decl) = Z_2\alpha_2$. We only observe a program when both the government and the IMF are willing to sign one. In other words,

$$\begin{aligned} P(P=1) &= P(G^*_{SP} > 0, I^*_{SP} > 0) \\ P(P=0) &= 1 - P(G^*_{SP} > 0, I^*_{SP} > 0) \end{aligned}$$

and this results in the following expectation for countries that are under an IMF program:

$$\begin{aligned} E(Y_1|P=1) &= X_1\beta_1 + E(\epsilon|G^*_{SP} > 0, I^*_{SP} > 0) \\ &= X_1\beta_1 + \rho_G\sigma_\epsilon\lambda^{SP}_G + \rho_I\sigma_\epsilon\lambda^{SP}_I \end{aligned} \tag{8}$$

where $\lambda^{SP}_G = \frac{\phi(\hat{G}^*_{SP})}{\Phi(\hat{G}^*_{SP})}$ and $\lambda^{SP}_I = \frac{\phi(\hat{I}^*_{SP})}{\Phi(\hat{I}^*_{SP})}$. For countries that are not under an IMF program, if we assume that the country did not choose to apply for a program, the expected growth rate is:

$$\begin{aligned} E(Y_2|P=0)) &= X_2\beta_2 + E(\epsilon|G^*_{SP} \leq 0) \\ &= X_2\beta_2 + \rho_G\sigma_\epsilon\lambda^{SP}_{\sim G} \end{aligned} \tag{9}$$

where $\lambda^{SP}_{\sim G} = \frac{-\phi(\hat{G}^*_{SP})}{1-\Phi(\hat{G}^*_{SP})}$. If, instead, the government wanted to participate in a program but was unable to reach an agreement with the IMF,

$$\begin{aligned} E(Y_2|P=0)) &= X_2\beta_2 + E(\epsilon|\{G^*_{SP} > 0, I^*_{SP} \leq 0\}) \\ &= X_2\beta_2 + \rho_G\sigma_\epsilon\lambda^{SP}_G + \rho_I\sigma_\epsilon\lambda^{SP}_{\sim I} \end{aligned} \tag{10}$$

[4]We use the agent error specification of Signorino's (1999) strategic probit. To make estimated coefficients comparable to the bivariate probit specification, one needs to either assume that the stochastic components associated with IMF and Government's expected utilities have standard errors equal to $1/\sqrt{(2)}$, or be aware that the estimated coefficients represent an estimate for the actual coefficients scaled by $\sqrt{2}\sigma$. This is akin to the problem of unidentified error variance in a probit model, where scholars either assume that $\sigma = 1$ or estimate βs scaled by σs.

where $\lambda_{\sim I}^{SP} = \frac{-\phi(\hat{I}_{SP}^*)}{1-\Phi(\hat{I}_{SP}^*)}$.

We use the estimated probabilities for each observation from the strategic probit model to decide whether to use equation 9 or 10 to calculate the growth effects of participating in an IMF program. This approach is superior, for example, to assuming that none of the countries that are not participating in programs applied for support, or that all applied but were rejected. Assigning countries to the most likely case takes advantage of the information we have about country choices from the strategic selection model, and allows us to estimate the differences between these two theoretically distinct groups of countries, which would otherwise bias our results. Furthermore, this allows us to directly test our adverse selection hypothesis.

Dynamic Aspects of IMF Programs and Temporal Dependence. As Vreeland (2003), we argue that potentially different processes govern the dependent variable being in a program if a country was already under a program in the previous year or if the country is deciding to enter a new program. We therefore separate these decisions to enter and remain in a program, and estimate the dynamic aspect of it. We also correct for the potential effect of program duration for countries that are under a program, and non-program duration for countries that consider entering into a brand new program. To model potentially nonlinear and non-monotonic effects of the two duration variables, we include a set of spline variables into IMF's and Government's decisions.[5]

Penalized Maximum Likelihood Estimation. To estimate the strategic probit model with partial observability, we use penalized maximum likelihood estimation (PMLE) approach. PMLE is first introduced by Firth (1993) as a small sample bias reduction method in maximum likelihood models. It is later offered as a solution to separation and quasi-complete separation problems in binary response models where maximum likelihood estimates either do not exist or are problematic (Heinze & Schemper 2002, Zorn 2005). PMLE works by introducing a 'penalty' term to the likelihood function that asymptotically disappears. This penalty term acts as a Bayesian prior on the coefficients[6], and keeps the estimates from approaching infinity when separation is an issue. The penalized likelihood function we maximize is equal to

$$L_{PMLE}(\beta|P) = L_{MLE}(\beta|P)|I(\beta)|^{\frac{1}{2}} \tag{11}$$

[5]See Beck, Katz & Tucker (1998) on the use of splines in controlling temporal dependence in logit models.

[6]For the exponential family link functions, the penalty term is equivalent to Jeffrey's Invariant Prior (Firth 1993, Zorn 2005)

Where $I(\beta)$ is the information matrix (Firth 1993, Zorn 2005). The reason we use this approach in estimating the selection model is that we were unable to calculate the MLE estimates of the parameters in some of the specifications for countries that are already under an IMF program, due to the small sample size and the complexity of the partial observability likelihood function[7].

Results

To calculate the unbiased effect of IMF programs on economic growth, we first estimate a model of selection into IMF programs. Using the coefficient estimates from the selection model, we calculate the appropriate λs, the selection corrections for countries under a program and those not under a program, to plug-in the growth equation and calculate GB and EB in equations 4 and 5.

Table 1 presents estimation results from the selection model. Model S1 is a bivariate probit model with partial observability that is estimated by Vreeland (2003). Separate models are estimated for countries that are already under a program and countries that are deciding to enter a program. Model S2 estimates a strategic probit model with partial observability instead, to appropriately capture the strategic element in Government's decision. Due to the problems with the "Decision to Remain" case, we were not able to estimate two separate models for decisions to enter and remain in a program.[8] Instead, we pooled the two samples together and used interaction terms and last year's program status to capture the dynamic aspect of program participation. In this specification, we also included splines to control for the effect of program duration and non-program duration on Government's and the IMF's preferences. Finally, in Model S3, we use a PMLE to estimate the parameters. We include a set of splines for duration dependence in this model as well.

Table 2 presents the results on our growth regression. Under each coefficient value, p-values are reported in parantheses. The table includes three different models: the first model includes program status as an independent variable and is not corrected for selection bias. This model also assumes that the effect of other regressors in the model are the same for countries that are under and not under a program. Model 2 relaxes this assumption and estimates separate regressions for countries that are under and not under IMF programs. This model also includes selection corrections for IMF's

[7] This was a problem for both bivariate probit and strategic probit models

[8] Out of 444 countries that are already under a program, only 61 of them fail to stay in the program in a given year. Due to this unbalanced nature of the dependent variable, and the demanding likelihood function of the partial observability model, both the bivariate probit and strategic probit were quite fragile in estimating the decision to remain in a program, with coefficient estimates approaching infinity in many specifications.

	Government				
	Bivariate Probit Model S1		**Strategic Probit Model S2**	**Strategic Probit Model S3**	
Variable	Enter	Remain	Pooled	Enter	Remain
Reserves	-.833	-4.464	2.183	-1.945	-.918
	(.125)	(.007)	(.396)	(.076)	(.023)
Budget Bal.	-.952	1.145	-11.294	-3.179	.106
	(.011)	(.014)	(.004)	(.000)	(.383)
Debt Serv.	1.377	2.363	12.284	6.048	.364
	(.004)	(.125)	(.008)	(.000)	(.085)
Investmemt	-6.059	17.485	-6.048	-2.086	.114
	(.001)	(.019)	(.013)	(.003)	(.424)
Years Under	.358	-1.140	.049	-.540	.092
	(.083)	(.112)	(.976)	(.428)	(.623)
Num. Under	.444	-.708	1.064	.396	-.099
	(.014)	(.176)	(.337)	(.280)	(.483)
Lagged Elec.	.869	-1.025	14.804	5.630	-.098
	(.007)	(.181)	(.009)	(.000)	(.644)
Under	-	-	4.019	-	-
			(.563)		
Constant	-2.271	6.537	1.337	1.176	4.229
	(.000)	(.013)	(.860)	(.635)	(.000)
	IMF				
	Bivariate Probit (MLE)		**Strategic Probit MLE**	**Strategic Probit PMLE**	
Variable	Enter	Remain	Pooled	Enter	Remain
BOP*Size	-.914	-.296	-1.710	-12.444	2.808
	(.014)	(.067)	(.012)	(.000)	(.024)
Num. Under	-.728	.200	-.157	-.268	1.453
	(.027)	(.023)	(.211)	(.007)	(.015)
Under*Num.Und.	-	-	.374	-	-
			(.026)		
Regime	.430	.387	.388	.368	-.120
	(.114)	(.041)	(.037)	(.096)	(.822)
Under	-	-	5.064	-	-
			(.001)		
Constant	2.145	.117	-.505	.471	.925
	(.150)	(.747)	(.349)	(.436)	(.689)
N of Observ.	1024		1024	1024	
Log-likelihood	-353.93		-344.65	-303.70	
% Predicted	86%		87%	88%	

Table 1: Selection into IMF Programs

		Selection Corrected			
	Model 1	**Model 2**		**Model 3**	
Variable	Pooled	Under	Not Under	Under	Not Under
Under	-.065	-	-	-	-
	(.808)				
Lagged Growth	-	-	-	.063	.002
				(.002)	(.952
Cap. Stock Gr.	.454	.478	.441	.477	.442
	(.000)	(.000)	(.000)	(.000)	(.000
Labor Force Gr.	.434	.484	.378	.489	.373
	(.000)	(.000)	(.013)	(.000)	(.017
λ_{GOV}	-	.683	-1.331	.465	-1.038
		(.042)	(.000)	(.100)	(.140
λ_{IMF}	-	-.686	-.374	1.217	.007
		(.078)	(.522)	(.087)	(.993
Constant	-.018	-.308	-.048	-2.629	.431
	(.951)	(.367)	(.919)	(.002)	(.724
N. of Observ.	1024	465	559	465	559

Table 2: The Effect of IMF Programs on Growth

and Government's decisions to enter into a program. The selection corrections are calculated from the strategic selection model presented in table 1. For countries that are not under a program, to calculate the correct selection correction, we used predicted probabilities. Finally, Model 3 includes all the regressors in Model 2 as well as lagged growth and a set of spline variables. In this model, the 'under' case includes four splines for program duration, and the 'not under' specification includes five spline variables for no program duration.

Based on Model 2, if selection into programs is assumed to be random (which is of course not true), the average benefit from an IMF program is .20 percent increase in growth rate. Based on this criterion, 784 out of 1024 countries in our sample would benefit from an IMF program. If we take into account self-selection into programs, the estimated average benefit for countries under a program is .52 percent. 394 out of 465 countries are predicted to have benefited from the program. Similarly, based on the gross benefit we calculate, 322 out of 465 countries are predicted to have benefited from an IMF program.

Using the spline variables in Model 3, we can plot the potentially nonlinear effect of program duration on growth. The resulting marginal effect curve is presented in Figure 2. For this plot, we fixed the rest of the regressors to their mean values.[9] The figure shows that the effect of program

[9]Since our growth model is linear in regressors, fixing the other regressors to other values will only shift the plotted curve up or down vertically.

duration for countries under a program is significant and positive. This indicates that IMF programs have their most positive effects on growth after a country has already participated in programs for several years. The increase in the benefit of participating in a program is quite pronounced in the first couple of years, as demonstrated by the steepness of the curve, and the change due to duration gradually decreases. After the first three years, the growth effect of remaining in IMF programs reaches a plateau. These results contradict arguments about the harmful effects of recidivism, which claim that prolonged use of IMF resources is harmful for growth. To the contrary, we find that IMF programs have more successful growth performances among long-term users (3+ years) than among short term users (0-3 years). This is consistent with the argument that the IMF gradually accumulates experience with its borrowers that allows it to overcome information asymmetries and adjust conditionality to overcome governance problems.

Figure 3 presents a quadratic regression fit of estimated growth benefit on the IMF's and the Government's estimated probabilities of entering or remaining in a program. Among governments that are under a program, the figure shows a negative relationship between the government's estimated probability of seeking a program and the estimated growth benefit the government gets from the IMF program. This supports our adverse selection hypothesis: the countries that are most interested in participating in IMF programs are the least likely to have favorable growth outcomes. There does not seem to exist a similar relationship between the IMF's estimated probabilities and the government's benefit from the program.

We provide two examples for the adverse selection effect in Figure 4. In this figure, we contrast India and Ghana's experiences with IMF programs. We estimate Ghana in 1979 to be very eager to enter into an IMF program, with an estimated .99 probability of seeking an agreement, while India in 1981 is estimated to seek an agreement with relatively lower probability (.75). IMF, on the other hand, was very eager to sign an agreement with India (with .95 probability), but not so with Ghana (with $\sim$ .30 probability). The figure shows that India's growth performance was steady and positive during its four years under the program, while Ghana's growth fluctuated during its program. Moreover, our model estimates a positive growth benefit for India for the whole duration of the program. Ghana, on the other hand, has a negative estimated benefit in some years under the program, and overall the growth benefit is very close to zero.

Conclusions

We argue that IMF programs appear to prevent rather than promote economic growth because they suffer from adverse selection. The countries that offer the best prospects of successfully implementing IMF programs are least likely to apply. When the selection process is modeled in a way that explicitly allows for the possibility of adverse selection, the results demonstrate that IMF programs generally have beneficial consequences for growth. The results are statistically significant and substantively important, and indicate that, contrary to the received wisdom, the IMF is in fact an important agent that promotes economic development.

Our results, furthermore, have implications for an on-going debate within the Fund and outside about the policy implications of long-term use of IMF resources. Countries that use IMF resources are more likely to use them repeatedly, and the countries that do so include some of the poorest and worst-managed economies in the world. Using the standard logic of moral hazard, scholars and policy analysts have concluded that long-term use of Fund resources is detrimental to the development of these countries, and have encouraged the Fund to limit itself to its original purpose of providing short-term balance of payments assistance rather than long-term development assistance. The logic of adverse selection suggests the opposite analysis: repeat users of IMF programs would have had poor economic performance without programs as well, but the opportunity to interact with them repeatedly allows the Fund to overcome its information disadvantage and screen out the governments that are not making good-faith efforts to promote reform. Consequently, long-term users of Fund resources should benefit more on average from program participation than short-term users. Our empirical results demonstrate that this is, in fact, the case.

Our analysis suggests ways of mitigating the adverse selection problem, which should improve the effectiveness of IMF programs over time. Each of these mechanisms relies upon efforts to separate worthy from unworthy borrowers. First, in order to mitigate adverse selection, it is essential that the credibility of Fund enforcement of conditionality increase. If conditionality is weakly enforced, it provides no incentives for governments that are not committed to reform to declare themselves by refusing to participate in IMF programs. Second, the Fund should mitigate the incentive for reform-averse governments to sign programs by front-loading conditionality in the form of prior conditions and back-loading the phasing of loan disbursements. Third, the Fund should increase the incentive for well-governed countries to participate in programs by raising the value of a Fund program as a

signal to the market. This requires the IMF to be more selective in approving programs. A program cannot be a seal of approval if it is available to any member that wants one; and if it conveys no positive information to the market, it is likely to convey negative information.

Contrary to a substantial literature that has grown up to criticize the IMF, our analysis finds evidence that IMF programs have contributed to the economic development of most of the countries that have participated in them. Furthermore, our findings indicate that it is possible to estimate which countries have benefitted and which have had their development stunted under IMF programs. In our analysisas in the real world of IMF program design and evaluationthe key factors that lead to success and failure are largely unobservable, and we can estimate them only because they have observable implications for which countries choose to apply for IMF assistance. If they were fully observable, adverse selection would be unproblematic. This indicates a fourth strategy for improving IMF program outcomes, which is to study the political factors that lead to program success and failure in order to reduce the degree of information asymmetry between the Fund and its members.

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Appendix 1: Bivariate Probit with Partial Observability

Our approach is similar to one that has been used by Vreeland (2003), Przeworski & Vreeland (2000), and Przeworski & Vreeland (2002), but differs in several key respects, so this appendix is included to explain the differences. Przeworski and Vreeland argue that selection models for IMF programs should incorporate the fact that two decisions are involved in the selection process: both the borrowing country and the IMF must consent to an agreement before one can be observed. Since only the outcome of the joint decision can be observed, they propose using bivariate probit with partial observability to estimate the unobserved parameters (Poirier). In the bivariate probit with partial observability approach discussed in Vreeland (2003), the government's and the IMF's decisions are modeled with two latent variable equations:

$$G^*_{BP} = \gamma\omega + \upsilon_G \tag{12}$$
$$I^*_{BP} = \alpha\kappa + \upsilon_I \tag{13}$$

where ω is the set of factors affecting a government's decision to seek a program, κ is the set of regressors influencing the IMF's decision to enter into an agreement with a government, υ_G and υ_I are standard normally distributed error terms. We only observe a program when both the government and the IMF are willing to sign one. In other words,

$$\begin{aligned} P(P=1) &= P(G^*_{BP} > 0, I^*_{BP} > 0) \\ P(P=0) &= 1 - P(G^*_{BP} > 0, I^*_{BP} > 0) \end{aligned}$$

If we allow that υ_G and υ_I are correlated with ϵ, such that Corr(ϵ, υ_G) = ρ_G and Corr(ϵ, υ_I) = ρ_I[10], then, the expected growth rate for countries that are under an IMF program (the first part of equation 5) becomes[11]:

$$\begin{aligned} E(Y_1|P=1) &= X_1\beta_1 + E(\epsilon_1|G^* > 0, I^* > 0) \\ &= X_1\beta_1 + \rho_G\sigma_\epsilon\lambda_G + \rho_I\sigma_\epsilon\lambda_I \end{aligned} \tag{14}$$

where $\lambda_G = \frac{\phi(\gamma\omega)}{\Phi(\gamma\omega)}$ and $\lambda_I = \frac{\phi(\alpha\kappa)}{\Phi(\alpha\kappa)}$; and ϕ and Φ are probability density and cumulative distribution functions of standard normal distribution respectively.

For countries that are not under an IMF program, if we assume that neither the IMF nor the country wanted a program, the expected growth rate is (the second component of equation 5):

$$\begin{aligned} E(Y_2|P=0)) &= X_2\beta_2 + E(\epsilon_2|\{G^* \leq 0, I^* \leq 0\}) \\ &= X_2\beta_2 + \rho_G\sigma_\epsilon\lambda_{\sim G} + \rho_I\sigma_\epsilon\lambda_{\sim I} \end{aligned} \tag{15}$$

where $\lambda_{\sim G} = \frac{-\phi(\gamma\omega)}{1-\Phi(\gamma\omega)}$ and $\lambda_{\sim I} = \frac{-\phi(\alpha\kappa)}{1-\Phi(\alpha\kappa)}$. If, instead, government wanted a program but the IMF did not grant it,

$$\begin{aligned} E(Y_2|P=0)) &= X_2\beta_2 + E(\epsilon_2|\{G^* > 0, I^* \leq 0\}) \\ &= X_2\beta_2 + \rho_G\sigma_\epsilon\lambda_G + \rho_I\sigma_\epsilon\lambda_{\sim I} \end{aligned} \tag{16}$$

Finally, if it is the case that the IMF wants a program and the government does not,

$$\begin{aligned} E(Y_2|P=0)) &= X_2\beta_2 + E(\epsilon|\{G^* \leq 0, I^* > 0\}) \\ &= X_2\beta_2 + \rho_G\sigma_\epsilon\lambda_{\sim G} + \rho_I\sigma_\epsilon\lambda_I \end{aligned} \tag{17}$$

Therefore, depending on which of the equations 15, 16, and 17 is predicted or assumed to apply to the country i, that equation will be used in calculating GB in equation 4 or EB in equation 4.

[10] for simplicity and for practical difficulties in estimation, Vreeland assumes Corr(υ_G, υ_I) = 0. We also make this assumption for the rest of the paper.

[11] observation indexes are dropped for ease of presentation

In effect, the Przeworski and Vreeland approach assumes that the government and IMF make simultaneous decisions about whether to initiate a program, and compares the case of program participation to the three logical alternatives: only the country wants a program, only the IMF wants a program, or neither wants a program. In contrast, our model captures the fact that only a borrowing country can initiate an application for a program, so the IMF only faces the option of approving programs when countries have already indicated that they desire to participate. This captures the essence of the problem of adverse selection. Our model generates different estimates for government and IMF utilities, and different selection corrections.

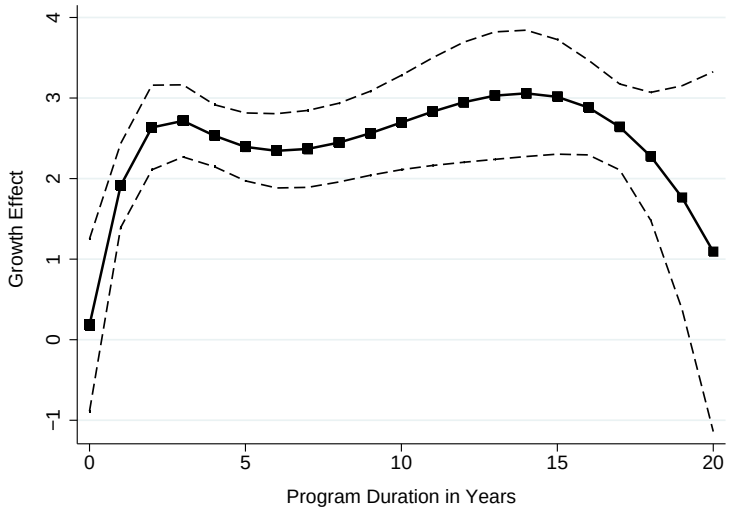


Figure 2: The estimated Effect of Program Duration on Growth Rates (From Model 3 in Table 2)

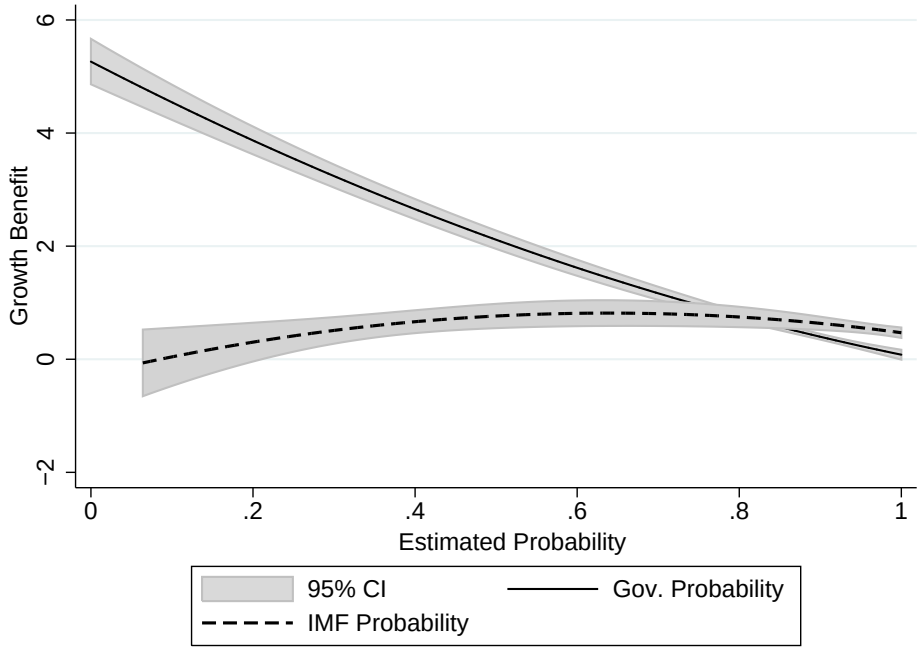
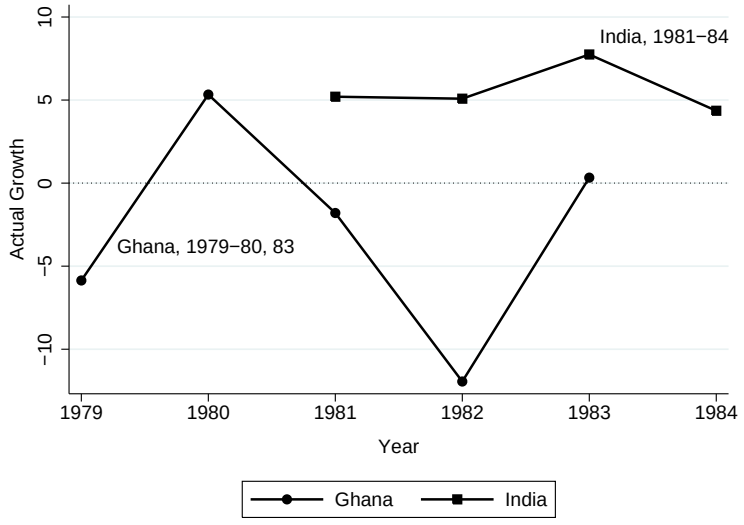
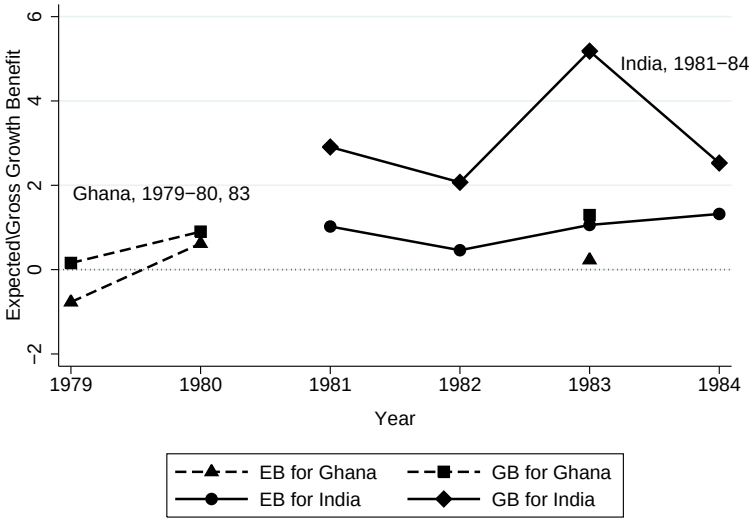


Figure 3: Quadratic Fit of Estimated Growth Benefit versus Government's and IMF's Probabilities

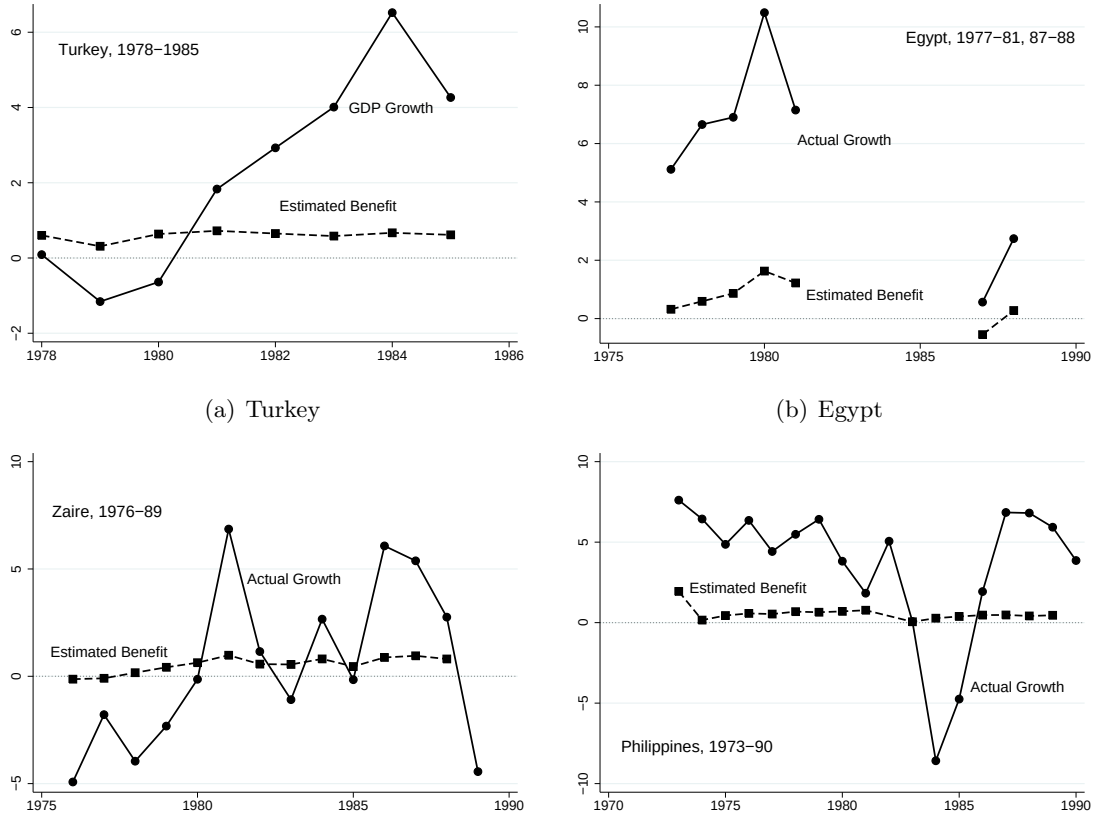


(a) Actual Growth Rates



(b) Estimated and Gross Growth Benefit

Figure 4: Growth Benefit and Actual Growth Rates Under a Program (Ghana and India)



(a) Turkey

(b) Egypt

(c) Zaire

(d) Philippines

Figure 5: Estimated Growth Benefit and Actual Growth Rates Under a Program