Endogenous IMF Conditionality: Theoretical and Empirical Implications

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Abstract
The decision to participate in an IMF program is a joint decision of the IMF staff and the government of the potential participant country. Conditionality is not set independently of the decision to approve a program, but is in fact the endogenous outcome of a bargaining process.

There are four contributions of the paper. First, there is a theoretical exposition of a bargaining game appropriate to this joint decision process. Second, the hypothesis that this bargaining game governs negotiations between the IMF and participating governments is tested; a simpler no-negotiation model is rejected in favor of this bargaining approach. Third, this insight has important implications for the estimation of participation functions; I derive those implications and demonstrate the significant difference in estimated participation coefficients. Fourth, the insight also has important implications for typical methods for estimating the impact of participation on economic performance. I demonstrate the empirical importance of this through estimation of the impact of IMF programs on economic growth in the 1990s. Failure to consider the endogeneity of conditionality leads to biased estimation results, and the results reported here indicate that this bias can be quite substantial.

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The Articles of Agreement of the International Monetary Fund created a credit facility to provide temporary balance-of-payments support to member countries.[1] To ensure that this support will be temporary, the Articles of Agreement stipulate that countries participating in this facility must approve conditions limiting the country's macroeconomic policies. These conditions were the "safeguards" devised by IMF staff to "correct balance of payments maladjustments" while not jeopardizing "national or international prosperity". The derivation and use of these conditions has been quite controversial over the years – some critics found the conditions to be too constraining while others found them too loose; some found them too political while others found them not political enough.[2]

The terminology of this debate persists to the present, but should be revised. It does not reflect the reality of IMF credit programs.[3] While the Articles of Agreement are written in the spirit of temporary balance-of-payments support, the practice has become that countries transit from one program directly to another. The effective length of a spell of participation in the IMF credit facilities is for many countries many times longer than the length of a single arrangement.[4] This phenomenon has received widespread attention recently. The International Financial Institutions Advisory Commission (IFIAC) appointed by the US Congress was quite critical of the development.[5] In response, the Independent Evaluation Office (IEO) of the International Monetary Fund recently concluded a thorough investigation of the phenomenon culminating in the report "Evaluation of Prolonged Use of IMF Resources".[6]

In both of these reports, the conditionality of IMF programs was given a central role in the argument. The authors of IFIAC (2000) concluded that the IMF had ceased to enforce the conditionality it negotiated at the start of each arrangement, thus eliminating

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1 Article I, section v, states that one goal of the IMF is " (v) To give confidence to members by making the general resources of the Fund temporarily available to them under adequate safeguards, thus providing them with opportunity to correct maladjustments in their balance of payments without resorting to measures destructive of national or international prosperity." A copy of the Articles of Agreement is available from the IMF at http://www.imf.org/external/pubs/ft/aa/aa.pdf.

2 Williamson (1982) is a collection of papers from the years leading up to the debt crisis, and provides evidence of both of these charges. More recently, IFIAC (2000) has charged that the conditions imposed are (a) politically motivated and (b) effective only in perpetuating the dependence of the borrowing country on the IMF. Other critics of IMF conditions include Sachs (1998) and Feldstein (1998). Rosett (1998) provides a summary of criticisms based on IMF conditions in East Asian countries. Ivanova et al. (2002) makes the case that IMF conditions do not have enough political motivation.

3 The IMF has created a number of "facilities" for disbursing credit: these include not only the original stand-by arrangement (SBA), but also the extended fund facility (EFF), the structural adjustment facility (SAF), the extended structural adjustment facility (ESAF), the poverty reduction and growth facility (PRGF), the oil facilities, the compensatory financing facilities, and others. When an individual country approaches the IMF for credit, funds are made available from the appropriate facility.

4 I will use the words "arrangement" and "program" interchangeably to describe the contractual relationship between the IMF and a borrowing country, but that is not quite right. The arrangement is the financial commitment of the country to draw down funds and then repay them, while the program is the set of conditions agreed upon between the IMF and the borrowing country. I will use either term to refer to that single contractual relationship between the two actors.

5 IFIAC (2000).

6 IEO (2002).

its effectiveness. The authors of IEO (2002) concluded that those countries with prolonged access to IMF programs were subject to fewer and less onerous conditions on average, and that conditionality was for these countries poorly "prioritized", so that compliance with some conditions assured continued access to IMF resources while the country's most critical economic problems remained unaddressed.[7]

Both of these critiques of the phenomenon of prolonged use miss a crucial aspect of conditionality: it is a negotiated agreement between the IMF and the participating country, and is thus should be considered endogenously determined. The conditions, rather than being an independently set list of policy reforms to achieve economic growth and external balance, are the outcome of bargaining between the IMF and the participating country. These conditions are not only policy-reform components of IMF programs, but have become facilitative devices to continued cooperation between the two parties as well. Countries not fulfilling the conditions of an arrangement will often cancel that arrangement – but another arrangement will follow immediately.

Section I chronicles this prolonged use of IMF facilities through examination of the histories of Kenya and Pakistan in dealing with the IMF. A number of stylized facts of these relationships will be incorporated into the theoretical model that follows, including the frequent cancellation of an existing IMF arrangement with immediate installation of a new arrangement and the wide variety in percentages drawn down in those arrangements.

While the conditions attached to IMF credit arrangements are closely held by the IMF and the borrowing government, two indicators of non-fulfillment can be found: the premature cancellation of an IMF arrangement and the drawdown of less than 100 percent of the available credit in the arrangement. Section II introduces a simple model of the intertemporal bargaining process between IMF and borrowing country. It becomes clear in that model that the conditions attached to an IMF facility may in fact make additional lending possible. While the initial arrangement may be cancelled due to non-compliance with conditions, a new arrangement can be put in place immediately thereafter due to the ability of both parties to adjust the conditions. Section III provides econometric evidence in support of this model drawn from the the IMF's Annual Reports and from the Monitoring of Arrangements (MONA) database of the IMF. Section IV explores the implication of this model for cross-country estimation of the determinants of participation in IMF programs. Section V examines the implications for cross-country investigations of the impact of IMF programs on economic growth. Section VI concludes.

I. The Prolonged Use of IMF Credit Facilities.

In the Articles of Agreement, member use of IMF credit facilities was expected to follow the model of a credit union: periodic use of the facilities, with all members rotating between borrower and lender roles.[8] In practice, however, many borrowing countries have experienced prolonged use of IMF credit facilities. This prolonged use does not seem to be the exclusive purview of countries meeting the conditions on programs, but

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7 IEO (2002, p. 13)

8 Kenen (1986) provides a detailed discussion of this analogy.

rather seems concentrated among those countries for whom it is quite common that arrangements be cancelled or funds not drawn down in full.[9] In this section I illustrate this point with evidence from Kenya and Pakistan.

Table 1 lays out Kenyan participation in five types of IMF credit facilities: stand-by arrangements (SBA), extended fund facilities (EFF), structural adjustment facilities (SAF), extended structural adjustment facilities (ESAF) and Poverty Reduction and Growth Facilities (PRGF). These facilities were those for which conditions were necessary for disbursement.

Table 1. Kenyan Participation in IMF Arrangements

Facility	Start Date	End Date	Cancellation	Percent Drawn Down
EFF	7/7/75	7/6/78	No	11
SBA	11/13/78	8/19/79	Yes	100
SBA	8/20/79	10/14/80	Yes	0
SBA	10/15/80	1/7/82	Yes	37
SBA	1/8/82	1/7/83	No	60
SBA	3/21/83	9/20/84	No	100
SBA	2/8/85	2/7/86	No	100
SBA	2/1/88	5/15/89	Yes	74
SAF	2/1/88	5/15/89	Yes	29
ESAF	5/15/89	3/31/93	No	83
ESAF	12/22/93	12/21/94	No	100
ESAF	4/26/96	4/25/99	No	17
PRGF	8/4/00	8/3/03	No	23 (as of 4/30/02)

Also received, but not listed: drawings from Oil Facility and Compensatory Facility in 1974-76, 1979 and early 1980s. Source: IMF Annual Reports, various years.

The Kenyan experience provides examples of two phenomena observed in many member countries. First, there are many instances of non-cancelled arrangements that nevertheless were characterized by small percentages drawn down. For example, the 1975 EFF agreement between Kenya and the IMF ran its entire term but only 11 percent of the total funds available were disbursed. Second, there were five cancelled agreements between Kenya and the IMF during the period since 1975. Each cancellation was followed immediately by the introduction of a new arrangement.

The low percentage drawn down is an indicator of one of two scenarios. The credit available in an IMF arrangement is disbursed in tranches. The tranches are disbursed according to a set timetable on the request of the borrowing country. Later tranches can only be disbursed if the country has met the conditions defined in the Letter of Intent

[9] The notion that conditionality is endogenous to the negotiation process is not a new idea, nor is it limited to these two examples. Dreher (2002) provides a very interesting compilation of the available historical evidence on conditionality and documents trends in design and implementation over time and by groups of countries.

associated with the arrangement. Thus, if the country has not met the conditions, then only the first tranche will be disbursed. Alternatively, the country's external position may improve over time; if the country has no need for the credit it may choose not to request disbursement but hold the arrangement as a credit line against future contingencies. In either case the arrangement continues but the credit is not drawn down.

Cancellation of an arrangement is in theory a more serious step, but in practice it can allows increased access to IMF credit facilities. So long as the current program is in place, its conditions govern the ability of the IMF to disburse credit. If the borrowing country and IMF agree that the conditions of an existing arrangement are no longer appropriate the country can cancel the current arrangement so that a new program, with new conditions, can be introduced. Cancellation is then a signal not of conflict but of cooperation, and is usually followed by immediate agreement on a new program with new conditions.

As Table 2 illustrates, Pakistan has a long history as a user of IMF credit facilities. This history can be broken into two parts: the initial generation (1958-1978) of non-cancelled and nearly completely disbursed arrangements, and a subsequent generation (1980-2000) of arrangements with limited disbursement and frequent cancellation. The initial generation includes a rather rare event – a cancelled arrangement in 1959 without a new program immediately negotiated. In the other instances of cancelled arrangements (1981, 1994, 1995) there was immediate introduction of a new arrangement in place of the one cancelled.

Table 2. **Pakistani Participation in IMF Facilities**

Facility	**Start Date**	**End Date**	**Cancellation**	**Percent Drawn Down**
SBA	12/8/58	9/22/59	Yes	0
SBA	3/16/65	3/15/66	No	100
SBA	10/17/68	10/16/69	No	100
SBA	5/18/72	5/17/73	No	84
SBA	8/11/73	3/10/74	No	100
SBA	10/16/74	10/15/75	No	100
SBA	3/9/77	3/8/78	No	100
EFF	11/24/80	12/1/81	Yes	0
EFF	12/2/81	11/23/83	No	0
SAF	12/28/88	12/27/91	No	71
SBA	12/28/88	11/30/90	No	71
SBA	9/16/93	2/22/94	Yes	33
ESAF	2/22/94	12/13/95	Yes	28
EFF	2/22/94	12/13/95	Yes	32
SBA	12/13/95	9/30/97	No	52
EFF	10/20/97	10/19/00	No	25
ESAF	10/20/97	10/19/00	No	39
SBA	11/29/00	9/30/01	No	100
PRGF	12/7/01	12/6/04	No	17 (as of 4/30/02)

Also received, but not listed: use of Oil Facility and Commodity Finance Facility in 1970s, early 1980s and early 1990s. Source: IMF Annual Reports, various years.

These examples illustrate three features of the history of IMF arrangements that a model should replicate. First, prolonged use should be a possible outcome of the model. Second, the cancellation of an existing arrangement and immediate negotiation of a new program should be an endogenous event in the model. Third, the partial drawdown of arrangements should be an endogenous outcome as well.

II. A Theoretical Analysis of Conditionality.

Participation in an IMF program is an interlocking set of decisions made over time. There are two decision-makers: the government of the country applying to participate in the program, and the staff and executive directors of the IMF. When a program is first proposed, there is an initial evaluation by both government and IMF staff as to the desirability of the program. The borrowing country weighs the costs and benefits of requesting a program, while the IMF staff examines the ability of the country to introduce the reforms that are thought to be necessary conditions for re-attaining external equilibrium. If the answer to each is "yes", then the arrangement is approved. The participating government signs a Letter of Intent, indicating its agreement with the conditions of the program. The first tranche of IMF funding is released.

If there is an ongoing arrangement with the country, the IMF staff first examines whether the country has met its conditions (denoted c_{jt}). If the country's historical performance (b_{jt}) has not satisfied the conditions (i.e., $c_{jt} > b_{jt}$) the IMF cannot automatically disburse funds. It will either postpone disbursement or grant a waiver. Otherwise, disbursement will occur upon request of the borrowing country.

Each program is assumed without loss of generality to last n periods. In each period, there is a re-examination of the feasibility and desirability of the program from the viewpoint of each decision-maker. When the program ends, the participating country remains a member of the IMF. It will, on a periodic basis, consult with the IMF staff about the value and conditions that would be attached to a new program.

Competing hypotheses.

I consider two competing hypotheses on conditionality.

- Hypothesis 1: conditions on IMF programs are derived by the IMF from economic fundamentals of the participating country. If conditions are not met, lending under the program is suspended. For one IMF program to follow another immediately, the conditions attached to the second program must be equal to or more restrictive than the initial program.

- Hypothesis 2: conditions on IMF programs are the outcome of bargaining between IMF staff and participating-country government. If conditions are not met, lending is suspended – but the two actors will look for ways to rewrite the conditions so as to permit disbursement. One method will be to establish an IMF program following another immediately with less restrictive conditionality. Another method will be to cancel the existing program and introduce a new program with reduced conditionality.

The two hypotheses will be addressed within a model of decision-making by IMF staff and participating-country government.

A Perfect-Foresight Model of the Bargaining Process.
In this section I develop a perfect foresight model of the decision rules of IMF staff and participating-country government. While the lack of uncertainty reduces the relevance of the model to current events, the simpler specification serves to illustrate the critical features of the model.

IMF Staff Decision Rule. The IMF staff decision rule can be represented as follows for period t. There is a variable z_{Ijt} whose value measures the discounted cumulative payoff to the IMF of an n-period program with country j. This variable is a function of observed country-specific variables of interest to the IMF denoted Z_{Ijt}. If there is a continuing program, the decision is also dependent upon the relation between conditions of the previous program (c_{jt}) and the actual value of target variables (b_{jt}). To be specific in this example, consider b_{jt} to be the government budget surplus as a percent of GDP in period t. The country is presumed to begin with a budget deficit. There is a discount factor $\eta < 1$ applied each period to create the discounted payoff.

The conditionality of IMF programs for country j enters the IMF payoff function in two ways. First, the payoff to the IMF will rise with the extent to which the agreed-upon condition for next period improves upon the outcome observed this period ($c_{jt+1} - b_{jt} > 0$). Second, the payoff to the IMF will fall for countries with existing programs in proportion to the extent by which the realized value of the target falls short of the agreed-upon condition for this period ($c_{jt} - b_{jt} > 0$). The variable J_{jt} is an indicator function taking the value of one if the country is in an IMF program in the current period, and zero otherwise. The decision to implement a new program in period t is indicated by the value of P_{Ijt}: if one, it is in the IMF interest to offer a new program, while if zero, the IMF will prefer not to offer a new program.[10]

$$z_{Ijt} = \Sigma^{n}_{i=1} \eta^{t} \{Z_{Ijt+i}\, \beta_{Ij} + \delta_{I1}(c_{jt+i} - b_{jt+i-1}) - J_{jt}\, \delta_{I2}\, (c_{jt+i-1} - b_{jt+i-1})\} \qquad (1)$$

$$P_{Ijt} = \begin{cases} 1 & \text{if } z_{Ijt} \geq 0 \\ 0 & \text{otherwise} \end{cases} \qquad (2)$$

While there is no explicit payoff to the IMF for its participation in arrangements, the decision criterion modeled here may be thought of as a weighted index of the country's eligibility for lending based upon a number of indicators. The first set of indicators ($Z_{Ijt}\, \beta_{Ij}$) will include comparable cross-country indices of macroeconomic stability, terms of trade deterioration, international indebtedness, and others. The indicators need not be

[10] It is possible, given the specification of (1), that a country could meet its conditions ($b_{jt} - c_{jt} > 0$) but the IMF prefer not to continue to lend at those conditions. The IMF is bound in this situation to continue with the program.

strictly economic; the country's political stance or other factors could also enter this weighted index. The β_{Ij} are the weights placed on each indicator in the overall index. For countries currently in programs, the country's ability to meet current conditions (b_{jt}–c_{jt}) enters the calculation with weight δ_{I2}. Also entering the eligibility index with weight δ_{I1} is the country's willingness to commit to restrictive conditions in the future (c_{jt+1}-b_{jt}).[11]

Decision rule for participating government j. For country j, there is an error-correction rule governing the dynamics of its policy variable b_{jt}:

$$b_{jt+1} = b_{jt} - \psi_j (b_{jt} - \tilde{b}_j) + \gamma_j (c_{jt+1} - b_{jt}) \qquad (3)$$

In the absence of an IMF program, the policy variable follows a simple error-correction process around its long-run value $\tilde{b}_j$. ψ_j represents the percent of any differential between actual and long-run value that is made up in period t+1. With an IMF program, there will in addition be adjustment toward an agreed-upon condition c_{jt+1}. The parameter γ_j indicates the degree of policy adjustment with its range between 0 and 1. Smaller γ_j indicates less movement toward the target c_{jt+1}, perhaps because of greater institutional rigidities in country j.[12] Through sequential substitution and re-arrangement of terms, (3) can be written contingent upon arbitrary condition c^o as:

$$b_{jt+i} - c^o = (\psi_j /(\psi_j+\gamma_j))\,(1-(1-\psi_j-\gamma_j)^i)\,(\tilde{b}_j - c^o) + (1-\psi_j-\gamma_j)^i\,(b_{jt} - c^o) \qquad (4)$$

The government's decision to participate in an IMF program is assumed to be triggered by a positive cumulative payoff from participating in the program. This payoff is represented by the variable z_{gjt}. There are gains and losses associated with external sources, a function of observed country-specific variables Z_{gjt}. There is a positive payoff K each period from participation. There are as well welfare losses associated with conditionality on policies measured by the adjustment (b_{jt-1}–b_{jt}).[13] The government's decision to request a program is indicated by P_{gjt}: its value is one if a request is made, or zero if no request is made.

$$z_{gjt} = \Sigma^n_{i=1}\, \eta^i \,\{Z_{gjt+i}\, \beta_{gj} + P_{gjt+i}\, (K + \psi_j(b_{jt+i} - \tilde{b}_j) - \gamma_j\, (c^o - b_{jt+i}))\} \qquad (5)$$

$$P_{gjt} = \begin{cases} 1 & \text{if } z_{gjt} \geq 0 \\ 0 & \text{otherwise} \end{cases} \qquad (6)$$

[11] The relative sizes of δ_{I1} and δ_{I2} will indicate whether the IMF decision depends more upon meeting conditionality or upon macroeconomic stability and external shocks. If δ_{I2} were large relative to δ_{I1}, for example, it would appear to the observer that the IMF had two sets of country-evaluation rules: one set for those countries currently in programs and one set for those not in programs.

[12] There can of course be other determinants of the evolution of policy, but these are suppressed for simplicity.

[13] The reputational cost of entering an agreement for the first time could be included easily as well.

Representing the joint decision. In general, the decision variables P_{Ijt} and P_{gjt} are not observed separately. The joint decision to set up a program $P_{jt} = P_{Ijt} * P_{gjt}$ is observed. In addition, it is difficult to identify cross-country explanatory variables that belong in the IMF choice set but not in the country's choice set, and vice versa. When such exclusion restrictions are impossible, $Z_{jt} = Z_{Ijt} = Z_{gjt}$. For simplicity, and without loss of generality in the perfect-foresight world, set $Z_{jt} = Z_j$ for all t. It will also be the case that conditions (c^o) are set at the beginning of the program for the n-period life of the program. Using (3), the two decisions can be summarized:[14]

$$z_{gjt} = \alpha_1\{ Z_j \beta_{gj} + K\}+ \alpha_2\{(\psi_j+\gamma_j)(b_{jt} - c^o) - \psi_j(\tilde{b}_j - c^o)\} \quad (7)$$

$$z_{Ijt} = \alpha_1 Z_j\beta_{Ij} - \phi_1(\tilde{b}_j - c^o) - \phi_2 (b_{jt} - c^o) + \delta_{I2} J_{jt} (b_{jt} - c^a) \quad (8)$$

$$P_{jt} = \begin{cases} 1 & \text{if } z_{gjt} \geq 0 \text{ and } z_{Ijt} \geq 0 \\ 0 & \text{otherwise} \end{cases} \quad (9)$$

(7) and (8) are linked by the importance to both actors of the conditionality of a future program. The parameter c^a in (8) represents the conditionality attached to a previous program governing period t.

Figure 1 illustrates the interaction of payoffs z_{gjt} and z_{Ijt} as defined by (7) and (8) for a country j not in an IMF program in period t ($J_{jt} = 0$). All determinants of the payoffs are summarized in the intercepts of the two curves except for their dependence on the conditionality (c^o) during the program. It is evident from (7) that the government's desire to enter a program is declining with c^o, other things equal. For Figure 1, the IMF's desire to extend a program to the country is rising in c^o, other things equal, due to the assumption that $(\delta_{I1} - \delta_{I2}) > 0$. It is evident from the values of the payoff z_{Ijt} at the current level of the government budget surplus ratio (b_{jt}) that the IMF staff will recommend against participation if no condition on reducing the budget deficit is built into the agreement.

The level of conditionality h_j^o in Figure 1 represents the minimal acceptable conditionality to the IMF staff. More restrictive conditionality (i.e., more positive c^o than h_j^o) will yield higher payoffs to IMF staff, but is less preferred by the participating government. The payoff schedule z_{Ijt} illustrates the predictions of Hypothesis 1: it is based on economic fundamentals of the participating country and it defines a level of conditionality below which disbursements do not occur. To illustrate the third part of Hypothesis 1, consider the payoff schedule with a preceding program in place ($J_{jt} = 1$).

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[14] The parameters of (7) and (8) can be presented in terms of the "deep" parameters as follows:

$\alpha_1 = (\eta/(1-\eta))(1-\eta^n) > 0$

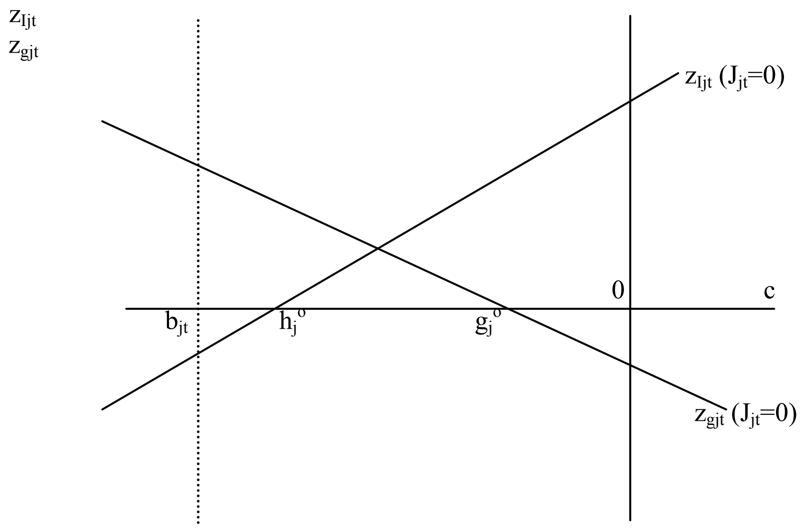
$\alpha_2 = (1-\eta^n (1-\psi_j-\gamma_j)^n)\eta(1-\psi_j-\gamma_j) /[1-\eta(1-\psi_j-\gamma_j)] > 0$ for $(1-\psi_j-\gamma_j) > 0$

$\phi_1 = (\delta_{I1} - \delta_{I2})\eta[(1-\eta^n)/(1-\eta)-\{(1-\eta^n(1-\psi_j-\gamma_j)^n)/(1-\eta(1-\psi_j-\gamma_j))\}] - \eta^n ((1-(1-\psi_j-\gamma_j)^n)\delta_{I1} > 0$

for $(\delta_{I1} - \delta_{I2}) > 0$ and $1 > (1-\psi_j-\gamma_j) > 0$ and n large enough

$\phi_2 = (\delta_{I1}-\delta_{I2})\alpha_2 + \delta_{I2} > 0$ for $(\delta_{I1} - \delta_{I2}) > 0$

Figure 1. **Bounds on Conditionality**



If past conditionality has not been met ($c_{jt} > b_{jt}$), then the minimal acceptable conditionality h_j^o rises: ceteris paribus, another program will follow immediately on one in which conditionality is not met only if the conditionality attached to the following program is more restrictive.

Figure 1 also illustrates the government's desire to enter an IMF program. It is declining in c^o, other things equal, because of the implied impact of increased conditions on welfare. The slope of this curve indicates the degree to which the government will adjust in response to participation. (If the participating government were planning simply to ignore the condition, then the curve z_{gjt} would be flat.) Hypothesis 2 posits that conditionality (c^o) is an endogenous variable. It will be determined by negotiation between the IMF and the member-country government.

The negotiation process between the two actors can be derived in the terms of Figure 1. While h_j^o is the minimally acceptable conditionality from the IMF perspective, g_j^o is the maximum conditionality acceptable to the participating country. The participating country will benefit from a program so long as the conditionality on the budget allows ratios less than g_j^o, and the IMF staff will favor a program for any conditionality on the budget surplus ratio less negative than h_j^o. For economies in which $g_j^o \geq h_j^o$ there is scope for bargaining over conditionality to reach a cooperative equilibrium c^o. For economies in which $g_j^o < h_j^o$ the model predicts no cooperative equilibrium and no IMF programs.

The information from Figure 1 relevant to the cooperative equilibrium can be summarized in reservation values (RV) of the budget surplus ratio. Setting z_{gjt} and z_{Ijt}

equal to zero in (7) and (8) defines g_j^o for the participating country and h_j^o for the IMF.[15] Inserting the RV pair (g_j^o, h_j^o) into the payoff definitions (7) and (8) defines a matrix of payoffs for the government and IMF. The values z^o_{Ijt} and z^o_{gjt} are linked through the equality $z^o_{Ijt} = \omega_j z^o_{gjt}$, with $\omega_j = \alpha_2\gamma_j/(\phi_1+\phi_2)$ the ratio between the marginal cost to the government of increased conditionality and the marginal benefit to the IMF of the increased conditionality. The condition $g_j^o \geq h_j^o$ ensures that the elements of the matrix are non-negative.

These payoffs have three components. The first is the impact of external variables. The third is the impact of satisfying the conditionality of the existing program $(b_{jt} - c^a)$; note that when conditions are not satisfied the payoffs are reduced for both actors. These components are observable, and thus will be included in the negotiation between the IMF and country government. The second component is the error-correction impact of deviations from long-run policy value: as current policy becomes more restrictive than its long-run value, the boundary payoffs are increased.

	$c_j^o = g_j^o$	$c_j^o = h_j^o$
z_{gjt}	0	$z^o_{gjt} = [Z_j\beta_{gj} + \omega_j\{Z_j\beta_{Ij} + K\}]$ $+ \alpha_2\gamma_j(b_{jt} - \tilde{b}_j)[(\phi_1/(\phi_1+\phi_2)) + (\psi_j/\gamma_j)]$ $+ \omega_j J_{jt}\delta_{I2}(b_{jt} - c^a) > 0$
z_{Ijt}	$z^o_{Ijt} = \alpha_1[Z_j\beta_{Ij} + (1/\omega)\{Z_j\beta_{gj} + K\}]$ $+ (\phi_1+\phi_2)(b_{jt} - \tilde{b}_j)[(\phi_1/(\phi_1+\phi_2)) + (\psi_j/\gamma_j)]$ $+ J_{jt}\delta_{I2}(b_{jt} - c^a) > 0$	0

Bargaining over conditionality. The notion that conditionality is endogenous is not new. Drazen (2002), for example, examines the political-economy determinants of conditionality, while Mayer and Mourmouras (2002) provides a model in which the government solves a common-agency problem with principals in the IMF and among the domestic vested interests. This model differs from those others, however, in that the negotiation between participating government and IMF staff over conditionality is represented as a generalized Nash cooperative equilibrium (see, e.g., Friedman (1990, ch. 6) or Svejnar (1986)). This equilibrium is illustrated in Figure 2. The "threat point" is the origin, while the payoff frontier is defined by varying c^o between the RV values (g_j^o, h_j^o).

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15 $g_j^o = b_{jt} + (\alpha_1/(\alpha_2\gamma_j))[Z_j\beta_{gj} + K] + (\psi_j/\gamma_j)(b_{jt} - \tilde{b}_j)$

$h_j^o = b_{jt} - (1/(\phi_1+\phi_2))[\alpha_1 Z_j\beta_{Ij} + J_{jt}\delta_{I2}(b_{jt} - c^a) + \phi_1(b_{jt} - \tilde{b}_j)]$

The relative bargaining power of the IMF and country j government is represented by the bargaining weights τ_j and $(1-\tau_j)$ respectively.[16] τ_j is bounded by 0 and 1, and lower values indicate relatively less bargaining power for the IMF in setting conditionality. At the extreme, $\tau_j = 1$ indicates that the IMF can impose its preferred conditionality g_j^o, while $\tau_j = 0$ leads to the government's preferred outcome from the feasible set h_j^o.[17] The equilibrium conditionality $c_j^o = \tau_j g_j^o + (1-\tau_j)h_j^o$. When appropriate substitutions are made,

$$c^o_j = b_{jt} + (\alpha_1/\alpha_2\gamma_j)\,[\tau_j K + Z_j\,\{\tau_j\beta_{gj} - (1-\tau_j)\omega_j\beta_{Ij}\}] - J_{jt}(1-\tau_j)\omega_j(\delta_{I2}/\alpha_2\gamma_j)(b_{jt} - c^a) - \{(1-\tau_j)(\phi_1/(\phi_1+\phi_2)) - \tau_j(\psi_j/\gamma_j)\}(b_{jt}-\tilde{b}_j) \qquad (10)$$

The equilibrium level of conditionality is based on the policy variable in period t. It is adjusted for the impact of external events, with the weights assigned to those external events determined by the relative bargaining power of the IMF and the participating government. Equilibrium conditionality for an arrangement immediately following another is adjusted upward by the extent to which the country fell short of its conditionality in the preceding program. It also depends upon the difference between the policy variable in period t and its long-run value; the effect of this difference on equilibrium conditionality depends upon the relative bargaining strength of the two actors. If the government is dominant (i.e., τ_j approaching 0) and the country has budget surplus less than its long-run value, then the equilibrium conditionality will be increased proportionally.

When this equilibrium value of conditionality is introduced into the definitions for the payoffs to IMF and government actors (6) and (7):

$$z_{gjt} = (1-\tau_j)[\alpha_1\{K + Z_j\{\beta_{gj} + \omega_j\beta_{Ij}\}\} + ((\psi_j/\gamma_j)+\omega_j\phi_1)(b_{jt}-\tilde{b}_j) + J_{jt}\,\delta_{I2}\omega_j(b_{jt} - c^a)\,] \qquad (7')$$

$$z_{Ijt} = \tau_j\,[\alpha_1(\{K + Z_j\beta_{gj}\}/\omega_j + Z_j\beta_{Ij}) + ((\psi_j/\omega_j\gamma_j)+\phi_1)(b_{jt}-\tilde{b}_j) + J_{jt}\,\delta_{I2}(b_{jt} - c^a)\,] \qquad (8')$$

There are a number of interesting implications of this "reduced form". First, the coefficients on the external variables Z_{jt} are now a combination of the coefficients found in the two payoff functions. Second, while in the original form only the IMF payoff depended upon satisfying conditionality, in this reduced form both payoffs now depend upon the degree to which conditions were met. Third, one payoff function is a multiple of the other. Estimating either one in this form will provide consistent estimates of these

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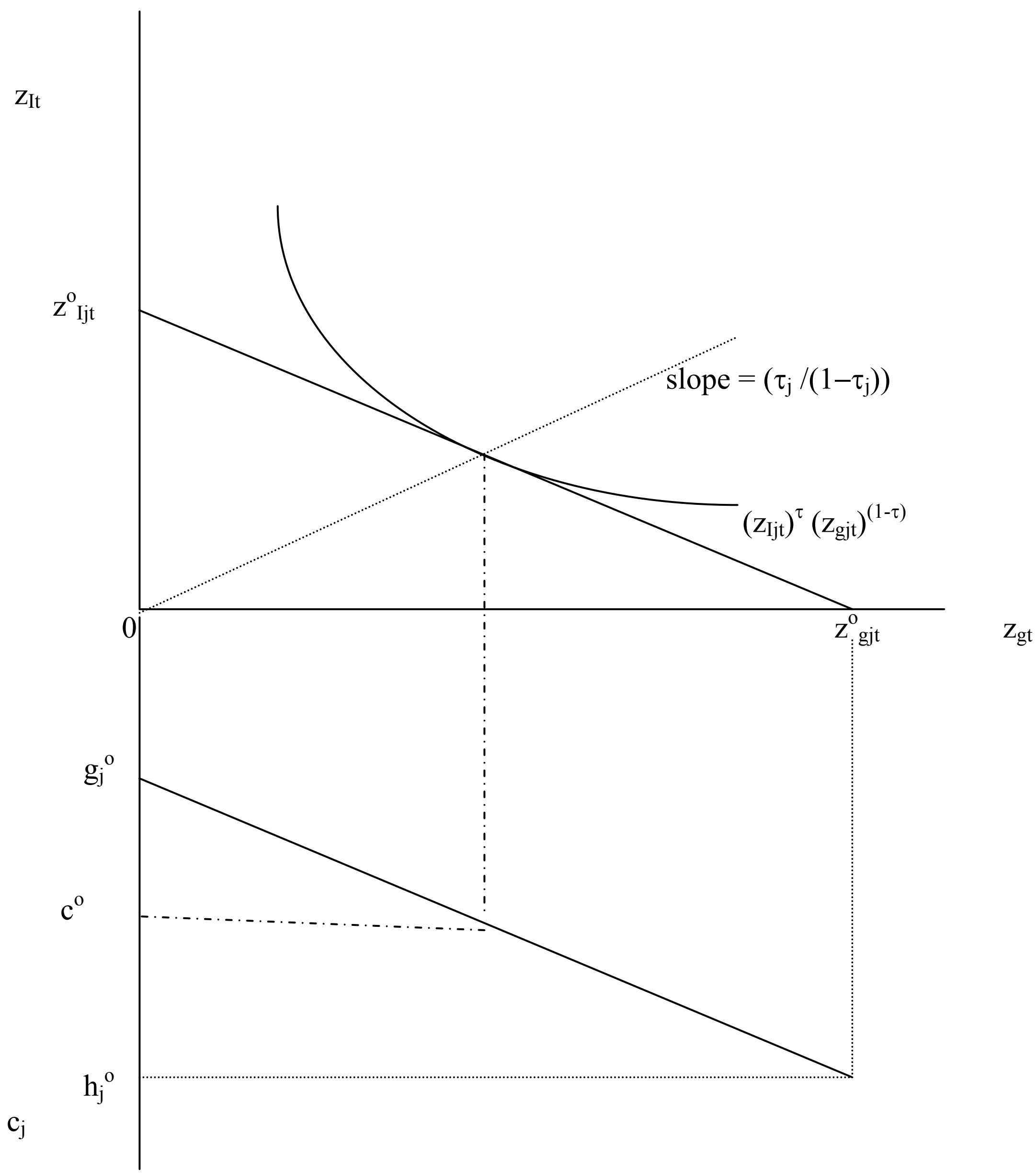
[16] The value of τ_j is assumed set exogenously for each country.

[17] The generalized Nash equilibrium concept is not essential to the argument. It is useful, however, because it nests two common bargaining outcomes in the literature: the IMF with monopolistic bargaining power ($\tau_j = 1$) and the Nash bargaining solution ($\tau_j = .5$). Maskin and Moore (1999) provides greater detail on these in the context of models of renegotiation.

reduced-form coefficients. Fourth, so long as $g_j^o > h_j^o$ it will be in both actors' interest to have a continuing cooperative relationship in any period t. Programs could follow one upon another, with conditionality adjusted so as to distribute the benefits from the arrangement between the two actors.

Figure 2: **The Nash Bargaining Solution: Perfect Foresight**



Uncertainty, cancellation and new arrangements.
In the perfect foresight model, there is a clear and once-off decision to create an arrangement. Given perfect foresight, the arrangement once reached is sustained throughout.

It is more realistic to consider a world of uncertain outcomes and incomplete information. Conditionality as represented by c^o is set at the beginning of each program. During the lifetime of a program, the participating country can terminate the program. The IMF will not unilaterally terminate the program, but has the right (and, in fact, the obligation) to deny drawings by the participating country if the country does not satisfy the agreed-upon conditionality. In that case, the participating country does not receive the benefits of the drawdown indicated by K in (5).

Why might the conditionality not be satisfied? If we introduce an additive random shock to the determination of the policy variable b_{jt+i} in (3), then its relation to the contractual conditionality level c^o can be stated:

$$(b_{jt+i}-c^o) = (\psi_j /(\psi_j+\gamma_j))\,(1-(1-\psi_j-\gamma_j)^i)\,(\tilde{b}_j -c^o) + (1-\psi_j-\gamma_j)^i\,(b_{jt} - c^o) + u_{jt+i} \qquad (11)$$

with u_{jt+i} a weighted average of random shocks from the beginning of the program. This formulation makes clear three potential reasons that conditionality may be violated. First, it may have been violated in the period prior to the program: $(b_{jt}-c^o) < 0$. Such violations contribute directly to violations in the future through the policy evolution rule, although the impact as i rises will be reduced for $0 < \psi_j + \gamma_j < 1$ Second, the conditions on the policy variable may exceed the long-run value of the policy variable for that country: $(\tilde{b}_j -c^o)<0$. This will cause a negative component of $(b_{jt+i}-c^o)$ that will grow over time. Third, the accumulated effect of random shocks may cause a violation: $u_{jt+n}<0$.

The probability of disbursement for given c^o in period t+i is the probability $(b_{jt+i}-c^o) > 0$. For normally and independently distributed random errors u_{jt+i}, the probability of disbursement in period t+i will be:

$$\pi(b_{jt+i}-c^o > 0) = 1 - \Phi(-(b_{jt} - c^o)(1-\psi_j -\gamma_j)^i - (\tilde{b}_j - c^o)(\psi_j /(\psi_j + \gamma_j))(1-(1-\psi_j -\gamma_j)^i)) \qquad (12)$$

with $\Phi(u_{jt+i})$ the cumulative normal density function. For simplicity, I represent this probability defined in (12) as $\pi_i(c^o)$. The payoff to the government in the k^{th} period of the arrangement can be restated in expected-value terms in (5u).

$$z_{gjt+k} = \Sigma^n_{i=1+k}\, \eta^i\{Z_j\beta_{gj} + \pi_i(c^o)K+\psi_j(b_{jt+i} - \tilde{b}_j) -\gamma_j (c^o - b_{jt+i})\} \qquad (5u)$$

Consideration of the probability of disbursement lowers the expected payoff from the program relative to the perfect foresight case so long as some $\pi_i(c^o) < 1$.[18] What could cause this probability to decline?

- Negative shocks to policy cause an initial increase to ($c^o - b_{jt+i}$) that will have inertial effects (albeit diminished) in future periods. This lowers the probability of disbursement in all future periods.
- If the arrangement is predicated upon an incorrectly high value for $\tilde{b}_j$, then the probability of disbursement will be reduced for all future periods within the program.

Figure 3 illustrates the impact of (a) a succession of negative shocks to the policy variable or (b) an inappropriately high value of $\tilde{b}_j$ assumed in negotiating initial conditionality. The horizontal axis indicates the conditionality choice, with RV pair (g^o_j, h^o_j) and equilibrium conditionality c^o.[19] The vertical axis measures the value of z_{gt+i} for the initial negotiation (i=0) and for three subsequent periods within the program. The diagonal lines represent the z_{gjt} as derived in (5) and illustrated in Figure 1 for different time periods. There is a declining value of the arrangement to the participating government over time, as the shocks lower the probability of drawdown. By period t+3, it will be in the government's interests to cancel this arrangement.[20]

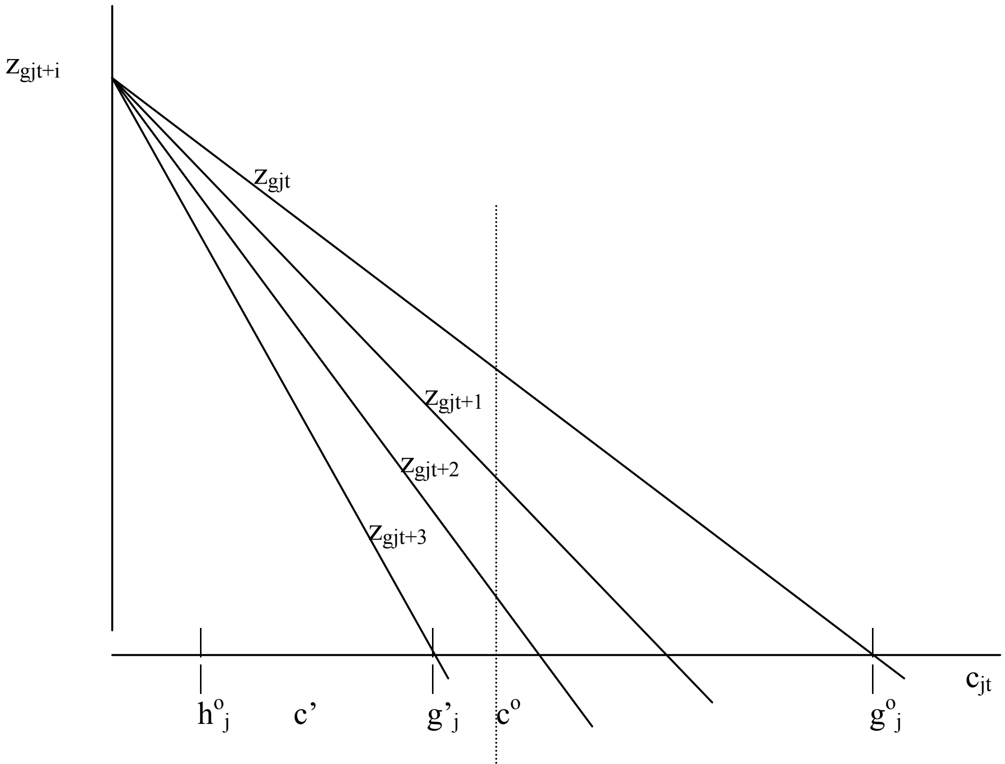
Will there be a new arrangement? Figure 3 suggests that there will be. At the termination of the arrangement, there is a new RV pair (h^o_j, g'_j). Negotiation with unchanged bargaining power will yield a new conditionality program c' for the new arrangement. This value will fall within the range of the RV pair, and will thus be a lower value of conditionality than c^o. This is thus an illustration of the Hypothesis-2 prediction on cancellation: when programs are cancelled, they will be followed immediately with a new program at reduced conditionality.

[18] In this argument I begin from the benchmark, similar to the perfect foresight case, that when the initial negotiation took place both actors believed $\pi_i(c^o) = 1$ for i=1,…,n. If the equilibrium conditionality were based upon some other path of probabilities, then the argument is simply that subsequent events shifted this path downward.

[19] The values (g^o_j, h^o_j) are calculated for the $\pi(c^o)$ case. The z_g curves are drawn linearly for ease in illustration, but would be concave in reality for normally distributed errors.

[20] The z_{Ijt} function of Figure 1 is not drawn in this diagram; it is assumed for expositional purposes that h^o_j is unchanging over the three-period time horizon.

Figure 3: **Incentive to cancel in t+3**



III. Evaluating the competing hypotheses of conditionality.

The two hypotheses provide two models of the determination of conditionality. Hypothesis 1 will serve as the null hypothesis: conditionality is determined by the fundamentals of the participating country. IMF programs can follow one another, but if conditionality is not met in one program then the subsequent program will have more restrictive conditionality. Hypothesis 2 is the alternative hypothesis, and predicts three potentially observable features. First, there is no reason for programs to be once-off activities; ceteris paribus, programs will be approved in sequence for the same country so long as $g_{jt+1} > h_{jt+1}$. Second, conditionality on the programs will be endogenously adjusted at the beginning of the arrangement to reflect the bargaining power and initial conditions of the participating country and the government, including the ability of the participating country to satisfy previous conditionality. If conditions were not satisfied in the previous period, then ceteris paribus the newly bargained conditionality will be less restrictive. Third, program cancellation is a natural course of events, and will in most cases be followed immediately by a new program with reduced conditionality.

These implications are difficult to test for two reasons. First, the conditions associated with specific IMF programs have not generally been made public. Second, there are often many interlinked conditions for which there is no single sufficient statistic. There are, however, two ways to deduce the conditionality associated with IMF programs indirectly. The first uses information on the percentage drawn down of funds made available in IMF programs. The mechanics of IMF lending ensure that a program not meeting its conditions will be characterized by a smaller percentage drawn down of the loan amount. This feature can be used to derive a proxy for conditionality from the observed percentage drawn down. I derive this proxy in what follows using data from IMF programs between 1993 and 2001. The second uses information on macroeconomic projections associated with each IMF program implemented. These macroeconomic projections are created simultaneously with the conditionality of the IMF program and incorporate the conditionality agreed upon in the program. A proxy for conditionality can be derived from the observed difference between projection and actual, and I do so for the same 1993-2001 time period.

Evidence from the percent drawn down. The IMF policy on disbursements ensures that the percent drawn down of a program will, ceteris paribus, reflect the strictness of conditionality. The funds available under an IMF program are drawn down in tranches. The first tranche can be drawn down upon signing the arrangement, but for subsequent tranches the IMF staff must either certify that the country has fulfilled the conditions of the Letter of Intent or must waive the conditions in that instance due to extraordinary events subsequent to signing that make the conditions unobtainable.

The linkage between percent drawn down and violation of conditionality is not exact. The percent drawn down will depend as well upon the country government's desire to use its credit line with the IMF. It may choose not to draw down the resources, either because the country desires the IMF agreement for reasons (e.g., HIPC consideration) unrelated to the availability of funds, because it has entered the agreement on precautionary grounds or because events subsequent to signing the agreement make it unnecessary to use those funds. This possibility must be incorporated in the derivation procedure.

The percent drawn down for any IMF program will be represented as:

$$P_{jt} = \beta_j + \beta_t - \beta_{10}\,\Delta Z_{jt} - \beta_{11}\,\Delta Z_{jt-1} - \beta_2\, Z_{jt-1} + \beta_3\,(b_{jt} - c_{jt}) + \varepsilon_{jt} \qquad (13)$$

The IMF decision to allow funds to be drawn down is based upon $(b_{jt} - c_{jt})$, the relation of realized policy variables to the conditions written into the Letter of Intent.[21] Once the IMF has decided, then the program country government decides upon the percent drawn down. I hypothesize that this decision will have both country-specific effects (β_j) and time-specific effects (β_t). The country may be one to use IMF programs as precautionary lines of credit or may be interested in the IMF program for other reasons than funding; the year may matter because world credit market conditions make alternative credit sources more attractive to all IMF program recipients. Positive shocks to macroeconomic variables (ΔZ_{jt}) will reduce the desired percent drawn down, and negative shocks will work conversely. The country's initial macroeconomic situation (Z_{jt-1}) will also affect the desired percent drawn down. I consider two macroeconomic variables Z_{jt}: the ratio of

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[21] If this IMF decision was a once-for-all choice in each program, it would be more appropriate to model the percent drawn down as a sequential choice: 0 if the IMF said no, and some positive amount if the IMF said yes. Since for each program there will be at least four determinations based on conditionality, I approximate this IMF "veto power" by the negative linear effect represented in the equation.

current account surplus to GDP (y_{jt}) and the ratio of government budget surplus to GDP (b_{jt}). Each can be thought of as a policy variable, and thus will have conditions attached. Positive shocks to each should reduce the percent drawn down, while ratios in the previous period that were less negative than average should reduce the percent drawn down as well. If a country outperforms its conditionality (c_{jt}) then it should be able to draw down more of its IMF funds, other things equal. Since I do not observe the government's decision rule with certainty, there will also be an error term (ε_{jt}) associated with the predicted rule.

$$P_{jt} - \beta_j - \beta_t + \beta_{10}\,\Delta Z_{jt} + \beta_{11}\,\Delta Z_{jt-1} + (\beta_2 - \beta_3)\,Z_{jt-1} = -\,\beta_3\,c_{jt-1} + \varepsilon_{jt} \qquad (14)$$

Under either the null or alternative hypothesis, the residual ($-\beta_3\,c_{jt-1} + \varepsilon_{jt}$) will be an indicator of conditionality. As conditionality falls, the percent drawn down not attributed to other factors should be larger.

The programs of special interest to the endogenous-conditionality argument are those that follow immediately upon another IMF program: these will be called "continuation" programs. A specific instance of a continuation program is one that follows immediately on a canceled program: these will be called "post-cancellation" programs. Under the null hypothesis, these programs should be characterized by stricter conditionality than those that they follow. Under the alternative hypothesis, these programs should be characterized by weaker conditionality than those they follow. These hypotheses will be tested using the empirical estimate of the residual ($-\beta_3\,c_{jt-1} + \varepsilon_{jt}$).

I investigate this hypothesis in two steps. In the first step I estimate (13) for the 175 IMF programs observed in 75 countries between 1992 and 2001. The data on percent drawn down by IMF program are taken from various IMF Annual Reports, while the data on the current-account and fiscal ratios are taken from the World Economic Outlook (WEO) prepared by the IMF. I calculate the estimated value of ($-\beta_3\,c_{jt-1} + \varepsilon_{jt}$), denoted $\hat{e}_{jt}$, from this first regression. In the second step, I create two dummy variables. The variable d_{xajt} takes the value of one for those IMF programs that are not preceded immediately by another program for that country but are followed immediately by another program, and 0 otherwise.[22] The variable d_{xpjt} takes the value of one for those IMF programs that follow immediately another IMF program for the same country, and zero otherwise.[23] In addition, those programs ending in cancellation are represented by the binary variable can_{xajt}, and those following immediately upon a cancelled program are presented by the binary variable can_{xpjt}. For nearly all observations, $can_{xpjt} = 1$ is a subset of $d_{xpjt} = 1$, and

[22] I define "immediately" here as occurring within a two-month window. In other words, if one program ends on 1 March and another begins on 15 April, then by my definition one follows the other immediately.
[23] There are 22 observations for which $d_{xajt} = 1$, and 35 observations for which $d_{xpjt} = 1$. The remaining programs are "stand alone", and have 0 for both these variables. There are more observations for d_{xpjt} because there are a number of countries in which three or more programs follow immediately upon one another. In those cases the first program has $d_{xa} = 1$, while the following programs all have $d_{xp} = 1$.

similarly for can_{xajt} and d_{xajt}.[24] The null hypothesis is that conditionality will be more demanding in follow-on programs, while Hypothesis 2 predicts that continuation programs will have less demanding conditionality. These effects will be heightened in the case of cancellation and immediate adoption of a new program. For post-cancellation countries the net effect on the percent drawn down will be given by the coefficients of d_{xajt} and can_{xajt} or d_{xpjt} and can_{xpjt}.

The first regression, with statistics reported in column (1) of the first part of Table 3, replicated (1) exactly with 75 country fixed effects, 9 yearly fixed effects, and regressors Δb_{jt}, Δy_{jt}, Δb_{jt-1}, Δy_{jt-1}, Δb_{jt-2}, Δy_{jt-2}, b_{jt-1} and y_{jt-1}. While the explanatory power of the regression is quite high, with $R^2 = 0.91$, the explanation comes largely through the time and country-specific dummy variables. When the conditionality component $\hat{e}_{jt}$ is examined in the second part of Table 33, the signs associated with the coefficients for d_{xajt} and can_{xajt} are negative, as expected under Hypothesis 2, while the coefficients for d_{xpjt} and can_{xpjt} are positive. The difference between the conditionality imposed on the first program and the subsequent programs is significant at the 93 percent level of significance for post-cancellation programs, but at a lesser level for continuation programs in general.

While the country fixed effects contributed significantly to the regression, it was clear in examining the significance of individual coefficients that only a subset of these country effects was important.[25] When insignificant country-specific effects were eliminated, the regression resulted in column (2) of Table 3. Those country effects remaining in the regression included those for Costa Rica, Croatia, Egypt, El Salvador, Estonia, Hungary, Latvia, Nigeria, and Slovak Republic. The coefficients on these country effects were all strongly negative, indicating that for these countries the drawdown percentage is much closer to zero.[26] The hypothesis that the specification in column (1) is significantly different from column (2) is rejected, as shown by the F test in the final row of the first part of the table. When the conditionality residual from this regression is carried to the lower part of the table, it is once again the case that the coefficients on d_{xajt} and can_{xajt} are negative. The coefficient on can_{xpjt} is positive, as expected, while the coefficient on d_{xpjt} differs insignificantly from the implied effect on stand-alone programs. The test that the coefficients on d_{xajt} and d_{xpjt} are equal is rejected by the data.

When all country-specific effects are excluded, as in column (3), the story is quite similar. The initial regression has a similar structure. In the second-step regression the coefficients on d_{xajt} and can_{xajt} are negative, as expected, while the coefficients for d_{xpjt} and can_{xpjt} are positive. Differences in coefficients are significantly different from zero at around the 95 percent level of confidence.

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[24] There are 13 observations for which $can_{xajt} = 1$ and 11 observations for which $can_{xpjt} = 1$. For the two programs in the sample for which cancellation did not lead to a new program, $can_{xajt} = 1$ but $d_{xajt}=0$.

[25] Statistical significance is indicated at the 95 percent level of confidence, unless otherwise stated.

[26] Why these countries? There is potentially a group of countries in the sample that will not draw down the funds from an IMF program because it has entered the program for precautionary purposes or for benefits other than the availability of funds. One indicator of this type of country will be evidence of zero percent drawdown on IMF programs.

*Examining projections for evidence of conditionality***.** Consider the following as a model of the IMF projection for a macroeconomic variable g_{jt}:

$$\hat{g}_{jt} = Y(Z_{jt-1}, \alpha_j, \gamma_t, c_{jt}) \qquad (15)$$

$\hat{g}_{jt}$ is the IMF projection for g_{jt}. It is derived based upon initial conditions Z_{jt-1} for the program country, a country-specific effect γ_j, and a time-specific effect α_t due to world demand conditions or developing-country contagion. It is also a function of the agreed-upon conditionality of the IMF program.[27]

Since 1992, the IMF has compiled a database of projected macroeconomic outcomes associated with IMF programs. This Monitoring of Arrangements (MONA) database includes one-period-ahead projections of current-account balance and fiscal balance as a share of GDP, consumer price inflation and exchange-rate depreciation for countries entering IMF programs.

I use a linear model based on (15) to represent the projection-creation process.

$$\hat{g}_{jt} = \alpha_j + \gamma_t + \alpha_1 b_{jt-1} + \alpha_2 y_{jt-1} + \alpha_{xp} * d_{xpjt} + \alpha_{canp} * can_{xpjt} + \alpha_{1xp} d_{xpjt} * y_{jt-1} +$$

$$\alpha_{2xp} d_{xpjt} * y_{jt-1} + \alpha_{1canp} can_{xpjt} * b_{jt-1} + \alpha_{2canp} can_{xpjt} * y_{jt-1} + \varepsilon_{jt} \qquad (15')$$

Time- and country-specific effects are included in the regression to capture any components of the program projection that were due to idiosyncratic features of the country or of the year. The ratio of current-account surplus to GDP in the previous year (y_{jt-1}) and the ratio of government budget surplus to GDP in the previous year (b_{jt-1}) are included as elements that will trigger a common response across countries in the projection variable. This is a simplified version of the projection equations estimated in Atoian et al. (2003); that paper provides a derivation of such a projection equation for a general vector autoregressive structure.

The conditionality of the average program is captured by the size of α_1 and α_2 – it is the reaction embodied in the projection to a change in the initial conditions. The final terms are based upon two indicator variables: d_{xpjt} for programs that are immediate successors to preceding programs, and can_{xpjt} for those programs that follow immediately on a cancelled IMF program. If α_{xp} or α_{canp} are significant, then the projections for these "continuation" programs are adjusted upwards or downwards significantly for these programs when compared to non-continuation programs. If α_{1xp}, α_{2xp}, α_{1canp} or α_{2canp} are significant, then the "continuation" programs demonstrate conditionality significantly different from that of the non-continuation programs.

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[27] I maintain the hypothesis that the projection is monotonically increasing (or decreasing) in the degree of conditionality.

Table 3: **Estimating the effect of continuing programs on conditionality**

Step 1: Deriving an explanatory equation for the percent drawn down.

	(1)		(2)		(3)	
	P_{jt}		P_{jt}		P_{jt}	
Δy_{jt}	-0.02	0.87	-0.22	0.61	-0.32	0.68
Δb_{jt}	0.61	1.36	0.65	0.89	-0.22	1.03
Δy_{jt-1}	-0.40	0.65	-0.31	0.43	0.31	0.48
Δb_{jt-1}	1.59	1.25	1.25	0.86	1.60 *	0.98
Δy_{jt-2}	0.39	0.54	0.70 *	0.40	1.00 **	0.46
Δb_{jt-2}	0.21	1.00	-0.25	0.67	0.30	0.78
y_{jt-1}	0.92	1.01	0.48	0.34	0.09	0.39
b_{jt-1}	-2.61	1.78	-2.33 **	0.82	-3.64 **	0.93
T93	82.67 **	20.60	64.90 **	8.46	40.46 **	9.23
T94	75.10 **	21.65	68.72 **	7.56	56.71 **	8.48
T95	76.49 **	21.88	64.31 **	7.17	48.70 **	7.95
T96	63.67 **	21.49	53.67 **	8.02	38.62 **	8.97
T97	71.68 **	20.26	59.16 **	8.13	38.96 **	8.67
T98	69.37 **	21.66	62.98 **	7.79	52.71 **	8.93
T99	44.03 **	21.38	40.84 **	7.28	31.82 **	8.36
T00	66.71 **	21.85	45.42 **	7.28	35.88 **	8.22
T01	33.36 **	21.06	12.84	10.70	2.77 **	12.37
N	174		174		174	
R^2	0.91		0.84		0.76	
Fixed Effects	75 countries, 9 years		9 countries, 9 years		0 countries, 9 years	
F test for excluded variables			$F(66,82) = 0.58$		$F(9,157) = 2.83$ **	

Step 2: Checking the conditionality portion of P_{jt} for sensitivity to nature of program.

	(1)		(2)		(3)	
	$\hat{e}_{jt}$		$\hat{e}_{jt}$		$\hat{e}_{jt}$	
Intercept	-0.22	1.80	2.15	2.43	1.83	2.94
d_{xajt}	-4.86	4.68	-12.08 *	6.31	-17.94 **	7.63
d_{xpjt}	3.51	3.96	-0.69	5.34	0.64	6.46
can_{xajt}	-3.22	6.51	-14.01 *	8.78	-3.57	10.62
can_{xpjt}	6.05	6.48	4.23	8.73	7.37	10.56
N	174		174		174	
R^2	0.02		0.04		0.04	
Test: coefficient $d_{xajt} = d_{xpjt}$ $F(1,171)$ stat	2.19	(0.14)	5.08 **	(0.02)	4.07 **	(0.04)
Test: coefficients $d_{xajt} + can_{xajt} = d_{xpjt} + can_{xpjt}$	3.28 *	(0.07)	2.24	(0.14)	3.45 *	(0.06)

Standard errors in right-hand column. Coefficients significantly different from zero at the 95 percent confidence level marked with **, and at the 90 percent confidence interval with *. P value in right-hand column for F tests.

The MONA data provide information to estimate (15') from 171 IMF arrangements between 1993 and 2001. Table 4 reports the results of ordinary least squares estimation of (15') for projections of real depreciation, real current-account adjustment and real fiscal adjustment.[28] Each section of the table reports two regressions. The first assumes that the continuation and post-cancellation programs are statistically identical in projection to other programs, while the second includes the variables of (15') to measure the differential projections in continuation and post-cancellation programs.

The first column of Table 4 reports the simple projection equation for real exchange rate changes within IMF programs. There is no significant effect of past current-account imbalances on projected real depreciation. However, an increase in the fiscal deficit has a significant effect in triggering a real depreciation in the projected real exchange rate. This coefficient (-2.56) represents the interaction of market forces and conditionality that the IMF staff projects on average in response to a previous-period fiscal imbalance. When d_{xpjt} is introduced, those continuation programs are demonstrated to have significantly smaller projected real depreciations (α_{xp} = -24.90), evidence of less conditionality projected in those program. There is as well evidence of tightened conditionality in the significant coefficient (α_{2xp} = -3.42) on b_{jt-1}. With post-cancellation programs, the coefficient on past current-account imbalances ($\alpha_{1canp}+\alpha_{1xp}$=4.90) is not significantly different from zero, although the post-cancellation programs are significantly different from other continuation programs in this regard. The coefficient on past fiscal imbalances in continuation (α_{2xp}= -3.42) and post-cancellation ($\alpha_{2canp}+\alpha_{2xp}$= -8.21) are significantly different from zero at the 90 percent and 95 percent level of confidence, respectively: these indicate that an increase in fiscal deficit will trigger larger projected real depreciations – certainly consistent with increased conditionality in these cases.

When the projected changes in the current account ratio are derived (reported in the third column of Table 4), the conditionality of the average IMF program shows through clearly. The change in the current-account ratio is projected to make up 38 percent of any projected imbalance in the previous period, while an increase in the fiscal deficit in the previous period leads to a projected increase in current-account surplus (and thus private saving) over the current period. There is evidence as well that continuation and post-cancellation programs differ significantly from others. For continuation programs, the projected adjustment to previous-period current-account imbalances is significantly less (α_{1xp}=.16) at the 90 percent level of confidence while the assumed adjustment to previous fiscal deficits through private saving is significantly greater (α_{2xp}= -0.34). For post-cancellation programs there is a large (though insignificant) increase in the projected adjustment of the current-account ratio to past imbalanace relative to other programs; this is indication of increased conditionality.

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[28] Time- and country-specific dummy variables were included in estimation, exhausting 86 degrees of freedom. The coefficients of these variables are excluded from the table for brevity. These regressions were redone excluding the dummies and including each set of dummies separately; the coefficients in Table 4 were little changed in absolute size. With all dummies excluded, the coefficients α_2 in the inflation projection regressions were significantly different from zero.

The equations for the fiscal-balance projection indicate that on average there is insignificant effect of past current-account imbalance on the projected change in the fiscal surplus, but that there is a large and significant projected adjustment to past fiscal imbalances. On average, 54 percent of previous-period imbalances are projected to be made up in the current period. There is little reduction in projection error when the continuation and post-cancellation programs are singled out; the F test of the joint significance of these variables is rejected (statistic not reported).

Thus, on the projections of fiscal balance, the continuation and post-cancellation programs do not seem to have significantly different determinants. By contrast, the projected real depreciation and change in current-account ratio for these programs are significantly different from that for non-continuation programs.

Conclusions on the endogeneity of conditionality. Since conditionality is not observed directly, all inference must be indirect. The evidence from the percentage drawn down in IMF programs and from projections of economic activity in IMF program countries indicates that there are significant differences between continuation and post-cancellation countries on the one hand and other programs on the other. I interpret the results of the percentage-drawn-down exercise as supporting rejection of the null in favor of the alternative, while the evidence from projection data is mixed.

IV. Implication for estimation of the determinants of IMF program participation.

The evidence cited in the previous section suggests that conditionality is in fact endogenously determined in a manner consistent with the theoretical model. If so, this becomes an important fact to consider when considering the determinants of participation in IMF programs.

There has been substantial empirical work in identifying the determinants of IMF program participation in the last decade: examples include Joyce (1992), Edwards and Santaella (1993), Conway (1994), Bird (1995), Knight and Santaella (1997), Thacker (1999), Przeworski and Vreeland (2000), Bird and Rowlands (2000), and Dreher and Vaubel (2001). The typical approach used is to specify a probit equation. The binary dependent variable indicates participation or non-participation in an IMF program; the independent variables included have been chosen to reflect both economic and political factors.

The authors have recognized that the decision to participate is jointly determined, but they have typically relied upon a "reduced form" estimation of (1) and (2) without explicit modeling of conditionality's role in the equations. Knight and Santaella (1997) and Przeworski and Vreeland (2000) went beyond this "reduced form" approach to estimate separately "structural" equations akin to (7), (8) and (9) but without consideration of the role of conditionality. Their ability to do so statistically hinged upon their willingness to assign elements of the independent variable matrix Z_{jt} to affect only the government or only the IMF decision. These exclusion restrictions are difficult to justify on a priori grounds.

Table 4: **Projected Changes in Continuation and Post-cancellation Programs**

	Percentage change in real exchange rate		**Change in current account ratio**		**Change in fiscal balance ratio**	
	$d_{jt} = 0$	d_{jt} positive	$d_{jt} = 0$	d_{jt} positive	$d_{jt} = 0$	d_{jt} positive
α_1	0.25	0.10	-0.38 **	-0.38 **	-0.02	-0.02 **
	(0.46)	(0.48)	(0.04)	(0.04)	(0.02)	(0.02)
α_2	-2.56 **	-1.44 *	-0.19 **	-0.16 **	-0.54 **	- 0.51 **
	(0.69)	(0.74)	(0.05)	(0.06)	(0.04)	(0.04)
α_{xp}		-24.90 **		-0.58		-0.52
		(11.23)		(0.77)		(0.60)
α_{1xp}		-0.81		0.16 *		-0.01
		(1.32)		(0.09)		(0.07)
α_{2xp}		-3.42 *		-0.34 **		-0.18 *
		(1.75)		(0.12)		(0.09)
α_{canp}		24.32		-0.98		0.93
		(20.38)		(1.43)		(1.07)
α_{1canp}		5.71 **		-0.68 **		0.14
		(2.70)		(0.20)		(0.14)
α_{2canp}		-4.79 *		0.21		0.12
		(2.88)		(0.20)		(0.15)
R^2	0.34	0.43	0.64	0.69	0.73	0.74
N	170	170	171	171	171	171

Time- and country-specific dummy variables were included in the regression, but the coefficients are not reported; these are available on request from the author. Standard errors in right-hand column. Coefficients significantly different from zero at the 95 percent confidence level marked with **, and at the 90 percent confidence interval with *.

As Dreher and Vaubel (2001) comment about this approach,

> "the distinction between demand and supply effects is increasingly blurred. Almost all the additional regressors can be interpreted at the same time as determinants of the government's credit demand and as criteria by which the Fund judges the creditworthiness of its applicants. Thus a meaningful simultaneous or two-state estimation is not feasible. However, for our purpose, … a reduced-form estimate is sufficient". (Dreher and Vaubel, 2001, pp. 7-8)

While this criticism is valid, the reduced-form estimation approach also has its dangers. In these papers, the authors have appealed to a "reduced form" without stating the endogenous variable that links supply and demand decisions in a reduced form. Without such an endogenous variable, a "reduced form" estimation strategy is potentially biased: the appendix provides an illustration of this bias.[29] In this paper I identify explicitly the endogenous variable as conditionality: this has surprising implications for the "reduced form" estimating equation.

Reconsidering the "reduced-form" specification. The typical approach to "reduced-form" estimation of a participation equation is to include all the Z_{jt} variables thought to be of importance either to the government decision or to the IMF staff decision. If conditionality matters to these decisions, however, this will be misspecified; further, if conditionality is endogenously determined, there are important consequences to the estimating equation.

$$z_{gjt} = (1-\tau_j)[\alpha_1\{K + Z_j\{\beta_{gj} + \omega_j\beta_{Ij}\}\}+((\psi_j/\gamma_j)+\omega_j\phi_{1j})(b_{jt}-\tilde{b}_j)+J_{jt-1}\,\delta_{I2}\omega_j(b_{jt} - c^a)\,]+u_{gjt} \qquad (7')$$

$$P_{jt} = \begin{cases} 1 & \text{if } z_{gjt} \geq 0 \\ 0 & \text{otherwise} \end{cases} \qquad (9')$$

The equation system implied by endogenous conditionality is reproduced here as (7') and (9'). An estimation technique exploiting the available panel data on IMF programs can be derived under the assumptions that the vectors $\beta_{gj} = \beta_g$, $\beta_{Ij} = \beta_I$, $\phi_{1j} = \phi_1$, $\tau_j = \tau$, $\omega_j = \omega$, $\gamma_j = \gamma$ and $\psi_j = \psi$ for all j. With this and the assumption of normality of errors, equations (7') and (9') define a univariate probit system of equations. The coefficients on the exogenous variables Z_{jt} are a weighted sum of the coefficients of the IMF and government payoff functions, with the relative weight defined by the ratio of the marginal cost ω to the government of tightened conditions to the marginal benefit to the IMF. The entire effect is weighted by the bargaining power of the government in setting

[29] If the determination of conditionality were orthogonal to the participation decision, then the estimation of a "reduced form" probit of the participation decision could lead to biased coefficient estimates. The Annex provides an example of the rather common case where conditions are placed on a policy variable that enters both country and IMF choice functions, but with opposite sign. In that case, the relation between participation and the policy variable is non-linear: estimation using the linear probit technique will lead to bias and imprecision.

conditionality. The variables for which conditionality is defined enter twice in contemporaneous form: once as a deviation from long-run value ($b_{jt} - \tilde{b}_j$), and once through the impact of conditions carried over from an existing program ($b_{jt} – c^a$). If the country participates in an IMF program in the previous period there will be an increase in the payoff of continued participation to the extent that the country's policy variable b_{jt} improves.

Hypothesis testing. The simplest test implied by the reduced-form derived here takes the null hypothesis that conditionality is not a determinant of either IMF staff or country-government participation decisions. The model is that of (7), (8) and (9), with $\gamma = \delta_{I1} = \delta_{I2} = 0$. In that case, the two payoffs define a bivariate probit with partial observability similar to that posited by Przeworski and Vreeland (2000). Identification of the coefficients β_I and β_g will be possible in theory through the assumption of joint normality of the errors. The first panel of Table 5 reports the results from such a bivariate probit for annual data on IMF program participation for the period 1991-1999.

Lagged regressors were used as proxies for contemporaneous variables to avoid the simultaneity bias in the participation decision and these macroeconomic variables. The payoff equations correspond to (7) and (8). For the variables of the Z_{jt} matrix I include a number of variables found to be significant in published explanations of participations in IMF programs: the ratio of foreign-exchange reserves to imports ($resimp_{jt-1}$) and the external debt/GDP ratio ($debt_{jt-1}$) enter significantly and with the expected sign. For policy variables potentially subject to conditionality I include the domestic credit/GDP ratio (cr_{jt-1}) and the government consumption/GDP ratio ($cons_{jt-1}$); these also enter significantly and with the expected sign. The intercept indicates the country bias, other things equal, against participation. In the IMF payoff the current account/GDP ratio (y_{jt-1}), the government budget surplus/GDP ratio (b_{jt-1}), the government consumption/GDP ratio ($cons_{jt-1}$) and the debt ratio ($debt_{jt-1}$) all enter in a fashion consistent with reported IMF preferences. The intercept indicates a bias toward program approval, other things equal.[30] Year-specific dummy variables were included to control for the influence of shared world economic conditions, but are not reported.

The hypothesis of this paper suggests that conditionality is endogenous, and simultaneously determined with the participation decision. A complete test of the implied parameter restrictions is left for future work, but here I test a few simple predictions of the endogenous conditionality model.

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[30] The identification of the two coefficients in the two probit equations is made econometrically. It is based in part on the curvature of the normal distribution. In this instance it was impossible to identify the two equations separately without imposing a restriction a priori. The lagged credit ratio was included in one set of regressors and not the other to provide this minimal condition for identification.

Table 5. **Partial observability bivariate probit**

Number of obs = 744, period 1991-1999

Null hypothesis. Log likelihood = -401.83582

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Country payoff						
$Resimp_{jt-1}$	-.7123183	.286285	-2.49	0.013	-1.273427	-.1512099
$Debt_{jt-1}$	1.673108	.2717943	6.16	0.000	1.140401	2.205815
y_{jt-1}	-.0839689	.9983769	-0.08	0.933	-2.040752	1.872814
cr_{jt-1}	-1.20489	.2420015	-4.98	0.000	-1.679204	-.7305759
b_{jt-1}	-.4831243	1.670006	-0.29	0.772	-3.756275	2.790026
$cons_{jt-1}$	4.383435	1.28136	3.42	0.001	1.872017	6.894854
intercept	-.5744157	.3212888	-1.79	0.074	-1.20413	.0552987
IMF payoff						
$Resimp_{jt-1}$	-.2741052	.4240685	-0.65	0.518	-1.105264	.5570538
$Debt_{jt-1}$	.2483909	.0911809	2.72	0.006	.0696796	.4271021
y_{jt-1}	1.954319	.7810386	2.50	0.012	.4235114	3.485127
b_{jt-1}	6.416493	1.500435	4.28	0.000	3.475695	9.357291
$cons_{jt-1}$	-1.906969	1.056481	-1.81	0.071	-3.977634	.163696
intercept	1.199174	.310273	3.86	0.000	.5910505	1.807298
/athrho	8.497726	40.6601	0.21	0.834	-71.19461	88.19006

Likelihood ratio test of rho=0: chi2(1) = 36.639 Prob > chi2 = 0.0000

Including prior participation Log likelihood = -295.66815

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Country payoff						
$Resimp_{jt-1}$	-1.517844	.5649597	-2.69	0.007	-2.625145	-.4105434
$Debt_{jt-1}$	1.326795	.5611555	2.36	0.018	.2269508	2.42664
y_{jt-1}	1.309269	1.825359	0.72	0.473	-2.268368	4.886907
b_{jt-1}	-5.779201	2.931293	-1.97	0.049	-11.52443	-.0339715
$Cons_{jt-1}$	.5316611	1.83319	0.29	0.772	-3.061325	4.124647
P_{jt-1}	4.077631	.7155976	5.70	0.000	2.675085	5.480176
Intercept	-1.731183	.5292383	-3.27	0.001	-2.768471	-.6938946
IMF payoff						
$Resimp_{jt-1}$	-.5858117	.3510087	-1.67	0.095	-1.273776	.1021527
$Debt_{jt-1}$	.2515033	.0965517	2.60	0.009	.0622655	.4407411
y_{jt-1}	1.482325	.7467524	1.99	0.047	.0187173	2.945933
Cr_{jt-1}	-.1797429	.230774	-0.78	0.436	-.6320516	.2725657
b_{jt-1}	3.748824	1.616723	2.32	0.020	.5801054	6.917542
$Cons_{jt-1}$	-.1852839	.9439403	-0.20	0.844	-2.035373	1.664805
Np_{jt-1}	-1.079258	.1832365	-5.89	0.000	-1.438395	-.7201215
Intercept	1.426598	.3024094	4.72	0.000	.8338866	2.01931
/athrho	10.4124	34.49228	0.30	0.763	-57.19124	78.01603

Likelihood ratio test of rho=0: chi2(1) = 1.67028 Prob > chi2=.1962

Time-specific dummy variables d91-d98 were included in both equations but their coefficients are excluded from the table. Those results are available on demand.

Table 6. **Partial observability bivariate probit**

Number of obs = 644, **period from 1981 and 1990**

Null hypothesis. Log likelihood = -350.577

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Country payoff						
$Resimp_{jt-1}$	-.9098332	.3880425	-2.34	0.019	-1.670382	-.1492839
$Debt_{jt-1}$	2.525902	.2716579	9.30	0.000	1.993462	3.058342
y_{jt-1}	-3.445711	1.166361	-2.95	0.003	-5.731736	-1.159687
b_{jt-1}	-.9377586	1.27907	-0.73	0.463	-3.444691	1.569173
$Cons_{jt-1}$	-2.446376	.7183754	-3.41	0.001	-3.854366	-1.038386
Intercept	-.3853633	.2455954	-1.57	0.117	-.8667215	.0959949
IMF payoff						
$Resimp_{jt-1}$	-1.749999	1.017755	-1.72	0.086	-3.744763	.2447639
$Debt_{jt-1}$	-.5908905	.3060993	-1.93	0.054	-1.190834	.0090531
y_{jt-1}	-1.133561	1.757444	-0.65	0.519	-4.578088	2.310967
cr_{jt-1}	-1.556225	.5129869	-3.03	0.002	-2.56166	-.5507887
b_{jt-1}	10.43575	2.473042	4.22	0.000	5.588678	15.28283
$cons_{jt-1}$	3.75882	1.535564	2.45	0.014	.7491706	6.76847
Intercept	2.870959	.6758989	4.25	0.000	1.546222	4.195697
/athrho	12.69297	44.6526	0.28	0.776	-74.82452	100.2105

Likelihood ratio test of rho=0: chi2(1) = 5.12982 Prob > chi2 = 0.0235

Including Prior Participation. Log likelihood = -231.03291

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Country payoff						
$Resimp_{jt-1}$	.1699899	.7201027	0.24	0.813	-1.241385	1.581365
$Debt_{jt-1}$	1.099345	.3844946	2.86	0.004	.3457495	1.852941
y_{jt-1}	-12.86132	2.488516	-5.17	0.000	-17.73872	-7.983913
cr_{jt-1}	.3455534	.3635967	0.95	0.342	-.3670831	1.05819
b_{jt-1}	-.1249559	1.95168	-0.06	0.949	-3.950178	3.700266
$cons_{jt-1}$	-3.59139	1.202291	-2.99	0.003	-5.947836	-1.234943
p_{jt-1}	1.872306	.2780693	6.73	0.000	1.3273	2.417312
Intercept	-.0851865	.485749	-0.18	0.861	-1.037237	.866864
IMF payoff						
$Resimp_{jt-1}$	-1.761086	.783409	-2.25	0.025	-3.296539	-.2256325
$Debt_{jt-1}$	-.3734943	.2209274	-1.69	0.091	-.806504	.0595155
y_{jt-1}	1.887935	1.77297	1.06	0.287	-1.587024	5.362893
b_{jt-1}	-.0669136	2.00447	-0.03	0.973	-3.995602	3.861775
$cons_{jt-1}$	.6758687	1.223097	0.55	0.581	-1.721358	3.073096
np_{jt-1}	-1.46744	.2541659	-5.77	0.000	-1.965596	-.9692838
Intercept	2.256165	.4194891	5.38	0.000	1.433981	3.078348
/athrho	-8.171273	81.94353	-0.10	0.921	-168.7776	152.4351

Likelihood ratio test of rho=0: chi2(1) = 6.63954 Prob > chi2 = 0.0100

Time-specific dummy variables were included in each probit, but coefficients are not reported.

The first test is of the simplest implication: that payoffs in the current period will be dependent on the participation (or non-participation) in the previous period as evidenced by J_{jt-1} in equation (7'). The endogenous conditionality model has that implication through the importance of past conditionality (c^a) in affecting current payoff. When binary variables indicating participation (p_{jt-1}) and non-participation (np_{jt-1}) in the previous period are added to the partial-observability probit, the results (reported in the second panel of Table 5) indicate a significant improvement in explanatory power. Comparison of the log-likelihood scores in the two panels demonstrates this improvement. The simple model is rejected in favor of the model including p_{jt-1} and np_{jt-1}. In Table 6 the experiment is redone for observations in the period 1981-1990. Hypothesis 2 of this paper cannot be rejected for that period either.

While the endogenous conditionality model of this paper predicts this result, other explanations of participation will do so as well.[31] A more precise test of the endogenous-conditionality model in the system (7') and (9') will interact the coefficients on the policy variables subject to conditionality with whether the country participated in a program in the previous period. In Tables 7 and 8 I perform such a test, with the variables subject to conditionality posited to be the current-account ratio (y_{jt-1}), government budget ratio (b_{jt-1}), the growth of domestic credit (cr_{jt-1}) and the government consumption ratio ($cons_{jt-1}$). The first panel of each table is the hypothesis that conditionality does not matter; the second panel reports the specification consistent with the endogenous-conditionality model. Significant coefficients on the interacted variables provide evidence to reject the exogenous conditionality model in favor of the endogenous conditionality model.

Table 7 reports the results of such a test. The upper panel of the table reports a specification derived under the assumption that $\gamma = \delta_{I1} = \delta_{I2} = 0$. The variables included are those of the analysis above; other variables (e.g., the terms of trade or the level of per capita income) were introduced but made an insignificant contribution in all cases. If the expected results were those associated with the country's payoff function, the estimates raise a number of questions. An increased reserves/import ratio tends to reduce the probability of participation while the increased external debt ratio increases the probability, as expected. However, the probability of participation is rising significantly in the current account and government budget surplus ratios, and declining significantly in the credit ratio: each of these is counter to expectations of government motivation, but consistent with motivations often attributed to IMF staff.

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[31] Even if conditionality were not endogenous, one could posit that the participating country pays a fixed cost in terms of popular support for participating in an IMF program. If this cost is less, or non-existent, for subsequent programs the participating country's probit would respond as in Table 5. Similarly, the IMF staff may be more comfortable lending to a country with a "track record"; that will also generate the results of Table 5.

Table 7: **Probit Estimates of the Consolidated System (7')-(9')**
744 observations for the period 1991-1999

Ignoring conditionality
Log likelihood = -430.21027
Pseudo R^2 = 0.0760

p	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
$resimp_{jt-1}$	-.7763446	.256989	-3.02	0.003	-1.280034	-.2726554
$debt_{jt-1}$	.547324	.1021725	5.36	0.000	.3470695	.7475784
y_{jt-1}	1.464338	.5794414	2.53	0.011	.3286538	2.600022
cr_{jt-1}	-.6791865	.1753448	-3.87	0.000	-1.022856	-.335517
b_{jt-1}	2.966095	1.105671	2.68	0.007	.79902	5.133171
$cons_{jt-1}$	.4165522	.8253528	0.50	0.614	-1.20111	2.034214
intercept	.4861461	.2136475	2.28	0.023	.0674046	.9048876

Introducing conditionality
Log likelihood = -307.98984
Pseudo R^2 = 0.3385

p	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
$resimp_{jt-1}$	-.857682	.2834114	-3.03	0.002	-1.413158	-.302206
$debt_{jt-1}$	.3340659	.0966258	3.46	0.001	.1446829	.523449
y_{jt-1}	1.517508	1.200692	1.26	0.206	-.8358057	3.870822
cr_{jt-1}	-.3162638	.4291718	-0.74	0.461	-1.157425	.5248976
b_{jt-1}	-.9565922	1.534015	-0.62	0.533	-3.963206	2.050022
$cons_{jt-1}$	.4463161	.8915358	0.50	0.617	-1.301062	2.193694
$p_{jt-1}*y_{jt-1}$	.066715	1.361984	0.05	0.961	-2.602726	2.736156
$p_{jt-1}*cr_{jt-1}$	.0435416	.4916683	0.09	0.929	-.9201106	1.007194
$p_{jt-1}*b_{jt-1}$	4.700078	2.259803	2.08	0.038	.2709453	9.129212
$p_{jt-1}*cons_{jt-1}$	-.1163092	1.60515	-0.07	0.942	-3.262344	3.029726
np_{jt-1}	-1.966722	.3255462	-6.04	0.000	-2.604781	-1.328663
intercept	1.242429	.2744285	4.53	0.000	.7045595	1.780299

Time-specific dummy variables were included, but not reported here. These are available on demand.

Table 8: **Probit Estimates of the Consolidated System (7')-(9') 644 Observations for the period 1981-1990**

Ignoring conditionality

Log likelihood = -415.41957
Pseudo R^2 = 0.0572

p	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
$resimp_{jt-1}$	-1.281937	.3353817	-3.82	0.000	-1.939273	-.6246005
$debt_{jt-1}$	.1584005	.1859935	0.85	0.394	-.2061401	.5229411
y_{jt-1}	-2.097992	1.015663	-2.07	0.039	-4.088654	-.107329
cr_{jt-1}	-.2607243	.2354399	-1.11	0.268	-.7221781	.2007294
b_{jt-1}	.1946734	.9938892	0.20	0.845	-1.753314	2.14266
$cons_{jt-1}$	-1.697353	.5666716	-3.00	0.003	-2.808009	-.586697
Intercept	.7994718	.2215956	3.61	0.000	.3651524	1.233791

Incorporating conditionality

Log likelihood = -253.6806
Pseudo R^2 = 0.4243

p	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
$resimp_{jt-1}$	-1.333377	.411809	-3.24	0.001	-2.140508	-.5262464
$debt_{jt-1}$	-.1638239	.1238909	-1.32	0.186	-.4066457	.0789978
y_{jt-1}	-5.101272	1.603209	-3.18	0.001	-8.243504	-1.959041
cr_{jt-1}	.1366009	.3556707	0.38	0.701	-.5605009	.8337027
b_{jt-1}	-2.889306	1.613659	-1.79	0.073	-6.05202	.2734081
$cons_{jt-1}$	-3.955995	1.713386	-2.31	0.021	-7.314171	-.5978194
np_{jt-1}	-2.16676	.3608943	-6.00	0.000	-2.874099	-1.45942
$p_{jt-1}*y_{jt-1}$	2.711456	2.496077	1.09	0.277	-2.180766	7.603677
$p_{jt-1}*cr_{jt-1}$	-.5898496	.5202717	-1.13	0.257	-1.609563	.4298642
$p_{jt-1}*b_{jt-1}$	5.216886	2.562407	2.04	0.042	.1946611	10.23911
$p_{jt-1}*cons_{jt-1}$	4.452506	2.195552	2.03	0.043	.1493029	8.755709
Intercept	1.971578	.3485465	5.66	0.000	1.28844	2.654717

Time specific dummy variables were also included in each consolidated payoff function. Coefficients are excluded from table, but are available on demand.

In the lower panel of Table 7, five additional variables are included to model more precisely the variables of (7'). The variable np_{jt-1} is added to capture the initial hurdle effect for the country government; its coefficient should be negative and significant to represent the initial cost to the government of entering an IMF program. The variables $p_{jt-1}*y_{jt-1}$, $p_{jt-1}*cr_{jt-1}$, $p_{jt-1}*b_{jt-1}$ and $p_{jt-1}*cons_{jt-1}$ interact the binary variable indicating participation in the previous year with the policy variables subject to conditionality. Their coefficients should be positive and significant if conditionality has indeed played a facilitative role in establishing programs.

The results from this specification are more in accord with theory. Once the current account, credit, government budget and consumption ratios are introduced as target variables for conditionality, the significant paradoxical results of the top panel are eliminated. The estimate of initial entry is negative and significant, as expected. The coefficients on the target variables provide some support to this hypothesis, primarily through the coefficient on $p_{jt-1}*b_{jt-1}$. As the government budget surplus improves for countries in IMF programs, the probability of continuing the program is increased.

Table 8 reports the results from incorporating conditionality in the form suggested by (18) and (19) for the period 1981-1990. Once again, the variables take on values consistent with the underlying payoff functions. The impact of current-account deficits in inducing initial participation in IMF programs is more pronounced in this period, while the external debt of the potential participants is less important. The variables introduced to pick up the impact of conditionality have the correct sign in four of five cases.

The estimate of the initial cost to the government of participating in a program is negative and significant, as expected. The four target variables are the current-account ratio, the domestic credit ratio, the government budget surplus ratio and the government consumption ratio. A reduction in the credit ratio or government consumption ratio will be in line with IMF targets, while an increase in the current account or government budget surplus ratios will be consistent. Correct signs are observed for the coefficients of $p_{jt-1}*y_{jt-1}$, $p_{jt-1}*cr_{jt-1}$ and $p_{jt-1}*b_{jt-1}$, and the last coefficient is significantly different from zero. The coefficient on $p_{jt-1}*cons_{jt-1}$ takes the opposite sign and is significant as well.

Unobserved heterogeneity. The preceding regressions were unsatisfactory in that they ignored the impact of the long-run policy value $\tilde{b}_j$. While this is an unobserved set of variables, its impact can be controlled for in this instance by regressions that correct for unobserved heterogeneity. Ignoring these effects can lead to spurious causation if unobserved heterogeneity in country preferences for or adaptability to IMF programs leads to systematic differences in participation. While it is possible that the heterogeneity is due to consistent policy choice rather than to differences in long-run values, the analysis in this section errs on the side of caution by removing all country-specific variation in the data before testing the endogenous-conditionality hypothesis.

Table 9 reports the results of four equations designed to test the endogenous-conditionality hypothesis. There are 735 country/years for which complete data are available, drawn from 88 countries. The variables used include those of the previous section, and a normalized index of the real effective exchange rate lagged one period (rn_{jt-1}).[32] Columns 1 and 3 represent the null hypothesis that conditionality does not facilitate agreement on IMF programs, while columns 2 and 4 incorporate the feedback through target variables associated with the model of (18) and (19). The difference between columns 1 and 2, on the one hand, and 3 and 4 on the other is the inclusion of country-specific dummy variables in the estimation underlying columns 3 and 4. This controls for any country-specific heterogeneity. While some of this heterogeneity may be program-related, some will not be: the estimation results of columns 3 and 4 thus represent a conservative test for the endogenous-conditionality hypothesis.

There is significant evidence for the overall hypothesis, although many of the individual coefficient estimates are insignificantly different from zero. The $\chi^2(5)$ statistics reported at the bottom of columns 1 and 3 report the results of the likelihood ratio test that the additional variables associated with the endogenous-conditionality hypothesis are jointly significant: in both instances, the statistic is significantly different from zero at usual confidence levels. The coefficients on the variable np_{jt-1} represent the estimate of an initial hurdle cost to participation, and these are significantly different from zero in both cases. The individual coefficient estimates all take the expected signs: increases in the current account ratio and the government budget surplus ratio, reduction in the government consumption ratio, and depreciation of the real effective exchange rate all have the effect for a country currently in a program of increasing the likelihood that the program will continue. In each set of estimates only one of these is individually significantly different from zero.

Among the other results from estimation are two robust findings: a larger external debt to GDP ratio is associated with a greater likelihood of an IMF program in the next period, and a larger reserves to imports ratio is associated with a reduced likelihood of an IMF program in the following period.

V. Implications for Program Evaluation.

While the results above are interesting in and of themselves, they are also important to the statistical evaluation of the effectiveness of IMF programs. Given that the decision to participate in an IMF program is potentially contemporaneously determined with typical indicators of economic performance, there is a possibility of selection bias in the determination of the program's effect on performance. Two methods of correcting for this bias have been used in the literature. One is based on the "propensity score" for participation, while the other introduces the inverse Mills ratio as a correction for the potential bias. Both will be biased if they do not consider this difference in determinants of participation.

[32] As in the previous section, both terms-of-trade indices and gross domestic product per capita in purchasing-power terms were included. Both were insignificant throughout and were thus excluded.

Table 9: **Testing the Endogenous-Conditionality Hypothesis: 1991-2000**

	1. No Conditionality		**2. Conditionality**		**3. No conditionality – U.H.**		**4. Conditionality – U.H.**	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
rn_{jt-1}	-0.00	0.07	0.10	0.14	-0.16	0.13	0.19	0.19
y_{jt-1}	1.15 *	0.63	1.26	1.32	3.65 **	1.61	2.84	2.12
$resimp_{jt-1}$	-0.87 **	0.25	-0.89 **	0.29	-0.33	0.64	-1.17 *	0.69
b_{jt-1}	2.58 **	1.17	-1.15	1.61	11.03**	2.58	6.95 **	3.07
$debt_{jt-1}$	0.49 **	0.10	0.30 **	0.10	1.22 **	0.41	1.17 **	0.44
$cons_{jt-1}$	1.20	0.96	1.90	1.67	-2.77	2.95	-0.26	3.72
np_{jt-1}			-2.20 **	0.34			-1.64 **	0.44
$p_{jt-1}*y_{jt-1}$			0.10	1.49			1.24	1.93
$p_{jt-1}*b_{jt-1}$			4.84 *	2.44			2.87	3.76
$p_{jt-1}*rn_{jt-1}$			-0.16	0.16			-0.42 **	0.22
p_{jt-1} $*cons_{jt-1}$			-1.98	2.17			-3.55	2.73
N	735		735		735		735	
C	88		88		88		88	
Log Likelihood	-429.1		-304.4		-249.3		-219.2	
$\chi^2(5)$	249.4 **				60.2 **			
Degrees of freedom	16		21		102		107	

All coefficients estimated using probit. All estimation results included year-specific dummy variables. The U.H. analyses also included a country-specific binary variable for each of the 88 countries for which complete data were available.
Asterisk indicates significance at 90 percent confidence level. Double asterisk indicates significance at 95 percent confidence level.
The critical value at the 95 percent confidence interval for the $\chi^2(5) = 11.07$.

I demonstrate in Table 10 the potential for divergent results through use of data on economic growth rates observed for countries participating and not participating in IMF programs over the preceding period. The average economic growth rate for the 816 periods (country/years) in the sample is 5.47 percent. In the 559 periods characterized by participation, the average growth rate was 5.45 percent while for the 257 periods of non-participation, the average growth rate was 5.48 percent. Clearly, the unconditional difference is approximately zero; the question at hand is whether the near equality masks the offsetting effects of more adverse conditions and positive effects of IMF programs (or vice versa).

Table 10 is divided into two panels. The top panel reports results in which fixed-effects estimation has been used to control for unobserved heterogeneity in the growth regression, while the bottom panel reports the results with no correction for unobserved heterogeneity in the growth regression. Within each panel are the results of systems regression using two instruments for the country's participation in IMF programs. The first instrument is derived from a first-stage probit of participation on explanatory variables. This specification corresponds to the null hypothesis of this paper (expanded to allow prior participation to matter to current participation). The second instrument expands the specification to include additional effects attributed to endogenous conditionality as suggested by the alternative hypothesis above. Both instruments include controls for unobserved heterogeneity, and thus the instruments correspond to the predicted values derived from the participation equations in columns 3 and 4 in Table 9. These predicted values will be denoted the propensity score (ps_{jt}). The standard errors reported in Table 10 represent those from the variance-covariance matrix corrected for the two-stage nature of estimation.

The importance of correcting for unobserved heterogeneity is the most important message of Table 10. A comparison of top and bottom panels indicates the wide swings in coefficient estimates that result from inclusion of country fixed-effects terms. While such controls represent a conservative approach to estimation, the large differences in coefficients argue for greater attention to these effects in interpreting such regressions.

The results of Table 10 also demonstrate that use of the appropriate propensity score changes the estimates of the impact substantially. The coefficients on the other explanatory variables change insignificantly, but those on IMF-participation variables ps_{jt} and p_{jt-1} are significantly different across the two formulations. Use of the appropriate propensity score leads to significantly larger estimates of the contemporaneous impact of participation on economic growth and a significantly larger cumulative effect of IMF programs.

These estimation results are not meant to be definitive. The choice of explanatory variables used here is based upon a demand-side approach to economic growth, and was selected because of the short time span of the sample. (Supply-side effects then are captured by the "unobserved heterogeneity" fixed effect. By contrast, Vreeland (2003) reports economic growth equations based upon a supply-side specification. Determining the consistency of the two sets of results can be left for a future paper; the message of this paper is the importance of incorporating endogenous conditionality in a program-evaluation exercise.

VI. Conclusions.

Participation in an IMF program is a joint decision of participating governments and IMF staff. With that maintained hypothesis, and with the hypothesis of linear decision functions for both actors, I derived the implied estimating equation for observing participation in equilibrium. The endogenous determination of conditionality and the ability to cancel an IMF program to introduce another prove to be crucial to this participation equation.

Data on percentages of IMF programs drawn down and on projections of IMF staff provide indirect measures of the endogenous conditionality hypothesis, and these measures indicate behavior consistent with the theoretical construct.

The endogeneity of conditionality has important implications for research on the determinants of IMF participation, and through them on the estimation of the impact of IMF programs on participating-country economic performance. The "endogenous conditionality" model implies a number of exclusionary restrictions for probit estimation of an IMF participation equation, and these are not rejected by the data. Use of this estimating structure in addition corrects a number of anomalies in the typical reduced-form estimation of the participation equation. Finally, I demonstrate that proper estimation of the economic-growth equation yields estimates of program impact that are significantly different from those estimated on the same data using traditional estimation techniques.

Table 10
Program Evaluation: Impact of IMF Programs on Economic Growth

	Exogenous conditionality first stage			**Endogenous conditionality first stage**		
	Coefficient	Standard Error	T Statistic	Coefficient	Standard Error	T Statistic
Controlling for Unobserved Heterogeneity in the growth regression						
ps_{jt}	-0.077	0.037	2.06	-0.018	0.010	1.77
gy_{jt-1}	0.107	0.041	2.58	0.120	0.036	3.32
y_{jt-1}	-0.174	0.039	4.48	-0.198	0.032	6.17
b_{jt-1}	0.039	0.062	0.63	0.005	0.051	0.09
$rxrn_{jt-1}$	-0.007	0.003	2.05	-0.004	0.003	1.57
$nfig_{jt-1}$	-0.138	0.069	2.01	-0.138	0.059	2.33
ttn_{jt}	-0.300	0.402	0.75	-0.255	0.332	0.77
p_{jt-1}	0.054	0.017	3.13	0.027	0.007	4.04
pp_{jt}	-0.030	0.014	2.15	-0.016	0.009	1.81
N			816			816
F			14.39			14.12
R^2			0.68			0.68
Not Controlling for Unobserved Heterogeneity in the growth regression						
ps_{jt}	-0.000	0.009	0.01	-0.003	0.007	0.41
gy_{jt-1}	0.383	0.031	12.34	0.383	0.031	12.37
y_{jt-1}	-0.133	0.023	5.80	-0.132	0.023	5.79
b_{jt-1}	-0.091	0.039	2.30	-0.093	0.039	2.38
$rxrn_{jt-1}$	-0.006	0.002	2.56	-0.006	0.002	2.61
$nfig_{jt-1}$	-0.003	0.031	0.09	-0.002	0.031	0.05
ttn_{jt}	0.073	0.212	0.34	0.075	0.212	0.35
p_{jt-1}	0.020	0.007	2.75	0.021	0.006	3.37
pp_{jt}	-0.001	0.007	0.08	-0.000	0.007	0.06
N			816			816
F			61.59			61.61
R^2			0.58			0.58

Each regression also includes year-specific regressors. Coefficients are jointly significant, but excluded for brevity.

ps_{jt} is the estimated probability of participation drawn from the first-stage probit analysis. Two different estimates ps_{jt} are used in this table. The first set of columns is derived from a probit model including lagged participation, year-specific fixed effects and country-specific fixed effects but not including the other endogenous-conditionality (EC) regressors. The second set of columns is derived from the same probit model in which all variables had two coefficients: one if the period followed a participation period, and another if the period followed a non-participation period.

The joint significance of the Unobserved Heterogeneity terms cannot be rejected for any of these specifications at the 95 percent level of confidence. For example, the model in the bottom half of the first column is rejected in favor of the model in the top half of the first column, with $F_{87, 711} = 2.54$. The critical value for that combination of degrees of freedom is 1.30. The critical two-sided T values for the coefficients in the table: 1.96 for 95 percent level of confidence, and 1.64 for 90 percent level of confidence.

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Annex: Use of the reduced-form probit

With bivariate normal errors, and with at least one regressor in Z_{gjt} but not in Z_{Ijt} and vice versa, bivariate probit can in theory be used to estimate β_{Ij} , β_{gj} and the correlation coefficient between u_{Ijt} and u_{gjt}.

When the joint decision-making process modeled as a probit is only partially observed, a single "reduced-form" probit can be estimated. The coefficients estimated in this reduced-form probit are in general weighted averages of the two individual probit coefficients.

I created a data set with five exogenous variables (x_1,x_2,x_3,ε_z,ε_y) and 100 observations indexed by t. Each variable was created as a random standard normal variable within STATA. The unobserved decision equations were defined as follows.

$$z^*_{jt} = a_z + x_{1t} + x_{2t} + x_{3t} + \varepsilon_{zt}$$
$$y^*_{jt} = a_y + 3x_{1t} - 5x_{2t} + 7\, x_{3t} + \varepsilon_{yt}$$

The binary probit variables were defined P_z and P_y, and were equal to one if z^*_{jt} and y^*_{jt} , respectively, are greater than zero. They were equal to zero otherwise. The intercepts a_z and a_y were set equal to zero for the initial estimation results. The binary variable $P = P_z * P_y$ was defined as the observed probability.

When P_z and P_y are observed, probit estimation yields solid results for each equation.

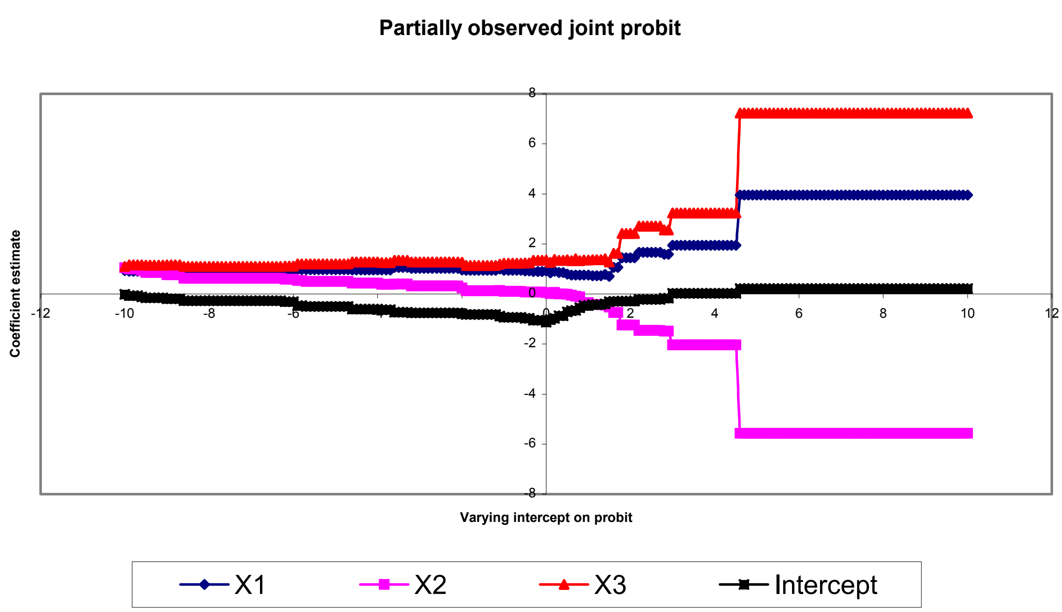
	P_z			P_y		
	Coefficient	Std. Error	Z stat	Coefficient	Std. Error	Z stat
Intercept	0.108	.166	0.65	0.215	0.348	0.62
X_1	0.943	.208	4.54	3.953	1.233	3.21
X_2	1.249	.210	5.95	-5.568	1.756	3.17
X_3	1.057	.238	4.45	7.228	2.074	3.49
Pseudo R^2	0.48			0.88		
N	100			100		

That the underlying parameters are those used to create the variables will not be rejected in either of these equations.

A probit estimation of the joint probability P with respect to the three exogenous variables yields an odd average of the two:

	P		
	Coefficient	Standard Error	Z statistic
Intercept	-1.122	0.210	5.35
X_1	0.927	0.259	3.58
X_2	0.053	0.170	0.31
X_3	1.352	0.244	5.53
Pseudo R^2	0.416		
N	100		

In the case of the intercept and x_2, we will reject the true parameter from either sample. For x_1 and x_3, the parameters from the z^*_{jt} equation will not be rejected while the parameters from the y^*_{jt} equation will be rejected.
I examine the proposition that this single probit on the joint probability is a weighted average of the two underlying equations through a further simulation exercise. First, I recalculated P for values of the intercept a_z from zero to 10 in increments of .10. Second, I recalculated P for values of the intercept a_y from zero to 10 in increments of .10. In each instance, after the recalculation, I estimated the single probit on the new joint probability. The following diagram indicates the parameter estimates derived from each of these.[33]



[33] The horizontal axis provides a numeration of the simulations results. For values to the right of zero, each point represents a simulation for a different value of a_y between zero and 10 (and with a_z equal to zero). For each point to the left of zero, the simulation results are indexed by the negative of the value of a_z (with a_y equal to zero).

As is evident from the coefficient values illustrated in the figure, it is the case that as the intercept of each individual equation rises above five, the estimated coefficients are those of a probit on the other equation. This is sensible, as the increasing intercept makes it increasingly likely that the binary variable calculated from that equation will be one always – and thus the joint probability is determined by the probability from the other equation. It is also evident that for small values of the intercepts the reduced-form coefficients do not bear a recognizable relation to either of the two individual equations. Thus, it will be important in practice to utilize any information available to disentangle these two effects.