

# Adoption of an IMF Programme and Debt Rescheduling. An empirical analysis

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## Abstract

The existence of an empirical relationship between the adoption of an IMF programme and the concession of a debt rescheduling by commercial creditors is tested using a bivariate probit model. If countries who have arrangements with the IMF are more likely than others to obtain a rescheduling of their external debt we could conclude that the adoption of an IMF programme could work as a sort of signal of a country's "good intent" which is thus rewarded with the debt relief. The results confirm the existence of a significant effect of the adoption of an IMF programme on the subsequent concession of a debt rescheduling by private creditors.

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# 1. Introduction

Throughout the 1980s and 1990s, many developing countries have struggled to service their external debts to both commercial banks and industrial countries' governments. While there is a general consensus on the idea that the adoption of an IMF programme may act as a "green light" for private loans, this paper provides a first test for the existence of an empirical relationship between the adoption of a Fund programme and the concession of a debt rescheduling by private creditors.<sup>1</sup>

In the early 80s Paris Club creditors provided reschedulings for low-income countries on non-concessional terms and on market-related interest rates. In the late eighties (1989-94) the Brady deals addressed commercial bank lending to sovereign debtors (generally middle-income countries) and involved a combination of an IMF agreement and debt-service reduction and rescheduling from commercial banks. In the same period, Paris Club creditors agreed to provide low-income countries with concessional reschedulings, conditional on the adoption of an IMF adjustment programme, under the Toronto (1988), Trinidad (1990), Naples terms (1994) and, more recently, the World Bank and the IMF have implemented the HIPC's Debt Initiative (1996).<sup>2</sup> At the end of the 90s the Fund has been involved in the East Asian financial crisis. It still seems the case that the acceptance of a Fund

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<sup>1</sup>An IMF programme basically consists of control on domestic credit and on the rate of growth of the money supply, reduction in government spending and increase in taxation, improved exchange rate policy and improvement of the trade balance. More recently, it also insists that its borrowers reform their financial system.

<sup>2</sup>In 1999, a review of the HIPC Initiative was carried out by the World Bank and the Initiative was enhanced in order to provide faster, broader, and deeper debt relief.

agreement acts as a signal of the country's intentions which reassures the market and in turn makes commercial creditors more willing to accord rescheduling of a country's debt.

The rescheduling process allows debtors not to default on their loans and to remain in the international financial system. It also prevents creditors from facing the whole consequences of a financial crisis. More specifically, it can be considered as a form of "debt reorganisation," in which payments falling due in a specified interval, are deferred for repayment on a new schedule, following negotiations between creditors and debtors. Since a rescheduling is a postponement of principal and interest payments, creditors would like to have some "guarantee" that this postponement will in fact contribute to an improvement in the economic conditions allowing the debtor country to service its external debt. The adoption of an adjustment programme supported by the IMF could reassure a country's creditors on this respect.

In the literature, two separate streams of research have independently identified the factors which affect the probability of an arrangement with the IMF and the probability of obtaining a debt rescheduling but there is no paper where the two events are combined. Marchesi and Thomas (1999) present a theoretical model where the agreement to follow an IMF programme can be a signal of an indebted country's willingness and ability to successfully reform (and use any new money provided for investment rather than consumption purposes), which is thus rewarded with a debt relief. From the conclusions of this article stems the main idea of this work.

In this paper we test for the existence of a significant effect of the adoption of an IMF programme on the subsequent concession of a debt rescheduling by commercial creditors, using a bivariate probit model to control for the endogeneity

of the choice “IMF adoption.” More specifically, we estimate a bivariate probit model for the joint determination of a Fund programme adoption and of the debt rescheduling, conditional on the adoption. We find that countries who have arrangements with the IMF are more likely to obtain a rescheduling of their external debt. This evidence therefore suggests that the adoption of an IMF programme can work as a signal of a country’s “good intent,” which is rewarded with the debt relief.

In Section 2 we provide some background to the empirical studies on the determinants of both Fund arrangements and external-debt repayment performance. In Section 3, we briefly describe the theoretical framework, while Section 4 develops the empirical one. Section 5 presents the results and, finally, Section 6 concludes.

## **2. Empirical studies on the determinants of Fund arrangements and on external-debt repayment performance**

### **2.1. Fund arrangements**

The existing empirical literature on IMF programmes has mainly focused on the macroeconomic impact of such programmes (see, for example, the survey paper by Haque and Khan, 1998). However, a recent stream of research has also tried to specify and estimate a model including the factors which lead developing countries to borrow from the IMF in the first place. There is a demand for a lending programme by a developing country and there is also a process of evaluation by the IMF to determine whether to accept it or not. The resulting negotiation gives the equilibrium outcome. Note that the Fund’s main target is to enable its

members to overcome their balance of payment problems and, in order to gain access to any Fund resources, a member must be able to demonstrate a balance of payment need.

Table 1 below reports a summary of the studies which tried to model the adoption of a Fund programme by developing countries. Some of them estimated the size of loans under Fund arrangement (for example, Bird and Orme, 1981; Bird, 1995), while others estimated countries' adoption of a Fund programme using binary-choice models (e.g., Joyce, 1992; Knight and Santaella, 1997).

### Insert Table 1

One early study (Bird and Orme, 1981) uses OLS regression to find a statistical relationship between drawings on the Fund and key country economic characteristics, including the balance of payments, the debt service ratio, the rate of inflation, *per capita* GNP, the level of reserves, the value of imports and the access to private capital markets (in particular the Euro-currency market).

This model provides a good explanation of drawings by developing countries on the IMF in 1976, but it “breaks down” in the following year. On the basis of the 1976 regression, developing countries seem to draw more from the Fund as their balance of payments deteriorates, their rate of inflation increases and their level of income decreases. It also seems that the IMF and the Euro-currency market are complementary rather than competing sources of finance. However, the authors' conclusion is that not only economical factors, but also socio-political (and information more at the level of single countries), would be necessary to provide a better explanation of IMF loans.<sup>3</sup>

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<sup>3</sup>A rerun of a similar econometric model for the period 1980-85 by Bird (1995) produces rather similar results: the coefficients of the inflation, income and balance of payments variables are all statistically significant and with the expected signs.

Cornelius (1987) studies the demand for IMF credits focusing only on Sub-Saharan countries (mainly because they made a large use of Fund credit as they were constrained in the access to international capital market). Following Bird and Orme, he assumes that drawings on the IMF increase when economic problems become more serious. The demand for IMF loans is positively affected by the debt-service ratio, the value of imports and deficits of the balance of payments; while it is inversely related to the per capita GNP (supposed to be a measure of the stage of development), the level of international reserves and of borrowing from foreign and international markets.<sup>4</sup> Using a pooled sample of annual observations for eleven countries, his results are similar to those obtained by Bird and Orme: they provide a good explanation for the initial period (1975-77) but not for the second one (1981-83). In particular, (as in the previous work) the results for the second period imply that IMF drawings are not a purely economic phenomenon and therefore other factors, like social, institutional and political ones, should be taken into account.

Among the papers which adopted binary choice models, Joyce (1992) uses a logit analysis to identify what factors characterise the adoption of an IMF programme by 45 developing countries in the period 1980-85. He adds domestic credit growth and the government's share of domestic output to the regressors included in previous studies and discovers that countries which enter Fund programmes have higher rates of domestic credit expansion and more expansionary policies than "non-programme countries." Finally, as in previous papers, the current account, international reserves and per capita income all appear with the expected negative coefficients.

Conway (1994) estimates the determinants of participation in a Fund ar-

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<sup>4</sup>This would suggest that IMF loans, on one side, and the decumulation of reserves and the level of borrowing from abroad, on the other, are substitutes.

rangement, where the participation variable is either a binary variable (which is modelled using a probit model) or a continuous variable censored at 0 and 1 (modelled using a Tobit model).<sup>5</sup> He considers a sample of 74 countries, over the period 1976-86, and shows that the most important variables to explain participation in IMF programmes are past participation in Fund arrangements, lagged values of the real GDP growth rate and of the current account (where a generally bad past economic performance contributes significantly to IMF participation), current values of the world real rate of interest, of the terms of trade and of the outstanding long-term external debt (which have the “traditional” impact on IMF participation, that is negative coefficients for the first two variables and a positive sign for the last one).

Finally, Knight and Santaella (1997), in a binary choice framework, reckon that the event of a Fund approval of a financial arrangement is the result of two joint events: both a country’s need to obtain an IMF arrangement and the Fund approval of the request (on the basis of an evaluation process of the economic reforms a country intends to adopt). Therefore, they criticise other previous papers for having considered, either explicitly or implicitly, only the so called “demand-side” determinants of Fund arrangements. On the other hand, their aim is to account for both the economic variables that induce a country to ask for an IMF loan (“demand-side”) and for the economic policy commitments that the Fund examines before deciding to approve it or not (“supply-side”). Moreover, in their empirical model, they also try to incorporate a better specification of the “timing of the events.” They argue that economic policy measures, which could provide a country with the Fund approval, are often taken before the arrangement is actually accepted by the IMF. Then, the assumption that the initial date of

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<sup>5</sup>In the latter case, the variable indicating “participation” is a continuous measure of the percentage of the year that a country has spent under an IMF programme.

the programme is at the same time also the initial date of the policy measures' adoption would be misleading.

More specifically, they obtain both bivariate and univariate probit estimates of the approval of an IMF arrangement, for a given country in a given year, using a pooled sample of annual observations for 91 developing countries over 1973-91. In the bivariate model the two dependent variables are a country's demand for an IMF loan and a country's meeting of the Fund criteria to supply the loan. In the probit equation, instead, the dependent variable is the IMF joint outcome of the two events. In the "demand side," their estimates suggest that lower level of international reserves, of *per capita* GDP, of domestic investment and higher values of the external debt service, movements in the real exchange rate, the dummy indicating previous Fund arrangements are significant determinants of a country's interest in a Fund arrangement. Among the "supply factors", they find that policy measures to increase fiscal revenue, to reduce government expenditure, to tighten domestic credit and to adjust the exchange rate, positively affect the Fund approval of an arrangement.

## **2.2. Debt rescheduling**

There are many papers dealing with the probability of a debt rescheduling. Typically, in this literature, the occurrence of a debt rescheduling is interpreted (and modelled) either as a reflection of a country's debt repayment difficulties or as equivalent to a country's default.

Table 2 below contains a summary of the studies which explain the occurrence of a debt rescheduling. The common idea in these works is that a limited number of financial, macroeconomic, or socio-political indicators can be identified as the main determinants of debt repayment behaviour. The issue of which variables

are the best predictor of a debt rescheduling has been discussed at length in this literature, so that different approaches have been developed to predict the probability of LDCs' debt rescheduling. These are: a "balance sheet approach," a "macro approach" and a "structural approach."

### Insert Table 2

According to the "balance sheet approach" financial variables are considered more relevant to explain the probability of a debt rescheduling. Lloyd-Ellis *et al.* (1989) include three sets of variables in a logit model used to predict the probability of a debt rescheduling. These are the traditional "ratio variables" (as the debt service to export ratio, the foreign exchange reserves to import ratio, the rate of growth of *per capita* GDP and the rate of growth of imports) and the so called "balance sheet variables" (as the ratio of short, or medium, or long-term debt over total borrowing from the banks, the proportion of each country's debt relative to total bank lending, total bank borrowing relative to bank deposit, the ratio between the unallocated credit over total banks' lending). Number and value of current reschedulings are included in order to "capture" a general attitude towards rescheduling.

With both a sample of 27 countries, during 1977-81 and of 59 countries, from 1977(II) to 1985(II), Lloyd-Ellis *et al.* discover that balance sheets variables are the only significant.<sup>6</sup> In particular, an increase in banks' loans relative to assets, in short, long and medium term bank debt to total bank debt lending lead to a rise in the probability of reschedulings, while increases in unallocated credit and in foreign exchange reserves lead to a fall in this probability. Lanoie and Lemarbre (1996) have used the same specification of Lloyd-Ellis *et al.*. Estimating a cross-section of data covering 93 countries in the two years 1989 and 1990, they

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<sup>6</sup>These results are also confirmed in a their subsequent paper (Lloyd-Ellis *et al.*, 1990).

confirm that balance sheet variables outperform the two other sets of variables in explaining debt reschedulings.

Bäcker (1992) shows that, as the prediction lag is lengthened, the significance of macro-variables (as the ratio between debt service payments and exports, the ratio between imports and reserves, the inflation rate, GDP, interest rates) improves relative to that of the balance sheet data. This might suggest that macro-variables are proxies for more fundamental, longer-term determinants of a country's solvency, while financial variables provide information about the country's current liquidity. More specifically, he uses a logit model to estimate the debt rescheduling probability for 68 debtor countries, with semi-annual data from 1981(I) to 1988(I). By integrating balance sheet variables with macro-variables, he finds that, while the former provide a rather static description of a country's financial situation, the latter are more appropriate to describe the medium-long term economic development of a country and its ability to fulfill its debt obligations.

The “structural approach” relates deeper structural characteristics of a country to the probability of a debt rescheduling. Berg and Sachs (1988) develop a cross-section probit model of debt rescheduling occurred between 1982-87 in 35 developing countries, which link the occurrence of this event to key structural characteristics of developing countries (like the trade regime, the degree of income inequality, the share of agriculture in GDP and the level of *per capita* GDP). They argue that outward orientation of trade policy should enhance the growth prospects of developing countries, as well as their capacity to adjust to external shocks, while a high degree of income inequality would increase the political pressure for excessive foreign borrowing.<sup>7</sup> On the other hand, governments which find

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<sup>7</sup>The pressure for income redistribution is likely to be greater in economies characterised by higher income inequalities, in which a government could satisfy the internal demand for higher public expenditure through foreign borrowing, without either rising taxes or inflation.

their political support mostly in the agricultural sector would be politically more stable and, as a result, less subject to external-debt crisis. Finally higher income countries may be less likely to reschedule their debt than poorer countries, since the cost of a rescheduling would tend to be higher for more advanced economies. In their model, the degree of income inequality, the share of agriculture in GDP and the level of *per capita* GDP are significant variables (with a positive and two negative coefficients, respectively).

Finally, Lee (1991) tests a model whose explanatory variables depend on a country's "willingness to pay." At each payment, the borrower compares the expected value of his discounted utility of consumption with repayment, against the expected value of his discounted utility of consumption with either default or rescheduling.<sup>8</sup> In this model, the probability of default depends positively on the interest rate on international lending, total foreign debt (relative to GNP) and the ratio of the government debt that is held domestically to GDP. It depends negatively on the growth rate of *per capita* GDP, the growth rate of industrialised countries and the variability of changes in *per capita* GDP.

Moreover, Lee considers separately "official rescheduling" (that is rescheduling payments, on both public and private debt, guaranteed by creditor countries' government or official agencies) from "commercial bank rescheduling" (that is rescheduling bank loans which are not guaranteed). He finds that both official and commercial rescheduling decisions depend on the economic performance of borrowers, the level of indebtedness and the level of interest rates. Commercial rescheduling depend also on the access to international credit markets.

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<sup>8</sup>Solvency is not considered a relevant issue since the borrower has the resources to honour its debt obligation.

### 3. The theoretical framework

Marchesi and Thomas (1999) show that the adoption of an IMF programme can be used as a screening mechanism that allows creditors to distinguish between those countries which intend to use the “debt relief” as an incentive to invest and later repay and those which do not (or cannot) do it. The idea is that there are two types of country, one with a high return on the investment, and the other with a low return or willingness to invest, and asymmetry of information on the country’s type. In the presence of a debt overhang, the high productivity country may choose not to undertake the investment, despite it being socially efficient to do so. In this case the creditor would like to offer the country some debt relief, but the low productivity type will also benefit from the debt relief.

When the country is credit constrained (which seems a plausible hypothesis dealing with indebted countries), this asymmetric information problem can be avoided if the country decides to undertake an IMF programme in return for debt reduction (and possibly new money in the form of an IMF loan). Only the high productivity country would be prepared to bear the adjustment costs, in this way signalling its type and thus separating from the low-productivity one. In conclusion, the creditor (the bank) must solve two problems at the same time: the first one is the “moral hazard” problem, which directly derives from the “debt overhang,” that is the lack of incentives to invest for the “good type” in the absence of any debt relief. The second problem is the need for the bank to separate between the two types in order not to grant the relief to the “bad” one (that is the one which will never invest).

It is worth noting that, in the theoretical model, the definition of debt relief involves more a debt reduction rather than a debt rescheduling. We believe that a

debt rescheduling can be considered as a component of a debt relief initiative (in particular when it is made at concessional terms, as it is the case for low-income countries). Rather than as an indicator of a country’s debt servicing difficulties, here a debt rescheduling is considered mainly as a debt relief which creditors may either decide to grant or not.

In order to find the “qualitative factors” which can influence the probability of a debt rescheduling, for simplicity, we shall focus here only on the “moral hazard” aspect.<sup>9</sup> The idea is to find the factors which affect the amount of debt relief creditors need to grant in order to make the good type invest and repay. The “moral hazard” condition, which makes the good type country willing to invest (and repay), is that the benefits from the investment are greater than its costs. This condition can be written as:

$$R \geq D - V(m - 1)/(1 - q_H) - \alpha(Q(2) + bS). \quad (1)$$

where  $R$  represents the amount of the debt relief and  $D$  stands for the total amount of external debt, which is positively correlated with  $R$ .

$V(m - 1)/(1 - q_H)$  corresponds to the outcome of the investment  $(m - 1)V$ , divided by the low income probability for the good type  $(1 - q_H)$ , where  $V$  represents the investment’s fixed costs in the first period,  $q_H$  is the probability to have a high income (for the good type) in the second period and  $(m - 1)$  is equal to the net rate of return on the investment.<sup>10</sup> The whole expression is negative, this suggesting the existence of an inverse correlation between a country’s investments and the level of the debt relief.

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<sup>9</sup>If we solved the model taking into account both the “participation” and “the self selection” constraint we would find that basically the same factors will affect the probability of a debt rescheduling. For more details on this, see the quoted paper.

<sup>10</sup>Intuitively, as the probability that the good type has a high income in the second period increases, its need for the debt relief will also decrease, since in the event of a high income the good type will always repay its debt.

$\alpha(\underline{Q}(2) + bS)$  describes what creditors could seize in case of default, where  $\alpha$  is the fraction of available resources which can be used to repay the debt,  $\underline{Q}(2)$  is the country's (low) income value in the second period,  $bS$  represents the beneficial effect of the programmes adoption on period-two outcomes ( $1 > b \geq 0$ ) and  $S$  is the short-term cost due to the IMF adjustment programme.<sup>11</sup> In Section 4.1.4 we will discuss in greater detail how these qualitative variables will become the control variables of the empirical model.

## 4. The Empirical model

In this Section we present the empirical model we are going to use in order to test for the existence of an effect of a Fund programme adoption on the subsequent concession of a debt rescheduling. As we saw in Section 3 two different empirical literature have developed, which have considered independently IMF arrangements and debt rescheduling. Here, instead, we want to estimate a bivariate probit model for the joint determination of a Fund programme adoption and of the debt rescheduling conditional on the programme adoption. Our “priori” is that countries which decide to adopt an IMF programme increase their probability to obtain a debt rescheduling.

Notice that we could not model the impact of the adoption on the rescheduling estimating just a single probit equation for the probability of the debt rescheduling and adding a dummy (equal one in the case of an IMF adoption) to the regressors since this dummy would be endogenous. More formally, it would be correlated with the error term of the equation for the debt rescheduling.<sup>12</sup>

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<sup>11</sup> $S$  indicates a direct reduction of welfare (rather than a financial cost) which may depend, for example, to adverse social effects such as reduction of social services and adverse shifts in income distribution.

<sup>12</sup>In other words, unobserved factors influencing both IMF adoption and debt rescheduling would be interpreted as part of the “IMF adoption” effect.

We consider the following IMF programmes: Stand by arrangements, Extended Fund Facility (EFF), Structural Adjustment Facilities (SAF) and Enhanced Structural Fund Facility (ESAF)<sup>13</sup>. These programmes are chosen as they are the most common among IMF programmes. They are set both for the short and the medium-term and they are designed for both middle-income (Stand by and EFF) and low-income countries (SAF and ESAF programmes).

The adoption of one of these programmes is considered only if occurred in the period 1985-94. Since some of these countries have adhered to an IMF programme more than once during the sample period, we have taken into account only their latest arrangement. The variable  $I$  denotes whether a country has obtained an IMF programme.  $I$  is equal one if the country has got the IMF lending and conditionality package and equal zero otherwise.<sup>14</sup>

We have considered only private rescheduling and as a measure of the debt rescheduling we use the “private interest and principal rescheduled” series. Considering both official and private rescheduling would introduce a bias in the results because the adoption of a Fund programme is generally a formal pre-requisite to obtain them. The variable which indicates a debt rescheduling is  $C$ . When  $I = 1$ ,  $C$  is coded one if the country has rescheduled a part of its commercial debt within not more than two years since the adoption of the programme.<sup>15</sup> When  $I = 0$ ,  $C$  is coded 1 if the country just obtains a debt rescheduling in any year of the sample. In this latter case, with more than one concession during the sample, we have taken only the most recent. Conversely,  $C = 0$  either when no rescheduling at all

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<sup>13</sup>Effective November 1999, ESAF was actually renamed Poverty Reduction and Growth Facility (PRGF).

<sup>14</sup>Actually, the data does not allow us to distinguish between the two alternatives: apply and do not get the loan and do not apply for the loan. So we are able to know only the resulting outcome.

<sup>15</sup>The probability of a debt rescheduling is a conditional probability. Therefore,  $C$  could be coded 1 only if occurred after an adoption and not if just occurred whenever within the sample.

was agreed or when the rescheduling was granted too early or too late respect to the year of the IMF programme.

In this model timing is crucial. In the first place, the indebted country can either receive or does not receive the IMF loan (and accept the IMF conditionality that goes with it). Then, creditors decide whether or not to grant the debt rescheduling to the country. Table 3 below presents a cross tabulation of  $I$  by  $C$ .

Insert Table 3

The bivariate probit specification is the following:

$$I^* = Xb + u \qquad I = 1 \text{ iff } I^* > 0, 0 \text{ otherwise} \quad (2)$$

$$C^* = Zg + Id + v \qquad C = 1 \text{ iff } C^* > 0, 0 \text{ otherwise} \quad (3)$$

The disturbances are assumed to be bivariate normally distributed.

$$\begin{pmatrix} u \\ v \end{pmatrix} \sim N \begin{pmatrix} 0 & 1 & \rho \\ 0 & \rho & 1 \end{pmatrix}$$

Equation (2) of the bivariate specification describes the IMF adoption. The latent variable for the IMF adoption,  $I^*$ , is a linear function of the countries' macroeconomic characteristics (vector  $X$ ) which affect the probability to adopt an IMF programme (they will be specified more carefully in Section 4.1.3). Since, after the adoption of the IMF programme, these macro-variables would be affected by the implementation of the programme (and thus they would become endogenous), we take their values two year before the programme is adopted, in order to ensure they are predetermined.

$I^*$  occurs both in the observed dichotomous form in equation (3) and in the latent-variable form in equation (2). The sign of the coefficient of the dichotomous

variable  $I$ , in equation (3), will measure the role of the IMF in debt concessions schemes and our prior expectation is that it will be significantly greater than zero.

Equation (3) describes the “concession” of a debt rescheduling. The latent variable for the debt rescheduling,  $C^*$ , is a linear function of the countries’ macro variables (vector  $Z$ ), and their values are taken two years before the occurrence of the debt rescheduling as well. Note that, in order to input a value of the control variables, when either  $I$  or  $C$  is zero, we calculated the average year of both events (adoption and concession) in our sample and took the control variables’ values two years before that year.

#### 4.1. The identification problem

This two simultaneous equations model contains both a reduced form, equation (2), and a structural form, equation (3). More specifically, our equation of interest is equation (3) (debt rescheduling) which is conditional on equation (2) (IMF adoption). We actually believe that IMF adoption is endogenous thus we specify equation (2) as a reduced form. Since this is not a linear equation both equations should be estimated simultaneously.

The structural form is identified if at least one variable in  $X$  is not included in  $Z$ .<sup>16</sup> To identify the parameters of the model we use both the dummy “previous Fund arrangement” (BEF) and the rate of change of the “general government consumption” (GGC). Our assumption here is that, conditional on the programme adoption, these two variables do not affect the probability of obtaining a debt rescheduling. In other words, what we argue is not that the two variables BEF and GGC do not affect at all the probability of a debt rescheduling, but that they are able to influence it only through their impact on the selection equation.

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<sup>16</sup>See Maddala (1983), p. 122.

This choice is justified on an economic ground. Regarding the dummy BEF, it is plausible that countries that have had Fund arrangements in the past will be more likely than others to enter into an arrangements in the future, because both the authorities of that countries are already familiar with the Fund operating procedure, and they have already gained a sort of “reputation” with the Fund. Therefore, we expect to find a significative and positive sign for the coefficient of this dummy. Instead, for the way in which we have constructed variable  $C$ , past Fund arrangements (that is arrangements which have been made between two and four years before the debt rescheduling) should not influence debt rescheduling in the present. More specifically, we assumed that when reschedulings are conditional on IMF programmes, only recent ones are assumed to influence them.

The growth of government consumption is one of the variables which determines the so called “supply side” of a Fund arrangement, that is the probability that the Fund would approve the request of a loan, rather than affecting the probability that a country would ask for IMF intervention. This distinction between a “demand” and a “supply side” on IMF arrangements was first made in the paper by Knight and Santaella (1997) described in Section 2.1.<sup>17</sup>

Restraint on central government expenditure is a key element for the Fund to approve an arrangement (and thus we would expect to find a significant negative sign for the coefficient of this variable) while, as far as we know, there is not such an explicit requirement to obtain a debt rescheduling (as confirmed in the literature survey on the determinants of a debt rescheduling in Section 2.2).

More importantly, relying on functional form for identification, we tested the identifying restrictions on the selection equation and the results of our test confirm

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<sup>17</sup>Unfortunately, we could not use the other three variables in their paper as three more “instruments.” That is: “nominal depreciation exceeding 5%,” “two year change in government revenues” and “two year change in real domestic credit.”

that they are valid instruments and so that the conditional equation's parameters are identified.

## 4.2. Definition of the variables

This model is estimated as a cross section using annual observations, the sample period goes from 1983 to 1995. There are values corresponding to all the four possible combinations of  $C$  and  $I$ . The data are taken from the International Financial Statistics (IFS), the World Bank Tables, the World Development Indicators and the Global Development Finance (World Bank). All these sources have presented many lacks of data in their series, forcing us quite often to choose between the number of countries in the sample and the number of variables to include in the equations. In fact, according to the IFS definition, the total number of “developing countries” would be 157: of those 64 had to be excluded due to missing data, both in the control and in the dependent variables. We assume that the resulting countries selection is not endogenous. The variables we use are described in Table 4 below. We decided to choose the following variables which were among the most significant regressors in the literature on both IMF arrangements and debt rescheduling, that is:

Insert Table 4

The control variables are basically traditional “ratio variables,” quite common regressors among those we found in other studies on the determinants of IMF arrangements and debt rescheduling. These variables capture both domestic and external factors. They are analysed more carefully in the next two subsections.

### 4.2.1. Determinants of Fund arrangement

The explanatory variables of the adoption of an IMF programme are policy target variables, whose values are taken two years before the Fund arrangement.

As the external factors are concerned, countries with a structural unbalance in the balance of payments (BOP) and in the current account (CA) will be more likely to need Fund financial assistance. Thus, we expect that both BOP and CA enter with a negative sign in the regression. We also expect that a country which experiences low exports (EXP) and reserves (RES) will ask for a Fund arrangements. The need for financial assistance will also depend positively on external indebtedness (EDT) and on a high value of total debt service (TDS). We added two more variables, corresponding to arrears in interests payments (IAR) and in the principal component (PAR), as general indicators of a country's financial difficulty. These two variables should enter with a negative sign in the Fund equation since the IMF prefers not to grant new loans to a country which is already in arrears with its payments.

As the domestic factors are concerned, countries experiencing relatively low levels of *per capita* GDP (GDPPC), low investments (GDI) and high inflation (INFL) will be more likely to seek Fund assistance. Therefore, we expect to find a negative correlation between IMF and both GDPPC and GDI. As we saw in Section 4.1, the growth of government consumption (GGC) is one of the two instruments in the reduced form, where the rate of change in the government consumption is used to capture the behaviour of the variable "fiscal policy" two years before the programme begins. As we previously discussed, we expect to find a negative coefficient for this variable.

We define the two dummies. The first one is BEF whose coefficient should

be positive. The other dummy is BB, which equals one for a country which has adopted the Baker plan (1986-88) and/or the Brady plan (1989-94).<sup>18</sup> Totally, 23 countries of the sample have adopted either plans. In some cases the date of the IMF adoption is the same as the date in which the country has adhered to these plans (7 countries out of 23), while for the remaining countries the IMF adoption occurred either before or after the plans. We expect it to have a significant positive effect.<sup>19</sup>

Compared to other studies on IMF arrangements, we generally opted for a more parsimonious specification (given the limited number of our observations). However, we added two variables not yet examined in the literature, that is both interest and principal arrears on long-term debt. We thought that developing countries' debt-repayment difficulties were an important component to consider, besides other economic characteristics.

#### 4.2.2. Determinants of debt rescheduling

In Section 3 we examined the potential determinants of the probability of a debt rescheduling, according to the Marchesi and Thomas' model. They reflect both domestic and external components.  $R$  is represented here by the total amount of the debt rescheduling (DRES), while  $D$  is captured by the total amount of external debt (EDT) and the total debt service (TDS). GDI represents the investment decision.

Then, we assumed that  $q_H$  (the probability of a high income for the good

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<sup>18</sup>The Baker plan set targets for bank and official lending, called for structural reforms in debtor economies and, in its latter part, experimented market based debt restructuring. The Brady plan shifted the attention from a co-ordinated lending to the reduction and rescheduling of the existing debt.

<sup>19</sup>Dummy (BB) could also be interpreted, in a broader sense, as a dummy for middle-income countries as both plans have generally involved middle-income developing countries.

type) depends, to some extent, on the level of a country's exports (EXP).  $\underline{Q}(2)$  is the country's income in period two (in the low income case) and in the empirical model it corresponds to the *per capita* GDP (GDPPC).  $bS$  represents the beneficial effect on period-two outcomes of the adoption of the programme but we cannot take it into account here, since we do not consider what happens to the control variables after the programme is adopted.

As in the "Fund equation" above, we included two variables corresponding to arrears in interests (IAR) and in principal repayments (PAR) (which describe a country's financial problem). The balance of payments (BOP), the current account (CA), the level of reserves (RES) and the rate of inflation (INFL) are other indicators of the severity of a country's problems. Dummy BB is included. Finally, dummy IMF (which is the most important variable in the regression) stands for the role of the IMF in the debt rescheduling process and it is expected to be positive and significant.

To conclude, regarding the external factors, we should find a positive correlation between the dependent variable and both EDT and TDS and a negative relation between DRES and the variables BOP, CA, EXP and RES. The sign is instead expected to be positive for the coefficients of both IAR and PAR. Regarding the domestic factors, *per capita* GDPPC, INFL and GDI should have negative coefficients (as a consequence of the debt overhang effect and also because we are generally dealing with countries in troubles). We expect to find a significant and positive coefficient for the dummy BB.

This equation did not include any of the so called "balance sheet" variables (see Section 2.2). This is because we are more interested in fundamental, longer-term determinants of a country's solvency and macro-variables seem to be better

proxies for this type of information.<sup>20</sup> The only two variables which give us an indication on a country's financial situation we considered are the interest and principal arrears on long-term debt.

## 5. Estimation results

Table 5 presents the estimation results for the final specification of our bivariate probit model.<sup>21</sup> Most economic factors enter the estimated equations with the expected sign and are significant at either the conventional 5% or 10% significance level.

In the *Fund arrangement equation*, the expected signs are all confirmed except that of EDT which is negative rather than positive (but not significant). All the coefficients' P-values are at least 10%, except GDPPC and EDT which are not significant. The two identifying variables GGC and BEF have a P-value of zero and 5%, respectively. Thus, a strong negative relation emerges between the adoption of an IMF programme and the rate of growth of government consumption (GGC), the level of investment (GDI), the level of exports (EXP), the presence of arrears in interests payment (IAR) and a positive relation with a disequilibrium in the BOP. The existence of a strong and positive relation between the dependent variable and the dummy corresponding to the adoption of an IMF programme in the past (BEF) is confirmed.

In the *equation for the debt rescheduling*, the signs of the coefficients are as expected with the exception of EXP, BOP which are both positive (rather than negative) but not significant. All the coefficients' P-values are at least 10%,

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<sup>20</sup>See Bäcker (1992).

<sup>21</sup>We have also estimated other specifications of the model not reported here for reasons of space.

except for GDPPC, BOP and EXP which are not significant. What emerges is a close relation between a debt rescheduling and: (lack of) investments (GDI), the level of a country’s indebtedness and the existence of arrears in the payment of interest (IAR). Indeed, the most important result of this estimation is that the coefficient of the dummy IMF is positive and highly significant (P-value equal zero), as expected. This confirms our intuition about the effect of IMF adoption on a debt rescheduling. Finally, Rho is highly significant (P-value is zero) and negative which means that the unobservables in the two equations are negatively correlated.<sup>22</sup>

In the other specifications of the model we have included five more variables among the control variables. The rate of inflation (INFL), the total debt service (TDS), the total value of reserves (RES), the current account (CA), the principal arrears (PAR) and the dummy BB. None of them was significant.<sup>23</sup>

Insert Table 5

## 6. Conclusions

The results of this paper confirm that the adoption of an IMF programme (and the conditionality that goes with it) can work as a signal of a country’s good behaviour and may, therefore, induce private creditors to concede a rescheduling of the country’s external debt. Our estimates of a bivariate probit model, which is used to control for endogeneity, assigns a positive and significant value to the coefficient of the dummy “IMF adoption” in the equation which determines the

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<sup>22</sup>It seems that the event IMF adoption positively affects the debt rescheduling only when we explain both of them using our control variables, that is variables that capture only structural/macro factors and not short-term or stochastic factors.

<sup>23</sup>Dummy BB was significant instead, in both equations, in a specification where the dependent variable of the second equation included both official and private debt rescheduling (i.e., it was used the “total debt rescheduled” series).

conditional probability of a debt rescheduling.

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## Appendix

### Data sources

The basic data set used in this study consists of annual observations of data for 93 developing countries over the period 1983-95. All the variable were taken from the International Financial Statistics (IFS), the World Bank Tables, the World Development Indicators and the Global Development Finance. They were constructed in the following way:

### Endogenous variables

$$\text{IMF} = \left\{ \begin{array}{l} 1 \text{ if a country had an arrangement approved during} \\ \text{the period 1985-1993.} \\ 0 \text{ otherwise} \end{array} \right\}$$
$$\text{DRES} = \left\{ \begin{array}{l} 1 \text{ if a country had its debt rescheduled within not more} \\ \text{than two years since the IMF adoption.} \\ 0 \text{ otherwise} \end{array} \right\}$$

## Determinants of the demand for an arrangements

$$\text{GDPPC} = \frac{\text{Gross Domestic Product (GDP) at market prices (cur. US\$)}}{\text{Population}}$$

$$\text{GDI} = \frac{\text{Gross Domestic Investment (cur. US\$)}}{\text{GDP at market prices (cur. US\$)}}$$

$$\text{EDT} = \frac{\text{Total external debt stocks (EDT) (cur. US\$)}}{\text{GDP at market prices (cur. US\$)}}$$

$$\text{TDS} = \frac{\text{Total debt service (TDS) (cur. US\$)}}{\text{Exports of goods \& services (cur. US\$)}}$$

$$\text{RES} = \frac{\text{Total reserves minus gold (cur. US\$)}}{\text{Imports of goods \& services (cur. US\$)}}$$

$$\text{GGC} = \left( \left( \frac{\text{General Government Consumption}_t}{\text{General Government Consumption}_{t-1}} \right) - 1 \right)$$

$$\text{INFL} = \left( \left( \frac{\text{Consumer Price Index}_t}{\text{Consumer Price Index}_{t-1}} \right) - 1 \right)$$

$$\text{EXP} = \frac{\text{Exports of goods and services (curr. US\$)}}{\text{Imports of goods and services (curr. US\$)}}$$

$$\text{IAR} = \frac{\text{Interest arrears on long-term debt outstanding (LDOD) (cur. US\$)}}{\text{Exports of goods \& services (cur. US\$)}}$$

$$\text{PAR} = \frac{\text{Principal arrears on long-term debt outstanding (LDOD) (cur. US\$)}}{\text{Total reserves minus gold (cur. US\$)}}$$

$$\text{BEF} = \left\{ \begin{array}{l} 1 \text{ if } \text{IMF}_{t-j} = 1 \text{ for any } j \geq 1 \\ 0 \text{ otherwise} \end{array} \right\}$$

$$\text{BB} = \left\{ \begin{array}{l} 1 \text{ if a country adhered either to the Baker or to the Brady plan} \\ 0 \text{ otherwise} \end{array} \right\}$$

Insert Table 5

Insert Table 6

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Table 1: Economic determinants of IMF loans

<b>Study</b>	<b>Dep. variable</b>	<b>Model/Est. meth.</b>	<b>Significant regressors</b>
<i>Bird and Orme (1981)</i>	Drawings on the IMF	OLS	Current acc./trade Rate of inflation GNP per capita Imports Euro-curr. cred./imports
<i>Cornelius (1987)</i>	Demand for IMF credits	OLS	Debt service GNP per capita Imports Int. reserves Cap. mks. borr.
<i>Joyce (1992)</i>	Fund prog. adoption	Logit	Gov. exp./GDP Int. reserves Dom. cred. growth Current acc./export GDP per capita Year dummies
<i>Conway (1984)</i>	IMF participation (binary choice) (cont. var.cens. at 0 and 1)	Probit Tobit	Prev. adoption Lagged curr. acc./GDP Terms of trade World real rate Lagged real GDP growth For. res./imports L-term external debt IMF prog. exp. date Year dummies
<i>Knight and Santaella (1997)</i>	Arrangement approval Demand and supply of a financial arrangement	Probit Bivariate probit	Int. reserves Ext. debt serv./exports GDP per capita Investment/GDP Real exchange rate Prev. adoption Year dummy Gov. revenue growth Gov. expend. growth Nom. depr. > 5%

Table 2: Probability models of debt rescheduling

<b>Study</b>	<b>Dep. variable</b>	<b>Model/Est. meth.</b>	<b>Significant regressors</b>
<i>Berg and Sachs (1988)</i>	Debt rescheduling	Probit	Income distribution Share of agriculture in GNP GNP per capita
<i>Lloyd-Ellis et al. (1989)</i>	Debt rescheduling	Logit	Rate of growth of exports Bank borr./bank deposits S-t bank borr./tot. bank borr. M-t bank borr./tot. bank borr. L-t bank borr./tot. bank borr. For. res./IMF quota Unall. credit/country's lend. Undis. credit/bank lending Number and value of resch.
<i>Lee (1991)</i>	Debt rescheduling	Logit	Foreign debt/GNP Growth rate of p.c. GDP Interest rate on intern. lend. Ind. countries' GNP growth Variability in p.c. GDP Domestic debt/GDP
<i>Bäcker (1992)</i>	Debt rescheduling	Logit	Undis. credit/bank lending Country's debt/tot. bank lend. Bank borr./bank deposits Growth rate of exports Wtd. av. spreads of resch. Resch. and regional dummies Stock exchange index Wtd. av. G7 gov. bond yield
<i>Lanoie and Lemarbre (1996)</i>	Debt rescheduling Amount of debt rescheduled	Probit OLS (Heckman's two-step estimator)	Unall. credit/total borr. For. res./IMF quota Undis. credit/total bank borr. Wtd. av. grace period of resch. L-t bank borr./tot. bank borr. M-t bank borr./tot. bank borr. Imports/reserves GDP per capita Debt service/exports Total debt/exports Debt amortisation/debt Investments/GDP Current account/GDP

Table 3: Cross Tabulation of I by C

	<i>C</i> (1)	<i>C</i> (0)
<i>I</i> (1)	44	31
<i>I</i> (0)	2	16

Table 4: Variables definition (a)

<b>Variable</b>	<b>Definition</b>	<b>Units</b>	<b>Expctd. sign</b>
IMF	Approval of an IMF arrangements	Binary	
DRES	Total amount of Debt Rescheduled	Binary	
BB	Baker and Brady countries	Binary	+
BEF	Previous Fund arrangement	Binary	+
GDPPC	GDP at market prices per capita	% Pop.	-
GDI	Gross domestic investment	% GDP	-
EDT	Total external debt stock	% GDP	+
TDS	Total debt service	% exports	+
RES	Total reserves minus gold	% imports	-
INFL	Consumer price index	% rate of change	+
BOP	Balance of Payment	% GDP	-
CA	Current Account	% GDP	-
EXP	Exports of goods and services	% imports	-
IAR	Interest arrears on long-term debt	% exports	-/+
PAR	Principal arrears on long-term debt	% reserves	-/+
GGC	General government consumption	% rate of change	-

(a) the Appendix contains all the calculation details.

Table 5: Bivariate Probit Model estimates

	<b>Exp. Sign</b>	<b>Coeff.</b>	<b>Std. Err.</b>	<b>z</b>	<b>P value</b>
IMF					
BEF	+	2.916	0.707	4.126	0.000
GDPPC	-	-0.0002	0.0002	-1.105	0.269
GDI	-	-3.926	1.997	-1.966	0.049
EDT	+	-0.935	0.649	-1.439	0.150
GGC	-	-3.455	1.803	-1.916	0.055
EXP	-	-2.450	1.201	-2.040	0.041
BOP	-	-14.391	8.535	-1.686	0.092
IAR	-	-0.687	0.259	-2.648	0.008
CONS		3.208	1.123	2.857	0.004
DRES					
GDPPC	-	-0.00004	0.0001	-0.313	0.754
GDI	-	-4.788	2.019	-2.372	0.018
EDT	+	0.883	0.520	1.699	0.089
EXP	-	0.846	0.688	1.231	0.218
BOP	-	0.805	3.991	0.202	0.840
IAR	+	3.226	1.348	2.393	0.017
IMF	+	1.610	0.417	3.863	0.000
CONS		-1.817	0.830	-2.189	0.029
$\rho$		-3.272	0.074	-44.297	0.000
<i>Log-Likelihood</i>			-56.65		
<i>Pseudo-R<sup>2</sup></i>			0.45		
<i>No. observations</i>			93		

Table 6: Countries in the basic sample

Algeria: Stand-by 1994-95	Ghana: Esaf 1988-92	Panama: Stand-by 1985-87
Argentina: Ext. arr. 1992-95	Grenada: None	Papua N. Guinea: Stand-by 1991-92
Bangladesh: Esaf 1990-93	Guatemala: Stand-by 1992-94	Paraguay: None
Barbados: Stand-by 1992-93	Guyana: Esaf 1994-97	Peru: Ext. arr. 1993-96
Belize: Stand-by 1984-86	Haiti: Stand-by 1989-90	Philippines: Ext. arr. 1994-97
Bolivia: Esaf 1994-97	Honduras: Esaf 1992-95	Poland: Stand-by 1994-96
Botswana: None	Hungary: Stand-by 1993-94	Romania: Stand-by 1994-97
Brazil: Stand-by 1992-93	India: Stand-by 1991-93	Rwanda: Saf 1991-94
Burkina Faso: Esaf 1993-96	Indonesia: None	Senegal: Esaf 1994-97
Burundi: Esaf 1991-94	Jamaica: Ext. arr. 1992-95	Seychelles: None
Cameroon: Esaf 1994-97	Jordan: Ext. arr. 1994-97	Sierra Leone: Esaf 1994-97
Cape Verde: None	Kenya: Esaf 1993-94	Solomon Islands: None
Centr. Afr. Rep.: Stand-by 1994-95	Korea Rep.: Stand-by 1985	Somalia: Saf 1987-89
Chad: Stand-by 1994-95	Lao Dem. Rep.: Esaf 1993-96	Sri Lanka: Esaf 1991-94
Chile: Stand-by 1989-90	Lesotho: Stand-by 1994-95	St. Kitts and Nevis: None
China: Stand-by 1986-87	Madagascar: Esaf 1989-92	St. Lucia: None
Colombia: None	Malawi: Esaf 1988-94	Sudan: None
Congo Dem. Rep.: Stand-by 1989-90	Malaysia: None	Swaziland: None
Congo Rep.: Stand-by 1994-95	Maldives: None	Tanzania: Esaf 1991-94
Costa Rica: Stand-by 1993-94	Mali: Esaf 1992-95	Thailand: Stand-by 1985-87
Côte d'Ivoire: Esaf 1994-97	Malta: None	Togo: Esaf 1994-97
Dominica: Saf 1986-89	Mauritania: Esaf 1992-95	Trin. and Tobago: Stand-by 1990-91
Dominican Rep.: Stand-by 1993-94	Mauritius: Stand-by 1985-86	Tunisia: Ext. arr. 1988-91
Ecuador: Stand-by 1994-96	Mexico: Ext. arr. 1989-93	Turkey: Stand-by 1994-96
Egypt Arab Rep.: Ext. arr. 1993-96	Morocco: Stand-by 1992-93	Uganda: Esaf 1994-97
El Salvador: Stand-by 1993-94	Mozambique: Esaf 1990-93	Uruguay: Stand-by 1992-93
Equatorial Guinea: Esaf 1993-96	Nepal: Saf 1987-90	Vanuatu: None
Ethiopia: Saf 1992-95	Nicaragua: Esaf 1994-97	Venezuela: Ext. arr 1989-93
Fiji: None	Niger: Stand-by 1994-95	Western Samoa: None
Gabon: Stand-by 1994-95	Nigeria: Stand-by 1991-92	Zambia: Stand-by 1986-88
Gambia: Esaf 1988-91	Pakistan: Esaf 1994-97	Zimbabwe: Ext. arr. 1992-95

Table 7: Baker and Brady plan countries

<b>Baker plan (1986-88) countries</b>	<b>Brady plan (1989-94) countries</b>
Argentina	Argentina
Bolivia	Bolivia
Brazil	Brazil
Chile	Bulgaria
Colombia	Costa Rica
Costa Rica	Dominican Republic
Côte d'Ivoire	Ecuador
Ecuador	Guyana
Jamaica	Jordan
Mexico	Mexico
Morocco	Mozambique
Nigeria	Niger
Peru	Nigeria
Philippines	Philippines
Uruguay	Poland
Venezuela	Uganda
Yugoslavia	Uruguay
	Venezuela

Source: Cline, 1995