JOURNAL OF ECONOMIC DEVELOPMENT 25
Volume 30, Number 2, December 2005

EVALUATING THE IMPACT OF FOREIGN AID ON ECONOMIC GROWTH: A CROSS-COUNTRY STUDY

SANDRINA BERTHAULT MOREIRA*

College of Business Administration Setúbal Polytechnic

One branch of the literature on aid effectiveness attempts to measure the contribution of foreign aid to the growth of developing countries. The micro results are clear and encouraging: foreign aid is beneficial to economic growth. However, until recently, the macro results were inconclusive: the impact of aid on growth was positive, negative, or even non-existent, in statistical terms. This contradiction is known as the "micro-macro paradox". Certain methodological and econometric flaws inherent in the assessments being carried out up to the mid-nineties may provide an explanation for the misleading macro results. Examining a large panel data set, I have found that foreign aid has had a positive impact on economic growth. In light of these findings, I conclude that earlier-generation work is in accordance with the new and recent generation of aid effectiveness studies. Thus, less importance should be attributed to the "micro-macro paradox" as an overall appraisal of aid effectiveness. In terms of magnitude, I have also found that aid has less effect on growth in the short-run than in the long-run. I also conclude that the time lags in the aid-growth relationship should not be ignored.

Keywords: Foreign Aid, Economic Growth, Panel Data, Generalised Method of Moments
JEL classification: F35, O11, O40, C23

* I am especially grateful for remarks and comments from an anonymous referee, Finn Tarp, Jochen Oppenheimer, and José Passos. The unpublished work of Hansen *et al*. (1998) has been kindly provided by Finn Tarp, who is acknowledged for. Earlier versions of this paper were presented at the 15th Annual Meeting on Socio-Economics, by SASE and LEST, Aix-en-Provence, France, June 2003 and the 7th Conference on Mathematics Applied to Economics and Management, by CEMAPRE, Lisbon, Portugal, September 2003. I would like to thank panel participants for comments.

1. INTRODUCTION

Official development assistance (ODA), more commonly known as foreign aid, consists of resource transfers from the public sector, in the form of grants and loans at concessional financial terms, to developing countries. Many studies in the empirical literature on the effectiveness of foreign aid have tried to assess if aid reaches its main objective, defined as the promotion of economic development and welfare of developing countries. When focusing on the traditional purpose of foreign aid - promotion of the economic growth of developing countries -, one notes that the results obtained differ according to the approach used. Studies at the micro-level, mainly using cost-benefit analyses, support the view of those in favour of the effectiveness of foreign aid. In contrast, the results presented in studies at the macro-level, namely cross-country regression studies, are, to say the least, ambiguous. Mosley (1986) called this contradiction the "micro-macro paradox".

The "official announcement" for a move towards selectivity in allocating development assistance gave new impetus to the discussion about aid effectiveness. As a result, a number of econometric studies linking economic growth to foreign aid have been published in the last few years. Compared to previous work, they break new ground in the field. Panel data econometric tools have been employed to allow for non-linear effects of aid on growth and the endogeneity of aid and other variables. Furthermore, these recent studies have been inspired by the "new growth" literature, which encompasses various modifications to the Solow-Swan neoclassical growth model and endogenous growth models, which in turn provides a different analytical basis compared to earlier work. The third-generation of cross-country regression studies, as it is known, with it's advances in theory and method, have achieved the macro results foreseen by those in favour of the effectiveness of foreign aid and, therefore, the "micro-macro paradox" ceases to exist. Even so, the widespread perception that a disparity exists between micro and macro results reported by former studies is still very much alive.

This paper concentrates on the aid-growth relationship at the macro-level. An overall analysis of cross-country regression studies published from the late sixties to the mid-nineties reveals that whether the dependent variable is savings, investment or economic growth, the ODA regressor is sometimes significantly positive, sometimes significantly negative, and sometimes even non-significant, in statistical terms. That is, the contribution of foreign aid to the economic growth of developing countries may be positive, negative, or even non-existent, in statistical terms. The explanation for the inconclusive results remains unclear, but many authors have suggested theoretical and/or methodological and econometric causes.

The underlying theory of the macro studies in focus here assumes that physical capital accumulation is the key to economic growth. However, advances in growth theory have come to show that the growth process relies on a complex set of interdependent factors. In other words, a host of other factors besides physical capital

accumulation is known to affect growth. Therefore, according to many authors, the Harrod-Domar growth model and the Chenery and Strout two-gap model are over-simplified.

The econometric aid-growth literature has been also criticised on several grounds. Indeed, after a careful study of twenty-nine macro studies, I have recorded a number of methodological and econometric weaknesses that may explain the inconsistent results of regression studies. Therefore, this paper assesses the macroeconomic impact of foreign aid on the economic growth of developing countries, and proposes improvements to the methodological and econometric procedures found in studies of the aid-growth relationship. Growth regressions, based on a large sample of developing countries covering a 29-year period, are estimated using the generalised method of moments (GMM) suggested by Arellano and Bond (1991).

The remainder of the paper is organised as follows. Section 2 briefly presents the theoretical basis for the cross-country regression studies on aid effectiveness reviewed in Section 3. Section 4 describes the main features of my empirical study, namely methodology framework, model specification, data and variables, followed by the analysis of the estimated results in Section 5. Section 6 briefly presents the new generation of cross-country regression studies and Section 7 this author's conclusions.

2. HARROD-DOMAR MODEL AND GAP MODELS

Empirical studies of the aid-growth relationship carried out until the mid-nineties were influenced by the early growth theories, which asserted that the growth process depends on the ability to surpass the constraints regarding the accumulation of physical capital. Investment was perceived as the key to economic growth.

Traditionally, the lack of savings crucial to investment was regarded as the most important limitation to the economic growth of developing countries. Indeed, one characteristic of developing countries is their limited capacity to generate savings, due to their low per capita income. The original Harrod-Domar model was expanded in the sixties in the Chenery and Strout (1966, 1979) two-gap model. The foreign exchange shortage was introduced as another possible growth constraint. Typically, developing countries need to import goods and services, vital to investment and production; but import requirements usually exceed export earnings.

Investment can be constrained either by a shortage of domestic savings (the savings gap) or by a shortage of exports earnings (the trade gap). Therefore, foreign aid inflows in particular, and foreign capital inflows in general, are needed to fill the prevailing gap, so that countries can grow more rapidly than their internal resources would otherwise allow. If these inflows do not exist, the country will experience slower growth and inefficient employment of internal resources (labour and natural resources). The desirable outcome is self-sustaining growth.

Following the crippling debt crisis of the 1980s, Bacha (1990) and other

neostructuralist authors, like Lance Taylor, introduced a third fiscal gap between government revenue and expenditures. The three-gap model predicts that government budget limitations rather than foreign exchange constraints or an overall savings restriction, may be binding. If foreign aid supplements government revenue, then it will be perceived as promoting economic growth.

3. OVERVIEW OF CROSS-COUNTRY REGRESSION STUDIES ON AID EFFECTIVENESS[1]

Hansen and Tarp (2000) consider three generations of cross-country regression studies. The first-generation studies offered an empirical assessment of how aid influences domestic savings (savings regressions). According to the Harrod-Domar equation, growth depends on investment, which is financed by savings (domestic plus foreign). If the effect of aid on domestic savings is positive, then one may state that aid will spur growth. Otherwise, aid will probably be detrimental to the economic growth of developing countries. The second-generation studies assessed the link between aid and growth, either via investment (investment regressions) or directly in reduced form equations (growth regressions). Like the second strand of the second-generation studies, the third-generation ones have explored the direct relationship between aid and growth.

The recent studies of the aid-growth relationship are classified as a new generation of aid effectiveness studies, because "in our view, the third-generation studies represent a distinct step forward in empirical cross-country work on aid effectiveness" (Hansen and Tarp (2000), p. 114). The current generation of cross-country regression studies is not at the core of the analysis. However, it should be stressed that their contributions were important in shaping the empirical research in this paper, as will become clearer in the next section (see also Section 6).

The study by Hansen and Tarp encompasses a list of twenty-nine empirical studies of the aid-growth relationship published from the late sixties to 1998.[2] An analysis of the main characteristics of these first and second generation studies provides a general understanding of the methodological and econometric procedures prevailing in the literature. They are as follows:

1. Single-equation regressions for the total sample, and sub-samples selected according to geographical region to take into account regional specificities;
2. Cross-section data with period averages, which means that the main evidence turns out to come from the cross-sectional (between-country) variation;
3. Non-specification of time lags in the aid-growth relationship, in spite of the

[1] See Moreira (2002) for a more detailed study of this subject.

[2] The list of cross-country regression studies offered by Hansen and Tarp (2000) is available in the Appendix.

perception that the effect of aid on growth does not end in a single time period;
4. ODA as an exogenous variable, even though there are reasons for suspecting correlation between aid and the error term in a given model;
5. Aid flows not identified separately from other foreign capital flows (a practice not prevalent, though strongly criticised);
6. Control variables, even though some of them are not fully documented;
7. Little mention of diagnostic tests, which are important when evaluating the quality of model specification;
8. The ordinary least squares (OLS) estimation method.

The results of these studies, summarised in Table 1, show inconsistent evidence of a positive and statistically significant effect of aid on growth.

Table 1. Estimated Results from Twenty-Nine Cross-Country Regression Studies

Unit of measure: number of regression studies

Impact of Aid:	Savings Regressions	Investment Regressions	Growth Regressions
Positive	1	17	40
Negative	25	0	1
Non-existent	15	1	31
Total(131)	41	18	72

Source: Adapted from Moreira (2002)

However, one of the main purposes of Hansen and Tarp's detailed survey (2000) is to offer a re-examination of the empirical cross-country literature covering the period up to the mid-nineties. After some theoretical and empirical considerations, these authors conclude that regressions giving empirical support to a positive aid-growth relationship prevail. Therefore, the "micro-macro paradox" is non-existent. This was the first paper to draw such a startling conclusion based on a wide range of cross-country regression studies on aid effectiveness.

4. EMPIRICAL STUDY

4.1. Methodology Framework

As can be seen in the previous section, there is evidence of methodological and econometric shortcomings in the first and second generation studies. These and other shortcomings were criticised in the literature and in some cases, seen as the explanation for the disparities between micro and macro results in general, and the inconclusive

macro results in particular. Therefore, I propose an alternative methodological and econometric procedure to heighten the accuracy of aid-growth studies.

From the list of cross-country regression studies supplied by Hansen and Tarp (2000), I have focused on single-equation growth regressions, since it is the most common practice found in the literature. Within this regression subset, I have chosen the model specification suggested by Dowling and Hiemenz (1982) and Mosley *et al*. (1987, 1992). Despite the unsophisticated empirical growth equations specified, the model specification of each study has been remarked for the inclusion of relevant control variables (e.g., White (1992); Durbarry *et al*. (1998); Hansen *et al*. (1998)).

Like the majority of growth regression studies, both studies mentioned above use the reduced form equation proposed by Papanek (1973) as their basic model. This is also my point of departure. The original derivation of the Papanek regression was based on the Harrod-Domar growth equation and a behavioural equation in which investment depends on its major financing components, including domestic savings as well as various forms of foreign resource inflows (ODA, private and other official inflows).[3]

The first practice I have changed was that of expressing the dependent variable in per capita terms. Real per capita GDP is the most common indicator of a population's standard of living. This implies a small change to the Harrod-Domar growth equation, in order to incorporate the effects of population growth.

A non-linear relationship between aid and growth is not taken into account in any of the 72 growth regressions selected from the literature. However, there are reasons for expecting that "too much aid" is detrimental to economic growth. As already put forward by Chenery and Strout (1966, 1979), the capacity of foreign aid to accelerate economic growth is contingent upon the absorption capacity of aid recipients. The capacity to make productive use of external resources depends on numerous factors such as the existing infrastructure, the available skilled labour and the institutional and administrative capacity of national and local governments. Excessively high amounts of foreign aid raise problems of absorption capacity and are thus counterproductive. A further effect of excessive aid is known as "Dutch disease". The "Dutch disease" operates through the spending effect. When part of the additional income generated by a strong inflow (boom) of aid is spent in-country on non-traded goods and services (education, health, welfare, construction, and other services), the result is an excessive demand for this type of goods and services. Since imports cannot flood in to meet demand, and since domestic supply constraints exist, the price of the non-tradable goods and services will therefore rise in relation to the price of those tradable. This appreciation of the real exchange rate is detrimental to external competitiveness and economic growth. Both absorptive capacity constraints and "Dutch disease" problems justify the possible existence of an inverted U-shaped relationship between aid and

[3] Out of the 72 growth regressions identified from the 29 articles, 51 were derived from the reduced form Papanek-type regression.

growth and, in particular, the notion of negative returns at high levels of aid inflows. I have allowed for non-linear effects of aid on growth by including the squared aid term.[4]

Most growth regression studies also take no account of the time lags that most probably exist in the aid-growth relationship. One would not expect aid to be effective in a single time period. Instead, lags may occur between aid-financed activities and their eventual impact on growth. The difficulty is how to allow for this time lapse econometrically. To provide for this time lapse, I have introduced some dynamic into the non-linear effect of aid by using an autoregressive distributed lag (ADL) relation between aid and growth. Aid and growth are each lagged once to reveal that the current growth value depends on the current and previous values of foreign aid. In other words, this relationship shows that the current value of foreign aid has an effect on the current and future values of growth.[5]

For macroeconomic data, reparameterisations of autoregressive distributed lag models have proven to be quite useful. I have reparameterised the ADL (1,1) scheme with first differences. Switching to first differences involves only linear transformations of the variables and does not impose any restrictions. Thus, the estimated results of the reparametrised model will be identical to those of the ADL model. Moreover, the move from a relation in terms of the levels of the variables to a relation in terms of both levels and first differences has substantial advantages. For instance, it usually gives a reduction in the collinearity of the regressors, thus reducing standard errors. The outcome is the basic model with both aid and aid squared in levels and first differences, and the dependent variable lagged once as a regressor.

Papanek (1973) and Mosley *et al*. (1987, 1992) estimate single-equation growth regressions for the total sample, and sub-samples selected according to geographical region. As an alternative, Dowling and Hiemenz (1982) prefer to estimate single-equation growth regressions with regional dummies. Both practices have been widely used to point out that, *ceteris paribus*, growth performances in countries in those

[4] The treatment of non-linearities in the aid-growth relation is a common feature shared by the recent empirical cross-country work on aid effectiveness. Hadjimichael *et al*. (1995), Lensink and White (2001), and other authors introduce the squared aid term in the regression to explicitly address this issue.

[5] Out of the 29 macro studies I have examined, only Mosley *et al*. (1987, 1992) attempt to deal with the issue of time lags in the aid-growth relation. Indeed, this has been a main concern in the research carried out by Hudson and Mosley (see, for instance, Mosley *et al*. (1987, 1992); Hudson and Mosley (1994); Mosley and Hudson (1995)). Recent work on aid effectiveness does not explicitly address the question of the lag structure that should be used. Yet, in the studies where the endogeneity of aid is found to be relevant, the procedure has been to include lagged aid terms. To take two examples, Hadjimichael *et al*. (1995, p. 51) note that "this study attempts to address these problems [endogeneity problems] by lagging foreign aid by one period" and Hansen and Tarp (2001, p. 552) state that "following Burnside and Dollar, we show results of instrumental variable estimations in which all regressors involving aid are treated as endogenous. We use, however, a different set of instruments. The main change is that we include all the aid regressors lagged one period".

regions appear to differ from those of other developing countries. However, using a panel data model with individual effects has a number of benefits, among which is that it allows us to account for individual heterogeneity. Indeed, developing countries differ in terms of their colonial history, their political regimes, their ideologies and religious affiliations, their geographical locations and climatic conditions, not to mention a wide range of other country-specific variables. Failing to take this heterogeneity into account will inevitably bias the results, no matter how large the sample is. The empirical model I have chosen to use is therefore a dynamic panel data model with fixed country effects. Time dummies are also taken into account to correct for possible fixed time period effects.[6]

Most growth regression studies assume that foreign aid is an exogenous variable, even though aid is expected to be endogenous in growth regressions. On the one hand, foreign aid may present issues of reverse causality, especially because, if aid depends on the level of income, it will necessarily depend on economic growth. If reverse causality is not taken into account, it can lead to serious inaccuracies in research results. Not only are the parameter estimates inconsistent, but the magnitude and the meaning of the aid parameter is altered as well. On the other hand, the error term in a given model may include factors that both affect growth and are correlated with aid, thus rendering the parameter estimates inconsistent. Consequently, I have employed Arellano and Bond's GMM-type estimator (1991) to deal with the issue of endogeneity in the context of panel data models.

The GMM estimator proposed by Arellano and Bond, also known as two-step estimation, is constructed in two phases. Firstly, first differences from the dynamic panel data model are calculated; then, lagged levels of right-hand side variables are used as their instruments. With a lagged dependent variable and other endogenous regressors (as is the case with aid and aid squared), the lagged levels are dated t-2 and earlier (t indexes time). If there are predetermined regressors, all their lagged levels are used as instruments.[7]

Before addressing the model specification issue, two technical aspects must be mentioned. First, one practical difficulty found in the estimation process is that the early values of the instruments do not show a close correlation to their late values, though the quality of the instruments depends on it. For this reason, I have used the common procedure of limiting the number of lags for each variable. Second, Arellano and Bond (1991) developed, not only a GMM estimator to apply to dynamic panel data models,

[6] I have chosen fixed effects rather than random effects mainly because, when Hausman's specification test is employed, the fixed effects estimator is consistent whether the null hypothesis (no correlation between individual effects and regressors) is true or not. A large loss of degrees of freedom may however arise, if the number of countries (N) is large, since one is including N-1 dummies in the regression.

[7] As done by Hansen and Tarp (2001), the additional regressors of the present empirical study (being other official flows and time dummies an exception) are assumed to be predetermined.

but associated specification tests as well. The Sargan test evaluates if the instruments are valid. In turn, the second-order serial correlation in the first-differenced residuals evaluates if there is serial correlation in the residuals. The GMM estimator is consistent, when the null hypothesis of both tests is not rejected.

4.2. Model Specification

On the basis of considerations discussed above, the empirical model which I have estimated is of the following form:

$$\begin{aligned} PCG_{it} = {} & \beta_1(S_{it}) + \beta_2(ODA_{it}) + \beta_3(\Delta ODA_{it}) + \beta_4(ODA^2{}_{it}) + \beta_5(\Delta ODA^2{}_{it}) \\ & + \beta_6(PF_{it}) + \beta_7(OOF_{it}) + \delta(PG_{it}) + \rho(PCG_{i,t-1}) + \tau_t + X_{it} + w_{it}, \end{aligned} \tag{1}$$

with $w_{it} = \mu_i + \varepsilon_{it}$, where i indexes countries, t indexes time, PCG_{it} is per capita GDP growth rate, S_{it} are domestic savings relative to GDP, ODA_{it} is official development assistance relative to GDP, PF_{it} are private flows relative to GDP, OOF_{it} are other official flows relative to GDP, PG_{it} is the population growth rate, τ_t represents time period effects, X_{it} represents other growth determinants, and w_{it} represents both country effects (μ_i) and the remainder error term which varies over both country and time (ε_{it}).

In brief, I have changed Papanek's conventional basic model to incorporate: first, a dynamic non-linear aid-growth relationship; second, the effects of population growth and other growth determinants suggested by Dowling and Hiemenz (1982) and Mosley *et al*. (1987, 1992); third, fixed country and time period effects. Then I have used the Arellano and Bond's GMM-type estimator (1991), assuming that foreign aid is an endogenous variable.

Given the lag structure proposed in the previous subsection:

- The immediate, short-run effect of a unit change on the ODA/GDP ratio on the average growth value is defined, from Equation (1), as:

$$\partial PCG_{it} / \partial ODA_{it} = (\beta_2 + \beta_3) + 2(\beta_4 + \beta_5)(\overline{ODAit}), \tag{2}$$

where $\overline{ODAit}$ is the mean value of the ODA/GDP ratio, with $t = 1,...,$ or, T.

- Provided the stability condition $|\rho| < 1$ is satisfied, the total, long-run effect of a unit change on the ODA/GDP ratio on the average growth value is defined, from Equation (1), as:

$$\partial PCG / \partial ODA = \beta_2 /(1-\rho) + 2[\beta_4 /(1-\rho)](\overline{ODA}), \tag{3}$$

where $\overline{ODA}$ is the mean value of the ODA/GDP ratio.

4.3. Description of Data and Variables

The empirical model presented above is estimated examining 48 developing countries covering the period 1970 to 1998. I have used six sub-period averages instead of yearly data.[8] The presence of missing values produced a total sample of 170 observations (unbalanced panel data). The main data source is the World Bank (2001) and the OECD-DAC (1999, 2000). In Appendix II, I present the list of sample countries according to income group and geographical region, summary statistics for the main variables, and the correlation matrix.[9] Appendix III shows the list of variables and sources.[10]

A few words must be said regarding the intuitive sign for each independent variable. As sources of physical capital accumulation, domestic savings, official development assistance, private inflows, and other official inflows (all as a percentage of the GDP) are expected to have a positive impact on investment and therefore on economic growth. The quadratic term of the ODA/GDP ratio is expected to be negatively related to growth. As has been pointed out, very high aid inflows (measured in relation to the GDP) are counterproductive. The population growth rate is also expected to have a negative effect on the growth rate of real per capita GDP.

Dowling and Hiemenz (1982) added four policy variables to Papanek's basic model. First, they expressed the degree of openness as the ratio of exports plus imports as a proportion of GDP. Theory and evidence suggest that trade liberalisation raises economic growth. Second, the role of governments in domestic resource mobilisation is measured by central government tax revenues as a percentage of the GDP. The sign of this variable is *a priori* ambiguous, because higher taxes can raise public savings and therefore contribute to domestic resource mobilisation. However, it can also reduce

[8] In the estimates, average data over sub-periods of five years are used, except for the last period, which refers to four years.

[9] Care should be taken in analyzing the correlation matrix presented in Appendix II, since it is computed by ignoring the panel structure of the data. Finding a negative correlation between aid and either economic growth or domestic savings is somewhat odd. It suggests - but clearly does not prove - that as the ODA/GDP ratio increases either the per capita GDP growth rate or the domestic savings relative to GDP decreases. However, part of the correlation may be spurious, reflecting the effects of third factors (e.g., traditional growth determinants and unobserved country effects).

[10] The developing countries listed in Appendix II were selected from *The 2001 World Development Indicators* (World Bank (2001)). Countries that did not have foreign aid data for at least half of the sample period were excluded. The econometric package also removed countries that had missing values in the six sub-periods.

private savings and discourage private capital formation. Third, the share of the public sector in economic activities is measured by total government expenditure in GDP. The inefficiency usually associated with public enterprises and the oversized bureaucracies suggest a negative sign for this variable. Fourth and last, we have M2 over GDP as a proxy for financial development. Financial development stimulates economic growth by enlarging the services provided by financial intermediaries such as savings mobilisation, project evaluation, and risk management. The size of financial intermediaries, traditionally measured by the ratio of M2 to GDP, is assumed to be positively associated with the provision of financial services.

In Mosley *et al*. (1987) and a follow-up paper that extended the database to the 1980s (Mosley *et al*. (1992)), the authors proposed an alternative expanded version of the Papanek-type regression. The additional independent variables chosen were changes in export values and in the literacy rate. Faster export growth is expected to contribute to economic growth by increasing the supply of foreign exchange and thus the capacity to import raw materials and equipment essential to rapid and sustained growth. We also have the growth of adult literacy rates to factor in the positive role for changes in the stock of human capital on economic growth.

5. REGRESSION RESULTS

The GMM results using Equation (1) are displayed in Table 2.[11] Regression [1] presents the estimated results of my basic model. The high correlation between tax ratio and government spending (correlation coefficient equal to 0.84 - see Appendix II) suggests that multicollinearity is a problem. So, as Dowling and Hiemenz (1982), I have put the policy variables into separate regressions, named Regressions [2] and [3]. Regression [4] enters the additional variables suggested by Mosley *et al*. (1987, 1992).

From regression [1], we see that the stability condition ($|-0.124|<1$) is met; otherwise, we wouldn't have been able to determine the short and long-run effect of foreign aid on economic growth. Furthermore, the explanatory variables are all correctly signed and statistically significant. The result concerning the key explanatory variable therefore suggests that foreign aid contributes to economic growth (as long as the aid to GDP ratio is not excessively high).

[11] I have used the DPD package for OX, available at http://www.nuff.ox.ac.uk/Users/Doornik/.

Table 2. Growth Regressions Using Panel Data with Fixed Effects

Dependent variable	Growth rate of real per capita GDP			
Sample / Period	48 countries / 1970-74, 75-79, 80-84, 85-89, 90-94, and 95-98			
Estimation method	GMM-type estimator of Arellano and Bond (1991)			
Regression	[1]	[2]	[3]	[4]
Lagged dependent variable	-0.124***	-0.101**	-0.140**	-0.212***
	(-3.08)	(-2.30)	(-2.47)	(-3.78)
Domestic savings	0.129***	0.074*	0.113***	0.078**
	(5.00)	(1.84)	(2.90)	(1.97)
Foreign aid	0.434***	0.540***	0.595**	0.655***
	(3.57)	(3.21)	(2.34)	(3.77)
Foreign aid (first differences)	-0.400***	-0.327*	-0.397*	-0.480***
	(-3.72)	(-1.93)	(-1.75)	(-2.92)
Square of foreign aid	-0.009**	-0.017***	-0.019**	-0.014***
	(-2.33)	(-2.81)	(-2.38)	(-2.94)
Square of foreign aid (first differences)	0.008***	0.012**	0.015**	0.010***
	(2.79)	(2.15)	(2.26)	(2.67)
Private flows	0.103***	0.076*	0.077*	0.051*
	(6.70)	(1.73)	(1.89)	(1.94)
Other official flows	0.291***	0.036	-0.085	0.130
	(5.76)	(0.41)	(-0.99)	(1.15)
Population growth (lagged)	-0.853***	-0.298	-0.040	0.541
	(-3.70)	(-0.45)	(-0.06)	(1.65)
Openness		0.074***		
		(4.54)		
Government spending		-0.105*		
		(-1.95)		
Financial depth			0.035*	
			(1.74)	
Tax ratio			0.109	
			(1.63)	
Export growth				0.178***
				(6.39)
Literacy growth				3.179***
				(2.73)
Number of observations	176	134	134	161
Sargan test	0.560	0.966	0.941	0.996
Serial correlation test	0.052	0.143	0.277	0.635
Wald test - significance of all regressors	0.000	0.000	0.000	0.000
Wald tset - significance of time dummies	0.000	0.000	0.000	0.000

Notes: a) *, ** and *** indicate that the estimated parameter is statistically significant at the 10%, 5% and 1% level, respectively.

b) t-values are shown in parenthesis. Heteroskedasticity-consistent standard deviations.

c) Regressions with time dummies.

d) The p-value for the tests.

From Regressions [2], [3], and [4], we see that the introduction of other growth factors does not alter the expected sign; nor does it change the statistical significance of the domestic savings parameter or of the private flows parameter. In addition, the magnitude of these parameters only presents small variations. The same goes for the parameters associated with a dynamic, non-linear aid-growth relationship. On the other hand, the results for other official flows (share of GDP) and population growth rate are not very stable. Thus, with the exception of OOF and PG, the basic model parameters are robust in that they show little sensitivity to small changes in the basic model specification.[12]

The variables added to the basic model have the intuitive signs. The respective parameters are statistically significant, except for the tax ratio parameter. We could however question the appropriateness of the proxies used for the additional growth factors. For instance, Barro and Lee (2000) argue that the average number of years of education in the total population and other educational measures suggested by these authors have advantages over others commonly used in cross-country studies such as school enrolment ratios and literacy rates. To take another example, there is a battery of alternative trade openness measures that have been employed in the empirical growth literature, with no "best" measure emerging. More reliable measures for the control variables used in my regressions may indeed exist. This is an empirical matter well worth exploring, but doing so is beyond the scope of the present paper.

I have used four tests to evaluate the quality of model specification. As can be seen from the table above (Table 2), the null hypothesis of valid instruments has not been rejected nor has the null hypothesis of no second-order serial correlation in the first-differenced residuals. In addition, I have rejected the null hypothesis of regressor parameters that are simultaneously null, and the null hypothesis of time dummy parameters that are simultaneously null.[13]

As a further check on the reliability of the estimation method chosen and, hence, underlying assumptions, I have replicated the regressions in Table 2 using OLS. The presence of a lagged dependent variable among the regressors is a major drawback when using least squares, because it renders the OLS estimator biased and inconsistent. Even

[12] There is empirical evidence in favour of the conditional convergence hypothesis, when the negative relationship between the growth rate and initial level of real per capita GDP is found after controlling the differences in structural characteristics among countries that generate cross-country differences in long-run income levels. It is useful to note that finding a statistically significant and negative sign on the lagged dependent variable does not corroborate the conditional convergence hypothesis. The lagged dependent variable means lagged growth, not lagged income.

[13] Sargan is a test of over-identifying restrictions, distributed as Chi-Squared (χ^2) under the null hypothesis of instrument validity. In Regression [1], for example, $\chi^2[40] = 38.02$, which is far smaller than the 95 percent critical value of 55.47 (i.e., p-value $= 0.560 >$ significance level $= 0.05$). One can therefore conclude that the null hypothesis of the Sargan test is not rejected.

so, this estimation method proceeds by essentially treating the variables included in the regression as exogenous and the country-specific effects as homogeneous among different individuals. If these assumptions do hold, there should be no substantial differences between the OLS and the GMM results. As shown in Appendix IV, this is not so. Economic growth does not respond to foreign aid in any of the four OLS regressions; the parameters associated with a dynamic, non-linear aid-growth relationship are highly insignificant. The same goes for some of the control variables, namely openness, government spending, financial depth, and literacy growth. One can therefore conclude that both the issue of endogeneity and that of country heterogeneity should be taken into account when evaluating the impact of aid on growth.

The GMM results presented above (Table 2) allow one to calculate the macroeconomic contribution of foreign aid to the economic growth of developing countries, namely its short and long-run effect. The information reported in Table 3 is obtained by using the regression parameters from Table 2 and the mean value of aid for the sample countries. For the short-run results, the mean aid value was computed from aid figures of the last sub-period, whereas for the long-run results it was computed from averages across all sub-periods. As Table 3 indicates, for developing countries as a whole, an increase in the ODA/GDP ratio of one percentage point leads to a per capita growth rate increase of 0.16 percentage points, approximately. However, the total impact on per capita growth of a one percentage point increase in the ODA/GDP ratio oscillates between 0.34 and 0.43 percentage points, depending on the regression.

Table 3. Aid Effectiveness Results

Regression	[2]	[3]	[4]
Short-run impact of aid	0.167	0.164	0.141
Long-run impact of aid	0.337	0.360	0.427

In sum, aid effectiveness results displayed in Table 3 may not be sizeable in terms of magnitude, but they do show that the immediate effect of aid on growth is positive and lower than its long-run effect.

6. NEW GENERATION OF CROSS-COUNTRY REGRESSION STUDIES

The *Assessing Aid* report (World Bank (1998)) explicitly laid the foundations for a move towards selectivity, giving aid to developing countries with a proven track record. The arguments put forward for aid selectivity were based on a number of background papers. The one by Burnside and Dollar (1997), which was later published in the American Economic Review (Burnside and Dollar (2000)), caught researchers' attention and gave new stimulus to the discussion on the effectiveness of aid. In view of that, a

number of cross-country regression studies linking growth to aid have been published since the World Bank's report *Assessing Aid*.

Overall, the new generation of aid-growth econometric studies share a common set of characteristics. First of all, they examine the variation in growth rates between countries within specified time periods by using panel data with sub-period averages. Some studies analyse the aid-growth relationship using both the total sample of developing countries and the sub-sample of lower income countries. Second, the overwhelming majority of studies introduce time dummies in the regressions to correct for the world business cycle. Many authors also use regional dummies, even though some of them prefer to take individual heterogeneity into account by including country specific effects. Third, as is standard in the empirical "new growth" literature, both the initial level of per capita income (which captures the conditional convergence effect) and a number of economic, political, and institutional factors are included in growth regressions. Fourth, a non-linear relationship between aid and growth is taken into account by using quadratic terms and/or interaction terms. The squared aid term allows for diminishing returns to aid. The interaction term between aid and a given variable addresses the hypothesis that aid effectiveness is conditional on that variable. Finally, most growth regression studies assume that foreign aid is an endogenous variable and only a few consider the possible endogeneity of other explanatory variables.

The new empirical work on aid effectiveness presents evidence on the relationship between foreign aid and economic growth that should make one trust in aid as a growth-enhancing factor. Indeed, a fair conclusion from the recent empirical evidence on aid and growth is that foreign aid appears to promote economic growth, but it's impact differs across countries depending on the conditions they face. Aid appears to be more effective in the following circumstances: post conflict situations (Collier and Hoeffler (2002)); structurally vulnerable countries, including those undergoing trade shocks (Collier and Dehn (2001); Guillaumont and Chauvet (2001); Chauvet and Guillaumont (2002)); countries outside the tropical areas (Dalgaard *et al.* (2002)); politically stable regimes (Chauvet and Guillaumont (2002)); and democratic countries (Svensson (1999)). Moreover, aid also seems to be subject to diminishing returns, as the squared aid term is found consistently negative in a "new growth" framework (e.g., Hadjimichael *et al.* (1995); Hansen and Tarp (2000, 2001); Dalgaard and Hansen (2001); Hudson and Mosley (2001); Collier and Dollar (2002); Collier and Hoeffler (2002); Dalgaard *et al.* (2002)).

There is a controversy as to whether the beneficial impact of aid on growth is dependent on good policies being in place or if it takes place irrespective of policy. The former is put forward by Burnside and Dollar (1997, 2000) and later supported by Collier and Dehn (2001), Chauvet and Guillaumont (2002), Collier and Dollar (2002), and Collier and Hoeffler (2002). The latter is advanced by a set of studies that demonstrate the sensitivity of the Burnside and Dollar's key result to variations in sample (including selection of outliers), model specification (regressors and instruments), policy index and estimation method (e.g., Hansen and Tarp (2000, 2001); Dalgaard and

Hansen (2001); Guillaumont and Chauvet (2001); Hudson and Mosley (2001); Lensink and White (2001); Lu and Ram (2001)). Nevertheless, the fact that policies do or at least potentially matter concerning the effectiveness of aid appears undisputed.

7. CONCLUSION

This paper has sought to evaluate the macroeconomic impact of foreign aid on the economic growth of developing countries. Cross-country growth regressions carried out until the mid-nineties were at the core of the analysis. In an attempt to achieve greater accuracy and improve upon existing procedures, which were viewed as possible causes of the ambiguous macro results underlying the "micro-macro paradox", I have proposed a methodological and econometric procedure that differs from the most prevalent one used in the literature. I have done this while using two expanded versions of the well-known reduced form Papanek-type regression, in which aid's contribution to growth is assumed to be roughly the same for all developing countries. The results achieved are in line with the micro results, and the common macro result from cross-country regression studies published in the last few years, i.e., foreign aid is beneficial to the economic growth of developing countries. Given this, one may then state that the method rather than the theoretical basis is the main problem inherent in the assessments being carried out up to the mid-nineties. Moreover, there is empirical evidence to assert that the "micro-macro paradox" should be given less importance as an overall appraisal of the effectiveness of foreign aid. It should be stressed, however, that the new generation of cross-country regression studies have gone beyond earlier work (including the present one) to address the conditions that must be place for aid to be (more) effective.

The present empirical results also suggest that non-linearity (negative effects of high aid inflows) and time lags in the aid-growth relationship, country heterogeneity, and endogeneity of foreign aid should be factored in when assessing the impact of foreign aid on the economic growth of developing countries. The recent cross-country studies on aid effectiveness do employ econometric tools to account for at least, one of these factors. However, the squared aid term is mainly to find evidence for decreasing returns to aid rather than a fixed capacity constraint (a threshold) and, even more importantly, the issue of time lags between aid-financed activities and their eventual impact on growth has been neglected.

The empirical study described in the present paper shows that the immediate and overall impact of aid on growth differ in terms of magnitude. This provides support to assert that the time lags in the aid-growth relationship should not be ignored. Nonetheless, the issue of time lags in the aid-growth relationship remains a Gordian knot in the empirical cross-country work on aid effectiveness. Indeed, the required lag structure will change according to the recipient country and the type of aid allocated. Programme aid is expected to have a more rapid impact than project aid and this, in turn,

is expected to have a more rapid impact than technical cooperation aimed at raising the level of human skills. This suggests that future research should focus on in-depth, country-specific, case studies.

APPENDIX I. List of Cross-Country Regression Studies Reviewed in Section 3

Ahmed, N. (1971), "A Note on the Haavelmo Hypothesis," *Review of Economics and Statistics*, 53, 413-414.

Areskoug, K. (1969), *External Public Borrowing: Its Role in Economic Development*, New York: Praeger Publishers.

Bornschier, V., C. Chase-Dunn, and R. Rubinson (1978), "Cross-National Evidence of the Effects of Foreign Investment and Aid on Economic Growth and Inequality: A Survey of Findings and a Reanalysis," *American Journal of Sociology*, 84, 651-683.

Dowling, J.M., and U. Hiemenz (1982), "Aid, Savings and Growth in the Asian Region," Asian Development Bank Economic Office Report Series No. 3.

Durbarry, R., N. Gemmell, and D. Greenaway (1998), "New Evidence on the Impact of Foreign Aid and Economic Growth," Centre for Research in Economic Development and International Trade Research Paper No. 98/8.

Feyzioglu, T., V. Swaroop, and M. Zhu (1998), "A Panel Data Analysis of the Fungibility of Foreign Aid," *World Bank Economic Review*, 12, 29-58.

Griffin, K.B. (1970), "Foreign Capital, Domestic Savings and Economic Development," *Bulletin of the Oxford University Institute of Economics and Statistics*, 32, 99-112.

Griffin, K.B., and J.L. Enos (1970), "Foreign Assistance: Objectives and Consequences," *Economic Development and Cultural Change*, 18, 313-327.

Gupta, K.L. (1970), "Foreign Capital and Domestic Savings: A Test of Haavelmo's Hypothesis with Cross-Country Data: A Comment," *Review of Economics and Statistics*, 52, 214-216.

_____ (1975), "Foreign Capital Inflows, Dependency Burden, and Savings Rates in Developing Countries: A Simultaneous Equation Model," *Kyklos*, 28, 358-374.

Gupta, K.L., and M.A. Islam (1983), *Foreign Capital, Savings and Growth: An International Cross-Section Study*, Dordrecht: D. Reidel Publishing Company.

Haveli, N. (1976), "The Effects on Investment and Consumption of Import Surpluses of Developing Countries," *Economic Journal*, 86, 853-858.

Heller, P.S. (1975), "A Model of Public Fiscal Behavior in Developing Countries: Aid, Investment, and Taxation," *American Economic Review*, 65, 429-445.

Khan, H.A., and E. Hoshino (1992), "Impact of Foreign Aid on the Fiscal Behavior of LDC Governments," *World Development*, 20, 1481-1488.

Levy, V. (1987), "Does Concessionary Aid Lead to Higher Investment Rates in Low-Income Countries?" *Review of Economics and Statistics*, 69, 152-156.

_____ (1988), "Aid and Growth in Sub-Saharan Africa: The Recent Experience," *European Economic Review*, 32, 1777-1795.

Massell, B.F., S.R. Pearson, and J.B. Fitch (1972), "Foreign Exchange and Economic Development: An Empirical Study of Selected Latin American Countries," *Review of Economics and Statistics*, 54, 208-212.

Mosley, P., J. Hudson, and S. Horrell (1987), "Aid, the Public Sector and the Market in Less Developed Countries," *Economic Journal*, 97, 616-641.

_____ (1992), "Aid, the Public Sector and the Market in Less Developed Countries: A Return to the Scene of the Crime," *Journal of International Development*, 4, 139-150.

Over, A.M. (1975), "An Example of the Simultaneous-Equation Problem: A Note on Foreign Assistance: Objectives and Consequences," *Economic Development and Cultural Change*, 23, 751-756.

Papanek, G.F. (1973), "Aid, Foreign Private Investment, Savings, and Growth in Less Developed Countries," *Journal of Political Economy*, 81, 120-130.

Rahman, A. (1968), "Foreign Capital and Domestic Savings: A Test of Haavelmo's Hypothesis with Cross-Country Data," *Review of Economics and Statistics*, 50, 137-138.

Singh, R.D. (1985), "State Intervention, Foreign Economic Aid, Savings, Growth in LDCs: Some Recent Evidence," *Kyklos*, 38, 216-232.

Snyder, D.W. (1990), "Foreign Aid and Domestic Savings: A Spurious Correlation?" *Economic Development and Cultural Change*, 39, 175-181.

_____ (1993), "Donor Bias Towards Small Countries: An Overlooked Factor in the Analysis of Foreign Aid and Economic Growth," *Applied Economics*, 25, 481-488.

Stoneman, C. (1975), "Foreign Capital and Economic Growth," *World Development*, 3, 11-26.

Voivodas, C.S. (1973), "Exports, Foreign Capital Inflow and Economic Growth," *Journal of International Economics*, 3, 337-349.

Weisskopf, T.E. (1972), "The Impact of Foreign Capital Inflow on Domestic Savings in Underdeveloped Countries," *Journal of International Economics*, 2, 25-38.

White, H. (1992), "What Do We Know About Aid's Macroeconomic Impact? An Overview of the Aid Effectiveness Debate," *Journal of International Development*, 4, 121-137.

APPENDIX III. List of Variables and Sources

Variable name	Description	Source
Per capita GDP	Growth rate of real per capita GDP	World Bank (2001)
Domestic savings	Gross domestic savings (share of GDP)	World Bank (2001)
Foreign aid	Net official development assistance(share of GDP)	OECD-DAC (1999, 2000) World Bank (2001)
Private flows	Net private capital flows (share of GDP)	World Bank (2001)
Other official flows	Net other official flows (share of GDP)	OECD-DAC (1999, 2000) World Bank (2001)
Population growth	Population growth rate	World Bank (2001)
Openness	Exports plus imports (share of GDP)	World Bank (2001)
Government spending	Total government expenditure (share of GDP)	World Bank (2001)
Financial depth	M2 (share of GDP)	World Bank (2001)
Tax ratio	Central government tax revenues (share of GDP)	World Bank (2001)
Export growth	Exports growth rate	World Bank (2001)
Literacy growth	Growth in adult literacy rate	World Bank (2001)

APPENDIX IV. Growth Regressions Using Panel Data with Regional Dummies

Dependent variable	Growth rate of real per capita GDP			
Sample / Period	48 countries / 1970-74, 75-79, 80-84, 85-89, 90-94, and 95-98			
Estimation method	OLS (Ordinary Least Squares)			
Regression	[5]	[6]	[7]	[8]
Lagged dependent variable	0.238***	0.242***	0.276***	0.148**
	(3.48)	(2.79)	(3.20)	(2.31)
Domestic savings	0.047**	0.073**	0.052*	0.036**
	(2.50)	(2.30)	(1.73)	(2.13)
Foreign aid	-0.094	-0.062	-0.055	-0.049
	(-0.96)	(-0.43)	(-0.41)	(-0.54)
Foreign aid (first differences)	0.017	0.041	0.032	-0.012
	(0.11)	(0.18)	(0.15)	(-0.08)
Square of foreign aid	0.005	0.004	0.003	0.002
	(1.53)	(0.48)	(0.47)	(0.81)
Square of foreign aid (first differences)	-0.004	-0.003	-0.003	-0.002
	(-0.84)	(-0.33)	(-0.31)	(-0.46)
Private flows	0.138**	0.171**	0.132*	0.082
	(2.18)	(2.23)	(1.75)	(1.47)
Other official flows	-0.087	-0.256	-0.438	-0.040
	(-0.47)	(-0.94)	(-1.63)	(-0.24)
Population growth (lagged)	-0.863***	-0.784**	-0.610*	-0.657**
	(-3.18)	(-2.48)	(-1.95)	(-2.56)
Openness		0.012		
		(1.31)		
Government spending		-0.030		
		(-1.00)		
Financial depth			-0.001	
			(-0.08)	
Tax ratio			0.072*	
			(1.83)	
Export growth				0.216***
				(8.01)
Literacy growth				-0.404
				(-1.56)
Number of observations	224	182	182	210

Notes: a) *, ** and *** indicate that the estimated parameter is statistically significant at the 10%, 5% and 1% level, respectively.

b) t-values are shown in parenthesis. Heteroskedasticity-consistent standard deviations.

c) Regressions with time dummies and regional dummies for Sub-Saharan Africa, East Asia and Latin America.

REFERENCES

Arellano, M., and S. Bond (1991), "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies*, 58, 277-297.

Bacha, E.L. (1990), "A Three-Gap Model of Foreign Transfers and the GDP Growth Rate in Developing Countries," *Journal of Development Economics*, 32, 279-296.

Barro, R.J., and J.W. Lee (2000), "International Data on Educational Attainment: Updates and Implications," Center for International Development Working Paper No. 42.

Burnside, C., and D. Dollar (1997), "Aid, Policies, and Growth," World Bank Policy Research Working Paper No. 1777.

_____ (2000), "Aid, Policies, and Growth," *American Economic Review*, 90, 847-868.

Chauvet, L., and P. Guillaumont (2002), "Aid and Growth Revisited: Policy, Economic Vulnerability and Political Instability," Paper presented at the Annual Bank Conference on Development Economics: Towards Pro-poor Policies, June 24-26, Oslo.

Chenery, H.B., and A.M. Strout (1966), "Foreign Assistance and Economic Development," *American Economic Review*, 56, 679-733.

_____ (1979), "Foreign Assistance and Economic Development," in *Structural Change and Development Policy*, ed. by H.B. Chenery HB, New York: Oxford University Press, 382-455.

Collier, P., and J. Dehn (2001), "Aid, Shocks, and Growth," World Bank Policy Research Working Paper No. 2688.

Collier, P., and D. Dollar (2002), "Aid Allocation and Poverty Reduction," *European Economic Review*, 46,1475-1500.

Collie, P., and A. Hoeffler (2002), "Aid, Policy, and Growth in Post-Conflict Societies," World Bank Policy Research Working Paper No. 2902.

Dalgaard, C.J., and H. Hansen (2001), "On Aid, Growth and Good Policies," *Journal of Development Studies*, 37, 17-41.

Dalgaard, C.J., H. Hansen, and F. Tarp (2002), "On the Empirics of Foreign Aid and Growth," Centre for Research in Economic Development and International Trade Research Paper No. 02/08.

Dowling, J.M., and U. Hiemenz (1982), "Aid, Savings and Growth in the Asian Region," Asian Development Bank Economic Office Report Series No. 3.

Durbarry, R., N. Gemmell, and D. Greenaway (1998), "New Evidence on the Impact of Foreign Aid and Economic Growth," Centre for Research in Economic Development and International Trade Research Paper No. 98/8.

Guillaumont, P., and L. Chauvet (2001), "Aid and Performance: A Reassessment," *Journal of Development Studies*, 37, 66-92.

Hadjimichael, M.T., D. Ghura, M. Mühleisen, R. Nord, and E.M. Uçer (1995), "Sub-Saharan Africa: Growth, Savings, and Investment, 1986-93," International

Monetary Fund Occasional Paper No. 118.

Hansen, H., and F. Tarp (2000), "Aid Effectiveness Disputed," in *Foreign Aid and Development: Lessons Learnt and Directions for the Future*, eds. by F. Tarp, and P. Hjertholm, London: Routledge, 103-128. Also published in *Journal of International Development*, 12, 375-398.

_____ (2001), "Aid and Growth Regressions," *Journal of Development Economics*, 64, 547-570.

Hansen, H., F. Tarp, and S. Vikkelso (1998), "Aid Effectiveness: A Survey of 30 Years of Literature on Aid-Savings, Aid-Investment, and Aid-Growth Linkages," Development Economics Research Group.

Hudson, J., and P. Mosley (1994), "Aid, Policy Reform and Endogenous Growth in Less Developed Countries," University of Reading Discussion Paper No. 13.

_____ (2001), "Aid, Policies and Growth: In Search of the Holy Grail," *Journal of International Development*, 13, 1023-1038.

Lensink, R., and H. White (2001), "Are There Negative Returns to Aid?" *Journal of Development Studies*, 37, 42-65.

Lu, S., and R. Ram (2001), "Foreign Aid, Government Policies and Economic Growth: Further Evidence from Cross-country Panel Data for 1970 to 1993," *International Economics*, 54, 15-29.

Moreira, S.B. (2002), "Ajuda Pública ao Desenvolvimento e Crescimento Económico: Estudos Cross-Country da Relação Ajuda-Crescimento," Masters Dissertation, Technical University of Lisbon.

Mosley, P. (1986), "Aid Effectiveness: The Micro-Macro Paradox," *IDS Bulletin*, 17, 22-27.

Mosley, P., and J. Hudson (1995), "Aid Effectiveness: A Study of the Effectiveness of Overseas Aid in the Main Countries Receiving ODA Assistance," University of Reading and University of Bath.

Mosley, P., J. Hudson, and S. Horrell (1987), "Aid, the Public Sector and the Market in Less Developed Countries," *Economic Journal*, 97, 616-641.

_____ (1992), "Aid, the Public Sector and the Market in Less Developed Countries: A Return to the Scene of the Crime," *Journal of International Development*, 4, 139-150.

OECD-DAC (1999), *Geographical Distribution of Financial Flows to Aid Recipients, Disbursements, Commitments, Country Indicators 1960-1997*, CD-ROM, Paris: Organisation for Economic Co-operation and Development.

_____ (2000), *Geographical Distribution of Financial Flows to Aid Recipients, Disbursements, Commitments, Country Indicators 1994-1998*, Paris: Organisation for Economic Co-operation and Development.

Papanek, G.F. (1973), "Aid, Foreign Private Investment, Savings, and Growth in Less Developed Countries," *Journal of Political Economy*, 81, 120-130.

Svensson, J. (1999), "Aid, Growth and Democracy," *Economics and Politics*, 11, 275-297.

White, H. (1992), "The Macroeconomic Impact of Development Aid: A Critical Survey," *The Journal of Development Studies*, 28, 163-240.

World Bank (1998), *Assessing Aid: What Works, What Doesn't, and Why*, New York: Oxford University Press.

_____ (2001), *The 2001 World Development Indicators*, CD-ROM, version 4.2, Washington, D.C.: Development Data Group.

Mailing Address: Dra. Sandrina Berthault Moreira Escola Superior de Ciências Empresariais Instituto Politécnico de Setúbal Campus do IPS - Estefanilha 2914 - 503 Setúbal, Portugal. Tel: +351 265 709 437, Fax: +351 265 709 314. E-mail: smoreira@esce.ips.pt, sbmoreira@mail.telepac.pt

Manuscript received October, 2004; final revision received February, 2005.

APPENDIX II. Sample Countries According to Income Group and Geographical Region Summary Statistics and the Correlation Matrix

Sample of countries classified by:	
Income group	**48 countries**
Low income countries (17 countries)	Bangladesh, Cameroon, Congo Democratic Republic, Ghana, India, Indonesia, Kenya, Lesotho, Liberia, Malawi, Nepal, Nicaragua, Pakistan, Senegal, Sierra Leone, Zambia and Zimbabwe.
Lower middle income countries (20 countries)	Bolivia, China, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt, Fiji, Guyana, Jordan, Papua New Guinea, Paraguay, Peru, Philippines, Sri Lanka, Swaziland, Syrian, Thailand, Tunisia and Turkey.
Upper middle countries (11 countries)	Argentina, Botswana, Brazil, Chile, Malaysia, Mauritius, Mexico, Panama, South Korea, Uruguay and Venezuela.
Geographical region	**48 countries**
Latin America and Caribbean (16 countries)	Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Guyana, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela.
Middle East and North Africa (4 countries)	Egypt, Jordan, Syrian and Tunisia.
Sub-Saharan Africa (14 countries)	Botswana, Cameroon, Congo Democratic Republic, Ghana, Kenya, Lesotho, Liberia, Malawi, Mauritius, Senegal, Sierra Leone, Swaziland, Zambia and Zimbabwe.
Asia, Europe and Pacific (14 countries)	Bangladesh, China, Fiji, India, Indonesia, Malaysia, Nepal, Pakistan, Papua New Guinea, Philippines, South Korea, Sri Lanka, Thailand and Turkey.

Series in levels	PCG	S	ODA	DODA	PF	OOF	PG	X&M	G	M2	T	XG	LG
Summary statistics (No. of observations)	(282)	(277)	(283)	(235)	(280)	(277)	(288)	(279)	(199)	(274)	(199)	(262)	(235)
Mean	1.80	17.10	4.93	0.26	2.60	0.66	2.32	62.30	22.93	31.07	15.98	6.42	1.33
Standard deviation	3.28	13.75	6.31	3.65	3.14	1.04	0.76	37.01	9.82	18.31	6.23	7.04	1.09
Minimum	-11.48	-68.08	0.07	-11.92	-2.75	-2.84	0.15	5.71	0.00	6.71	0.00	-15.25	-0.89
Maximum	15.81	49.19	34.89	25.85	30.42	9.36	5.69	231.97	76.28	116.51	38.53	37.32	6.97
Correlation matrix (*)													
Per capita GDP (growth; %): PCG	1.00												
Domestic savings (% GDP): S	0.31	1.00											
Foreign aid (% GDP): ODA	-0.17	-0.57	1.00										
Foreign aid (first differences; % GDP): DODA	-0.28	-0.16	0.18	1.00									
Private flows (% GDP): PF	0.27	0.30	-0.22	-0.25	1.00								
Other official flows (% GDP): OOF	-0.12	-0.01	0.15	0.12	0.12	1.00							
Population (growth; %): PG	-0.21	-0.23	0.40	0.14	-0.14	0.11	1.00						
Openness (% GDP): X&M	0.04	0.06	0.41	-0.17	0.25	0.16	0.07	1.00					
Government spending (% GDP): G	-0.03	-0.08	0.39	-0.09	0.11	0.23	0.07	0.62	1.00				
Financial depth (% GDP): M2	0.24	0.13	0.02	-0.23	0.17	0.05	-0.20	0.45	0.47	1.00			
Tax ratio (% GDP): T	0.10	0.10	0.15	-0.13	0.21	0.21	-0.05	0.67	0.84	0.45	1.00		
Exports (growth; %): XG	0.55	0.14	-0.18	-0.10	0.16	-0.11	-0.13	-0.09	-0.19	0.06	-0.06	1.00	
Literacy (growth; %): LG	-0.08	-0.26	0.49	0.05	-0.27	0.12	0.59	-0.09	0.11	-0.13	-0.08	-0.12	1.00

* Spearman correlations; cases with missing values for one or both of a pair of variables for a given correlation coefficient were excluded from the analysis.