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Modelling Inter-temporal Aid Allocation

by

Simon Feeny and Mark McGillivray

Centre for Research in Economic Development and International Trade, University of Nottingham

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Abstract
This paper models the inter-temporal allocation of bilateral foreign development aid to developing countries. A formal theoretical framework is developed, in which aid is treated as a private good of the donor country bureaucratic group responsible for bilateral aid allocation. This model is applied to data for 10 principal recipients of bilateral official development assistance over the period 1968 to 1999. A feature of this application is that it caters for the joint determination of aid allocations to individual recipient countries. Results indicate that both recipient need and donor interest variables determine the amount of foreign aid to developing countries. These results differ from many of those previously reported, which reject recipient need as a determinant of aid allocation.

Outline

1 Introduction
2. Theoretical Model of Aid Allocation
3. Econometric Application
4. Results and Interpretations
5. Conclusion

1. Introduction

The real value of bilateral foreign development aid from members of the OECD's Development Assistance Committee (DAC) fell from US$45.4 billion in 1991 to US$37.2 billion in 1999 (OECD, 2000).[1] This 18 per cent reduction is a matter of great concern given that aid remains an important source of financing for a large number of developing countries, especially those which are unable to rely on often volatile private capital flows. Such a reduction is of even greater concern on the grounds that the most recent evidence suggests that aid has been effective in increasing economic growth in recipient countries. The well-cited World Bank (1998) study *Assessing Aid* finds that aid works in a good policy environment while other studies conclude that aid works irrespective of this environment (Hansen and Tarp, 2000, 2001, and Dalgaard and Hansen, 2001). Moreover, growth is widely regarded as the main driver in poverty reduction and foreign aid is likely to play an important role in achieving the International Development Goals set by the DAC in 1996 and the UN's Millennium Development Goals set in September 2000. Not only is the amount of ODA important but so is its distribution. To reach these goals, which include a halving of world poverty, it is imperative that donors in the allocation of aid react to changes in the developmental requirements of recipients and not only to political and other non-developmental criteria. This paper examines the allocation of aid over time.

There exists a reasonably large literature seeking to explain the amounts of aid allocated to developing countries. An issue of central concern is the extent to which humanitarian criteria influence the allocation of aid to and among countries. The general position is that if donors are motivated by these criteria they will allocate aid among countries in accordance with their relative needs. Most studies reject recipient need as a determinant of aid allocation. McKinlay and Little (1979, p. 243), for example, concluded that there are "no grounds for asserting that humanitarian criteria have any significant direct influence" on aid allocation. Similarly, Maizels and Nissanke (1984, p.891) concluded that "bilateral aid allocations are made ... solely ... in support of donors' perceived foreign economic, political and security interests" and not, therefore, on the basis of relative need.

The aid allocation literature has been dominated by the analysis of cross-section data, and hence conclusions relate to whether aid is sensitive to the needs or developmental requirements of recipient countries at a particular point in time. These conclusions are important, but so too is information on whether aid is sensitive to the needs of individual

developing countries over time. This is the specific issue to which this paper turns. It proposes a theoretical model of aid allocation which is subsequently applied to DAC bilateral inter-temporal aid flows for the period 1968 to 1999. The application of this model addresses and corrects a weakness of the very limited number of previous time series analyses of aid allocation: the assumption that aid flows to any given country are determined independently of those to other countries. Aid flows among countries are jointly determined and the econometric method of this paper allows for this fact. Results obtained from this paper's econometric analysis differ markedly from those reported by most previous studies, in that aid and recipient need are significantly related.

The remainder of this paper is as follows. Section II outlines a theoretical model of aid allocation. Section III discusses the econometric procedure and data used in this paper. Section IV presents and interprets the results and Section V concludes.

2. Theoretical Model of Aid Allocation

The literature on aid allocation is dominated by purely empirical studies, especially those which estimate "recipient need" and "donor interest" models of aid allocation. The most influential studies, arguably, are McKinlay and Little (1977, 1978a, 1978b, 1979) and Maizels and Nissanke (1984). A number of relatively recent studies provide a formal theoretical model of aid allocation, including Trumball and Wall (1994), Wall (1995), Tarp *et al.* (1999) and Lahiri and Raimondos-Møller (2000). These more recent studies employ variants of the model originally proposed by Dudley and Montmarquette (1976), in which aid decisions of donors are motivated by a subjectively measured developmental impact of aid on recipient countries. The model developed in this paper, an extension of that of Dudley and Montmarquette, not only makes this link explicit but focuses on the behaviour of those actually responsible for allocating bilateral aid among developing countries - bureaucrats within the donor aid agency. Aid allocations are the outcomes of the decisions of this group; it is these decisions that aid models seek to explain.

Bilateral aid allocation is a complex task. Donor policy statements, especially those of the larger donors, have tended to emphasise humanitarian, commercial and political, diplomatic or strategic objectives.[2] These objectives can even be referred to in such statements as mandates. The humanitarian objective is given most emphasis. Its pursuit involves

promoting the developmental impact of aid in general and in allocating aid either favouring those countries in greatest need or those which can best or most efficiently achieve development outcomes. The other objectives relate to pure donor self-interests. Pursuit of the commercial objective is typically thought to involve the promotion of donor trade or investment opportunities, through *inter alia* allocating most aid to countries which already, or have the capacity to, absorb relatively large amounts of these flows. Pursuit of the political, diplomatic or strategic objectives involves the creation or maintenance of an international environment which favours the donor. This can involve allocating aid to countries which are in a strategic geographic location or which have particularly close diplomatic ties with the donor. It can even involve rewarding countries for particular actions with increased aid, or punishing others with reduced or continually low or zero levels of aid.

The bilateral aid allocation decision makers of the donor aid agency are required to take into account and weigh-up these often competing mandates or objectives for aid. Their basic task is to ensure that aid allocations are as consistent with these objectives as possible. But these decision makers will have their own bureaucratic objectives, including the aversion of conflict with their counterparts in other bureaucratic agencies both in the donor and recipient countries and seeking to allocate aid in a reasonably expedient manner.

It is assumed that the donor's bilateral aid decision making group, responsible for allocating aid among recipient countries, has a well-behaved, homothetic preference map and behaves as if it was a single individual.[3] A representative utility function of this group may therefore be written as:

$$U = f(CN) \tag{1}$$

where CN is the subjectively measured concordance of the bilateral aid program to the various mandates to which it is subject. This variable is treated as a private good of the decision makers under consideration.[4] CN is defined more precisely as the sum of the concordances

from allocating aid to or among m recipient countries, as follows:

$$CN = \sum_{j=1}^{m} CN_j = \sum_{j=1}^{m} CN\left(A_j, RN_j^e, DI_j^e, B_j^e\right) \quad (2)$$

where CN_j is the subjectively measured mandate concordance achieved from bilateral aid to recipient j, A_j is the absolute amount of bilateral aid from the donor under consideration to j, RN_j^e is the expected recipient developmental need for aid of j, DI_j^e is the expected level of the donor's self-interests in j and B_j^e is the expected bureaucratic expediency associated with allocating aid to this recipient. RN_j^e, DI_j^e B_j^e are each vectors of variables. All variables are for period t. Donor self-interests relate to commercial, political, diplomatic and strategic considerations.

Donor decision-makers typically believe strongly that the aid they administer is of benefit developmentally to recipients. Utility therefore increases unambiguously with the amount of aid allocated to country j. It is agreed reasonably widely in donor circles that need is greater in countries with low levels of development and large populations, and that donors should respond positively to this need, irrespective of how well the recipient might use the aid provided. However, in some circles it is agreed that aid should be given to those countries which can use it best in terms of development outcomes, and these countries tend not to be the poorest and largest. Often they are countries with small populations and middle level incomes.[5] It follows from comments made above that decision maker utility will also increase unambiguously with the donor self-interests in country j and the extent to which giving aid to this country is bureaucratically expedient. It therefore follows that:

$$\frac{\partial CN}{\partial A_j} > 0, \quad \frac{\partial CN}{\partial RN_j^e} \gtrless 0, \quad \frac{\partial CN}{\partial DI_j^e} > 0 \quad \text{and} \quad \frac{\partial CN}{\partial B_j^e} > 0.$$

Let the concordance function (2) for a single recipient be re-written as:

$$CN_j = DI_j^{e^{\alpha}} B_j^{e^{\pi}} \left(\frac{A_j}{RN_j^e} \right)^{\delta} \qquad \begin{matrix} 0 \le \alpha \le 1 \\ 0 \le \delta \le 1 \\ 0 \le \pi \le 1 \end{matrix} \tag{3}$$

The task of the donor decision makers is to maximise the sum of the individual concordances subject to a budgetary constraint. The donor agency faces the following overall constraint:

$$TA = BI + M + OA + C \tag{4}$$

where TA is the total aid budget, BI is the total bilateral aid program, M is the total multilateral program (that is, the sum of funds allocated to developing countries via multilateral agencies), OA is the total of funds allocated to developing countries via other programs (such as regional-wide, humanitarian, refugee and other such assistance) and C is administrative costs not allocated to individual programs. It is assumed *ex ante* that each of the variables on the right-hand side of (4), like TA, are pre-determined, as is overwhelmingly the case in practice. Specifically, each of these variables are fixed shares of TA and there is no substitution between them. It follows that (3) is maximised subject to:

$$BI = \sum_{j=1}^{m} A_j. \tag{5}$$

The Lagrangian can therefore be written as:

$$\max \mathcal{L}_j = \sum_{j=1}^{m} DI_j^{e^{\alpha}} B_j^{e^{\pi}} \left(\frac{A_j}{RN_j^e} \right)^{\delta} + \lambda \left(BI - \sum_{j=1}^{m} A_j \right) \tag{6}$$

The first-order conditions are:

$$\frac{\partial \mathcal{L}}{\partial A_j} = \delta DI_j^{e^{\alpha}} B_j^{e^{\pi}} A_j^{e^{\delta-1}} RN_j^{e^{-\delta}} - \lambda = 0, \qquad \text{and} \tag{7}$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = BI - \sum_{j=1}^{m} A_j. \tag{8}$$

From (7) it follows that:

$$\lambda = \delta DI_j^{e^{\alpha}} B_j^{e^{\pi}} A_j^{e^{\delta-1}} RN_j^{e^{-\delta}} \tag{9}$$

Solving (9) for A_j yields:

$$A_j = \left(\frac{\delta DI_j^{e^{\alpha}} B_j^{e^{\pi}} RN_j^{e^{-\delta}}}{\lambda} \right)^{\frac{1}{1-\delta}} \tag{10}$$

Taking the logarithms of both sides of (10) and adding an error term yields the following estimating equation:

$$\ln A_j = \beta_0 + \beta_1' \ln RN_j^e + \beta_2' \ln DI_j^e + \beta_3' \ln B_j^e + \mu_j \tag{11}$$

where

$$\beta_0 = \frac{\ln(\delta/\lambda)}{1-\delta}, \qquad \beta_1 = \frac{-\delta}{1-\delta},$$
$$\beta_2 = \frac{\alpha}{1-\delta} \qquad \text{and} \qquad \beta_3 = \frac{\pi}{1-\delta}.$$

Three comments on the model are warranted. The first concerns the use of expected values of recipient need, donor interest and bureaucratic variables. The allocation of aid is subject to informational time lags. Allocations for any given year are determined by donors towards the end of the preceding year. Decision makers can only base these decisions on

currently-available information, and in the case of most variables, especially those relating to need, this information will at best be for the year prior to that for which the aid is allocated. Decision makers can simply base their decisions on this information, or for variables which change over time use this information to form expectations for the year for which the aid is allocated. It is assumed that they do the latter, employing a naive expectations framework.[6] While such an approach is crude it is institutionally realistic, as most observers of the activities of aid agencies would probably agree. RN_j^e, DI_j^e and B_j^e are therefore defined as follows:

$$\ln RN_j^e = \gamma_0 + \gamma_1' \ln RN_{j,t-i} \tag{12}$$

$$\ln DI_j^e = \theta_0 + \theta_1' \ln DI_{j,t-i} \quad \text{and} \tag{13}$$

$$\ln B_j^e = \Phi_0 + \Phi_1' \ln B_{j,t-i} \tag{14}$$

where $i \geq 1$.

The second comment relates to the endogeneity or exogeneity of the vectors RN_j^e, DI_j^e and B_j^e. The model given above treats them as exogenous. While decision makers might in practice believe that aid impacts on many of the elements of these vectors, especially those relating to need, there is no evidence to suggest that they contemporaneously adjust aid on the basis of this relationship. Indeed, evidence, albeit anecdotal, suggests that they do not make such adjustments, on the grounds that they are simply too complicated or difficult to implement.

The third comment relates to the specification of the aid variable A_j in absolute terms, rather than per head of recipient population (per capita). This has been an issue of some contention in the literature on aid allocation, with most studies focussing on per capita aid. The prime purpose of a model of aid allocation is to explain observed aid allocations; as such the specification or measurement of the aid variable must ultimately rest on the most likely decision variable used in practice by donor agencies. Anecdotal evidence suggests that this variable is aid expressed in absolute amounts. That is, aid administrators rarely speak of per capita aid, and their agencies rarely, if ever, report aid in per capita terms: the focus is on absolute aid.[7] Perhaps more compelling are the constraint equations (4) and (5). Like *M*, *OA* and *C*, *BI* is determined prior to the determination of allocations to individual recipients: it is the amount set aside for allocations of bilateral aid to individual countries. Bilateral aid

decision makers might initially consider aid in per capita terms, but they would have to multiply these allocations by recipient country populations to ensure the bilateral programs budget is fully allocated.[8] But this reduces mathematically to a decision on absolute aid amounts. If the aid decision makers were not conscious of this, they would have to continually adjust absolute allocations to ensure the corresponding per capita amounts resulted in a fully allocated bilateral program budget. Effectively what this becomes is a situation in which absolute aid allocations are adjusted on the basis of population, but with these allocations rather than per capita aid being the decision variable. This is recognised more fully below with the specification of recipient population as an element of the vector $RN_{j,t-i}$.

3. Econometric Application and Data

While the literature on aid allocation has been dominated by purely empirical studies, these studies have in turn been dominated by analyses of cross-section data. The relatively few time series studies include Gang and Khan (1990), Gounder (1999) and Gounder and Sen (1999), which have looked at the cases of India, Papua New Guinea and Indonesia, respectively. These studies have assumed implicitly, through the nature of their econometric analyses, that aid allocations to each recipient country are determined independently of such flows to all other countries.

Such an assumption is at best brave and at worst highly dubious. Aid flows are allocated from a predetermined, fixed pool of total funds, as equation (5) above makes clear. It follows that aid allocations among *j* recipients, in any one year, are jointly determined. Increasing aid to one country must result in a decrease in aid to at least one other. Moreover, as donor agencies typically want to spend the entirety of their budgets, decreasing aid to one country results in an increase in aid to another. It further follows that an equation describing aid to any one recipient belongs to a simultaneous system of equations with correlated error terms.[9] The error term for any one equation will not therefore have an expected value of zero, which is what previous time series studies have assumed, and the relevant equation or equations must be estimated using a procedure which allows for this. Failure to do this results in inefficient estimates of the beta coefficients (that is, they will not exhibit minimum variance) and the corresponding *t* ratios are drawn into question. The practical consequence of this is the possibility of erroneously not rejecting null hypotheses relating to these coefficients. Given

that the elements of equation (11) are treated as exogenous an appropriate procedure is Zellner's Seemingly Unrelated Regressions (SUR) in which a system of equations is estimated simultaneously and the error terms of each equation are transformed so that they have the same variance and are uncorrelated.

Equation (11) therefore belongs to a system of equations which can be written as follows:

$$
\begin{aligned}
\ln A_{j,t} &= \beta_{0,j} + \beta_{1,j}\left(\gamma_{0,j} + \gamma_1'\right)\ln RN_{j,t-i} + \beta_{2,j}\left(\theta_{0,j} + \theta_{1,j}'\right)\ln DI_{j,t-i} \\
&\quad + \beta_{3,j}\left(\Phi_{0,j} + \Phi_{1,j}'\right)\ln B_{j,t-i} + \mu_{j,t} \\
\ln A_{k,t} &= \beta_{0,k} + \beta_{1,k}\left(\gamma_{0,k} + \gamma_1'\right)\ln RN_{k,t-i} + \beta_{2,k}\left(\theta_{0,k} + \theta_{1,k}'\right)\ln DI_{k,t-i} \\
&\quad + \beta_{3,k}\left(\Phi_{0,k} + \Phi_{1,k}'\right)\ln B_{k,t-i} + \mu_{k,t} \\
&\vdots \\
\ln A_{m,t} &= \beta_{0,m} + \beta_{1,m}\left(\gamma_{0,m} + \gamma_1'\right)\ln RN_{m,t-i} + \beta_{2,m}\left(\theta_{0,m} + \theta_{1,m}'\right)\ln DI_{k,t-i} \\
&\quad + \beta_{3,m}\left(\Phi_{0,m} + \Phi_{1,m}'\right)\ln B_{m,t-i} + \mu_{m,t}
\end{aligned}
\qquad
\begin{aligned}
&j = 1,\ldots,k-1, \\
&k = j+1,\ldots,m. \\
&i \geq 1 \\
&\operatorname{cov}\left(\mu_{j,t},\mu_{k,t}\right) = \sigma_{j,k,t}
\end{aligned}
\qquad (15)
$$

where $A_{j,t}$ and $A_{k,t}$ are aid allocations to countries under specific consideration. There may be numerous aid recipients, each represented by a separate equation up to $A_{m,t}$. The assumption $\operatorname{cov}(\mu_{k,t},\mu_{i,t})=\sigma_{i,j,t}$ indicates that there is contemporaneous correlation. That is the error terms of the equations are, at the same point in time, correlated.

Estimating (15) is a daunting task as it involves obtaining data for a large number of recipient countries. More than 150 countries receive official development assistance (ODA) and most donors individually provide aid to more than 100 recipients. Some compromise is warranted, therefore. In the current study there are ten recipient countries under consideration. These countries have been the largest DAC ODA recipients since 1970 for which time series data are available[10]. The following system of eleven equations is therefore

posited:

$$\begin{aligned}
\ln A_{j,t} &= \beta_{0,j} + \psi'_{1,j}\ln RN_{j,t-i} + \psi'_{2,j}\ln DI_{j,t-i} + \psi'_{3,j}\ln B_{j,t-i} + \mu_{j,t} && j = 1,\ldots,k-1,\\
\sum_{k=j+1}^{m}\ln A_{k,t} &= \beta_{0,k} + \psi'_{1,k}\sum_{k=j+1}^{m}\ln RN_{k,t-i} + \psi'_{2,k}\sum_{k=j+1}^{m}\ln DI_{k,t-i} && k = j+1,\ldots,m.\\
&\quad + \psi'_{3,k}\sum_{k=j+1}^{m}\ln B_{k,t-i} + \mu_{k,t} && i \geq 1\\
& && k = 11,\\
& && \operatorname{cov}\left(\mu_{j,t},\mu_{j,t}\right) = \sigma_{j,k,t}
\end{aligned} \tag{16}$$

where

$$\begin{aligned}
\psi'_{1,j} &= \beta'_{1,j}\left(\gamma_{0,j} + \gamma'_{1,j}\right), & \psi'_{2,j} &= \beta'_{2,j}\left(\theta_{0,j} + \theta'_{1,j}\right),\\
\psi_{3,j} &= \beta'_{3,j}\left(\Phi_{0,j} + \Phi'_{1,j}\right), & \psi'_{1,k} &= \beta'_{1,k}\left(\gamma_{0,k} + \gamma'_{1,j}\right),\\
\psi'_{2,k} &= \beta'_{2,k}\left(\theta_{0,k} + \theta'_{1,j}\right) \quad \text{and} & \psi_{3,k} &= \beta'_{3,k}\left(\Phi_{0,k} + \Phi'_{1,k}\right).
\end{aligned}$$

The first ten equations in (16) describe aid to the top ten largest DAC recipients. The eleventh describes aid to all other countries.[11]

Careful consideration was given to the measurement of the ODA variable. Three feasible options are available: net disbursements, gross disbursements and commitments, each expressed in US dollars. Commitments are the amount the donor agrees to make available to the recipient during the relevant time period. Disbursements are the actual amount of aid transferred from donor to recipient. They are the amount of the commitment actually spent during the relevant time period. Net disbursements are simply gross disbursements minus any repayments relating to the previous period's ODA loans. Commitments are primarily supply-side determined, by the donor country. As equations (16) basically describes a donor decision making process, ODA commitments are the logical choice of dependent variable.

We largely follow McKinlay and Little (1977, 1978a, 1978b, 1979), Maizels and Nissanke (1984), Gounder (1999) and Gounder and Sen (1999) in terms of the specification of individual recipient need and donor interest variables. The elements of the recipient need vector are country *j*'s population, per capita GNP, per capita GNP growth rate, balance of payments and multilateral aid receipts. The balance of payments variable is net of official transfers and measured as a ratio of GNP. It is used as a measure of economic performance

and not of a gap which needs to be filled with aid inflows. Multilateral aid receipts are seen as a substitute for bilateral aid, in the sense that countries with low amounts of multilateral aid need *ceteris paribus* more bilateral assistance. Alternatively, the two inflows could serve as complements with bilateral donors topping-up multilateral flows or *vice versa*. Dudley and Montmarquette (1976) label this a "bandwagon effect". The expected sign of the coefficient attached to the multilateral aid variable is therefore ambiguous; so too are the expected signs of the remaining recipient need variables given the reasoning outlined in Section II above. The elements of the donor interest vectors are the values of DAC investment, exports and arms transfers to country *j*. *i* was set to one for each of the above variables.

The administrative expediency vector *B* contains a single element only, a lagged dependent variable. These variables are intended to capture a possible allocative inertia in the aid allocation process. It is well known that donor agencies tend to avoid large year-on-year fluctuations in aid, especially downward, given the administrative and political difficulties involved. These difficulties relate to the winding back of existing projects or programs and identifying new ones, and the offence often caused to recipients through significant reductions in aid. One would expect, therefore, relatively smooth aid flows over time, with the sign attached to the lagged dependent variable being positive.

Equations (16) were supplemented with additional variables. The first was the GNP deflator, averaged across the DAC. The inclusion of this variable is based on the reasoning that DAC donors are sensitive to the real value of their aid, and adjust allocations on the basis of the movement of prices. This is not to say however that allocations are determined in real dollar amounts, otherwise the dependent variable would be measured in this manner, simply that adjustments are made on the basis of concerns for the real value of allocations. Additional variables, added to some but not all equations in (16), are binary dummy variables, intended to capture major events in a recipient's history which have influenced the provision of aid from the DAC and are not captured by other explanatory variables. Further details are in the Appendix (see Table A1).

Like many of the pre-existing studies comprising the aid allocation literature, we are interested in whether a vector of recipient need variables and a vector of donor interest variables determine aid allocations. We test, therefore, the joint significance of the recipient

need and donor interest coefficients, respectively.[12] In the case of the first equation of (16) this involves evaluating the null hypotheses that

$$H_0: \psi_{1,1,j} = \psi_{1,2,j} = \ldots = \psi_{1,p,j} = 0$$

and

$$H_0^{/}: \psi_{2,1,j} = \psi_{2,2,j} = \ldots = \psi_{2,q,j} = 0$$

using a Chi-squared test. Further details are given below.

ODA commitments, multinational aid, GNP per capita, population and investment data were obtained from the OECD database (2000). Data on current accounts and exports were obtained from the IMF's International Financial Statistics and Direction of Trade statistics, respectively. Data on arms transfers were provided by the Stockholm International Peace Research Institute (SIPRI) database. The relevant time period is 1968 to 1999. This is the longest series that could be constructed given data availability for the DAC's largest aid recipients.

3. Results and Interpretations

Results are shown in Tables 1 and 2. All estimation was conducted using the statistical package STATA 7.0. Robust, statistically satisfactory results were obtained. All equations are individually significant, R^2s range from 0.70 to 0.99 (in the cases of Pakistan and all other developing countries, respectively) and there is significant correlation between their error terms. The first of these conclusions is based on the Chi-squared tests of Table 1 (see χ_1^2) which evaluate the null hypotheses that the slope coefficients of the equations are zero. The third of the above conclusions is based on the Breusch-Pagan χ^2 test for independence. This statistic is 79.35, which is significant at well over the 95 percent level. It follows that using the SUR simultaneous equations approach, as opposed to single equation estimation, is validated and using the latter may have produced misleading conclusions.

Table 1
Econometric Results: Summary Statistics

Recipient Country	R^2	χ^2_1	χ^2_2	χ^2_{2a}	χ^2_3
Egypt	0.94	531.87**	25.52**	10.20*	18.69**
India	0.76	155.69**	9.95* 23.42**[a]	9.50*	27.08**
Indonesia	0.76	112.83**	21.77**	20.77*	4.31
Israel	0.92	386.73**	47.37**	35.12*	5.46 9.18*[b]
Kenya	0.87	237.91**	34.25**	7.75*	12.23**
Morocco	0.94	558.22**	42.23**	42.22*	48.97**
Pakistan	0.70	97.24**	26.36**	14.87*	49.01**
Philippines	0.97	1043.03**	14.78**	8.43*	6.50* 15.82**[c]
Tanzania	0.97	918.72**	44.01**	0.81	17.16**
Thailand	0.96	725.89**	46.44**	[d]	11.99**
All Others	0.99	3230.29**	13.82**	4.71*	10.97**

* - significant at the 90 percent level. ** - significant at the 95 percent level or greater.
[a]: statistic with liberalisation dummy variable included in test. [b]:statistic with Camp David dummy is included in test. [c]: statistic with post-Marcos era dummy is included in test. [d]: test not performed due to all relevant variable coefficient displaying needs-inconsistent signs.

Overall the results suggest that DAC bilateral aid donors consider *both* recipient need *and* donor interests in determining the amounts of aid allocated over time to developing countries. This result contrasts sharply to the conclusions, highlighted at the outset of this paper, drawn by studies which have looked at cross-country aid data. This is based on the statistics χ^2_2 and χ^2_3, which test for the joint significance of the coefficients attached to the recipient need and donor interest variables, respectively. χ^2_2 is significant at the 95 percent level or greater for all equations estimated. In the case of the equation seeking to explain aid to India, this result was achieved after supplementing the recipient need variables with an economic liberalisation period dummy.[13] Without this dummy the recipient need coefficients in this equation are jointly significant at the 90 percent level. Overall, indicators of need do influence aid allocation, significantly determining allocations to individual countries over time.

While the vectors of recipient need variables coefficients were jointly significant for

all recipient countries, a number display signs which are counter to a pro-needs based aid allocation practice. For example, as discussed below, the sign displayed by the coefficient attached to per capita income was positive. Aid should increase as per capita income decreases, based on the criterion of relative need. In recognition of these findings the statistic χ^2_{2a} was computed, which tests for the joint significance of recipient need coefficients only in those instances in which a pro-needs sign is displayed (that is, these coefficients were set to zero is such a sign is not displayed). As shown in Table 2, recipient need still cannot be rejected as a criterion for aid allocation as in only two cases (Tanzania and Thailand) is this statistic insignificant.

Some equally interesting results were obtained for χ^2_3, given the singularly overwhelming importance previous studies have attached to donor interests as determinants of aid allocation. Indonesia and Israel are political and strategically important countries and have close political allegiances with many larger aid donors. Israel's relationship with the United States is arguably one of the most intense between a donor and recipient. Indonesia is a very important export market for many donors. The general perception is that aid to these countries has heavy commercial, political, diplomatic and strategic orientations. Yet donor interest variables, as a group, appear not to have influenced inter-temporal allocations to Indonesia. For Israel, the coefficients of these variables are not significant unless a Camp David dummy (see Appendix) is included in the donor interest vector, but then only at the 90 percent level. Similar results were obtained for the Philippines. The coefficients of the donor interest variables were initially jointly significant at the 90 percent level only, but increased to the 95 percent level after including a post-Marcos dummy (see Appendix) to the vector.

Some other interesting results have been obtained from estimating the model (see Table 2). The negative coefficient on the lagged DAC aid variable reveals that allocative inertia has reduced the amount of DAC aid to Indonesia and Morocco. This result reflects the scaling down of DAC donor aid to these countries after controlling for other factors. For Israel, Pakistan, Tanzania and the equation explaining aid to all other developing countries, inertia exists in the allocation process. Results also indicate that aid commitments have not kept pace with population growth in several countries. The coefficient on population is negative and significant for six of the aid recipients. Only in the cases of Israel and Morocco have aid commitments increased with increases in population. From a needs perspective one would

hope that decreases in per capita GNP would be associated with increases in aid commitments. Results indicate that this is true for the cases of Egypt, Indonesia and Pakistan. However, for India, Kenya, Tanzania and Thailand, results indicate that DAC donors respond to improvements in per capita GNP by increasing aid. As mentioned above, this result is explained by donors tending to favour countries with higher levels of growth due to a greater perceived return on their aid. This suggests that donors provide aid to countries where it has the greatest developmental impact and is further evidenced by positive coefficients on the growth in per capita GNP variable for the cases of Tanzania and Thailand.

The coefficient on the balance of payments variable takes on an unexpected positive sign for the Phillippines and for Thailand. This indicates that improvements in the current account (relative to GNP) are associated with increases in aid. Both these countries have consistently recorded current account deficits up until the late 1990s and the result is explained by DAC donors rewarding these countries for improving their balance of payments positions.

The positive and significant coefficient on the multilateral aid variable lends support to a 'bandwagon effect' for Egypt, Israel and Thailand. First identified by the cross-section study of Dudley and Montmarquette (1976), this effect has donors providing more aid to recipients which receive more aid from multilateral institutions. McGillivray and Oczkowski (1992) also found strong support for a bandwagon affect in their cross-section study of British bilateral aid. However, DAC donors have reduced the amount of aid allocated to Indonesia, Kenya, Morocco and the Philippines in response to increases in multilateral aid provided to these countries.

The coefficients on the donor interest variables are expected *a priori* to be positive and this result is confirmed in many cases. However, there are a number of coefficients on the

Table 2
Econometric Results: SUR Estimates of Coefficients of Inter-temporal Model of Aid Allocation

Country	Constant (β_0)	Population ($\psi_{1,1}$)	Per Capita GNP $\psi_{1,2}$	Growth in Per Capita GNP ($\psi_{1,3}$)	Balance of Payments ($\psi_{1,4}$)	Multilateral Aid ($\psi_{1,5}$)	DAC Exports ($\psi_{2,2}$)	DAC Investment ($\psi_{2,3}$)	DAC Arms Transfers ($\psi_{2,4}$)	Lagged Aid ($\psi_{3,1}$)	DAC GNP Deflator (ψ_4)	Dummy Variables (ψ_5)	($\psi_{5,2}$)	($\psi_{4,2}$)
Egypt	15.12	-1.13	-1.69**	-1.07	-2.92**	0.25**	0.42*	0.09	0.10	-0.06	2.25**	0.68**		
	(0.76)	(-0.50)	(-2.29)	(-1.23)	(-2.33)	(3.09)	(1.87)	(1.34)	(1.56)	(-0.45)	(2.96)	(3.11)		
India	42.28*	-3.12*	1.15*	-1.27*	-10.79**	-0.03	-0.88**	0.42**	-0.34**	-0.01	2.14**	-1.29**	-0.61**	
	(1.90)	(-1.68)	(1.93)	(-1.95)	(2.55)	(-0.42)	(-3.01)	(4.54)	(-3.59)	(-0.02)	(4.53)	(-6.96)	(-3.05)	
Indonesia	-9.01	1.29	-1.01**	0.46	-3.47	-0.40**	0.53*	-0.04	0.08	-0.49**	1.78**	-1.42**		
	(-0.38)	(0.58)	(-3.03)	(1.51)	(-1.23)	(-2.94)	(1.92)	(-0.72)	(1.39)	(-3.01)	(2.52)	(-4.42)		
Israel	-29.35**	4.23**	0.19	-0.15	-7.01**	0.17**	-0.32	-0.02	-0.08**	0.45**	-0.41	0.47*	-2.01**	-0.96**
	(-2.26)	(2.15)	(0.86)	(-1.32)	(-5.72)	(2.38)	(-0.54)	(-0.26)	(-2.27)	(4.80)	(-0.50)	(1.93)	(-7.39)	(-3.59)
Kenya	34.35**	-4.78**	0.76**	-0.87*	-0.98	-0.32**	0.18	-0.00	-0.08**	0.11	3.27**	0.68**		
	(4.04)	(-4.52)	(2.14)	(-1.67)	(-0.61)	(-2.75)	(0.38)	(-0.01)	(-2.17)	(0.79)	(4.71)	(2.87)		
Morocco	-53.02**	6.49**	-0.47	-0.42	0.03	-0.13**	0.37	-0.04	0.17**	-0.64**	-0.50			
	(-5.18)	(5.20)	(-1.26)	(-1.15)	(0.04)	(-2.43)	(1.25)	(-1.21)	(6.95)	(-3.95)	(-1.03)			
Pakistan	23.98**	-2.65**	-1.15**	-1.71**	2.04	0.28	2.28**	-0.11*	-0.28**	0.50**	-0.39	1.80**		
	(2.13)	(-2.13)	(-2.11)	(-2.87)	(0.93)	(1.57)	(5.64)	(-1.86)	(-3.32)	(3.69)	(-0.66)	(5.71)		
Philippines	32.51*	-3.76**	0.46	-1.20**	3.07*	-0.24**	0.43*	-0.09**	0.03	0.11	2.12**	0.70**	-0.69**	
	(1.93)	(-2.00)	(1.29)	(-2.18)	(1.86)	(-2.33)	(1.66)	(-2.21)	(0.62)	(1.00)	(4.81)	(2.96)	(-4.07)	
Tanzania	29.85**	-3.90**	0.59**	0.28*	-0.58	-0.04	-0.47*	0.11**	-0.10**	0.29**	3.27**	-0.33**		
	(4.78)	(-5.34)	(2.48)	(1.66)	(-0.78)	(-0.45)	(-1.77)	(2.74)	(-2.81)	(2.01)	(6.84)	(-2.13)		
Thailand	45.71**	-5.02**	1.54**	1.31*	10.42**	0.52**	-0.57	0.16**	0.11	0.00	1.77**	-0.96**		
	(2.04)	(-2.14)	(2.84)	(1.77)	(4.82)	(4.48)	(-1.40)	(2.58)	(1.48)	(0.04)	(2.80)	(-3.99)		
All Others	7.19*	-0.33	0.12	-0.16*	-0.30	0.20	-0.40**	0.09*	0.14**	0.37**	0.96**			
	(1.78)	(-1.13)	(1.32)	(-1.88)	(-0.29)	(1.42)	(-2.54)	(1.91)	(2.54)	(3.83)	(5.46)			

*, **: significantly different from zero at 90 and 95 percent confidence levels, respectively.

exports, investment and arms variables which are negative and significant. These results are explained by donors viewing aid and these variables as substitutes. For example donors may increase their aid to a recipient in response to lower exports in order to maintain commercial ties with the recipient. This explanation is particularly true for arms transfers where increases in arms are associated with lower transfers for five of the aid recipients.

Finally, the coefficients on the DAC Deflator were positive and significant in eight of the equations, indicating that the DAC donors are sensitive to the real value of their aid and adjust allocations accordingly. All coefficients on the binary dummy variables are statistically significant.

5. Conclusion

This paper has attempted to model the allocation of aid to developing countries, looking at time series data for the period 1968 to 1999. Its main concern was whether aid allocations respond over time to the developmental characteristics of recipient countries, especially need, after controlling for the influence of non-developmental allocative criteria. A system of eleven equations was estimated simultaneously using the Seemingly Unrelated Regressions approach. Ten of these equations related to the largest recipients of DAC total official development assistance, for which data were available. The eleventh related to aggregated aid flows to all other recipient countries.

Results indicated that aid allocation does respond over time to developmental conditions within developing countries. Vectors of recipient need indicator coefficients were jointly significant in all eleven equations estimated. While some individual need coefficients displayed signs which are not entirely consistent with a needs approach to aid allocation, developmental criteria very clearly influence the amounts of aid developing countries receive over time. This evidence not only sharply contrasts to the results obtained by previous cross-section studies, which indicate that aid is not sensitive to relative developmental conditions in countries at particular points of time, but is on balance very encouraging. DAC aid donors responding to changes in developmental criteria will help to achieve the International and Millennium Development Goals mentioned at the outset of this paper, although declining aid budgets and the lingering importance of donor interests are likely to hamper the realisation of these ambitious targets.

Time series studies of aid allocation are relatively new and few. This literature is essentially an emerging one. As such, there is plenty of room for continuing improvements in the way in which inter-temporal aid allocation is modelled. This paper has shown that it is important to account for the joint determination of aid allocations. However, a useful future direction for this literature includes modelling of allocations from individual donors (that is, the use of donor-specific rather than aggregate aid allocation data) using systems estimation techniques.

Appendix

Table A1: Binary Dummy Variables

Recipient Country	Period for which variable equals one	Explanation
Egypt	1990-92	Gulf war
India	1990 onwards	Liberalised economy
	1998-99	Nuclear testing
Indonesia	1998-99	Asian economic crisis
Israel	1978 onwards	Camp David agreement
	1995	US budgetary difficulties
	1997 onwards	Classified as Part II country
Kenya	1982 onwards	Post adjustment era
Pakistan	1972-73	Political instability
Philippines	1985 onwards	Post-Marcos era
	1996	Unable to disburse ODA in the preceding two years.
Tanzania	1981 onwards	Poor performing economy
Thailand	1975 onwards	Post-Vietnam war period.

Notes

1. Development aid, or Official Development Assistance (ODA), is defined by the DAC as grants or loans to developing countries which are: a) undertaken by the official sector; b) with the promotion of economic development and welfare as the main objective; c) at concessional financial terms (a loan must have a grant element of at least 25 per cent). In addition to financial flows, technical co-operation is included in ODA. Grants, loans and credits for military purposes are excluded. Transfer payments to private individuals (e.g. pensions, reparations or insurance payouts) are in general not counted. Only countries which belong to Part I of the DAC's list of developing countries can receive ODA. The DAC, whose membership comprises all major Western aid donor countries, collects and reports aid flows on behalf of its member countries. See OECD (1999) for further details.

2. Note that in the late 1990s a number of donors, most notably the United Kingdom, have in public pronouncements of policy sought to move away from the non-humanitarian objectives, embracing poverty alleviation or the promotion of sustainable development as the sole or dominant objective. They do not however unambiguously rule out pursuit of these other objectives. See, for example, White (1998).

3. To this extent we follow much of the public choice literature on local (or state) budgetary behaviour (see, for example, Barnett *et al.*, 1991).

4. It could be argued that the bilateral aid decision makers also derive utility from the impacts of other programs funded by the agencies in which they are located, such as the multilateral aid program. However, as the bilateral aid decision makers have little or no control over the allocation of these funds, this impact is exogenous with respect to the preferences of these people and including such a variable in the utility function makes no difference to the behavioural and estimating equation derived below.

5. A number of studies have tested for what are referred to as the small and middle-income "biases" in aid allocation, most recently Arvin and Drewes (2001), where aid decreases with population and increases with per capita income over given ranges of these variables.

6. These comments do not apply to a number of time-independent variables on which aid inter-recipient allocation is based, such as the geographic location of the recipient country.

7. The decision variable could also be aid shares, with aid measured as a percentage or ratio of the total bilateral aid budget. Econometrically, using this measure or absolute aid makes very little difference with only the constant term being affected.

8. In this case (5) would be written as:

$$BI = \sum_{i=1}^{m} \left(\frac{A_i}{P_i} \right) P_i$$

where P_i is the population of recipient country *i*.

9. This is the case irrespective of whether the other equations are estimated. They simply need to exist, and since many countries actually receive aid this must be the case.

10. China and Bangladesh have been two major recipients of DAC aid but data availability did not permit a long time series. China started receiving aid from the DAC in 1979 and Bangladesh in 1972 (formerly West Pakistan). However, these recipients are included in the equation explaining aid to all other countries. Note also that Israel was no longer classified as DAC Part 1 developing county from 1997 onwards. However, it continues to receive DAC "aid" (but not ODA), as a Part II country on the DAC list, it is included in the sample. See OECD (1999) for further details.

11. This equation will clearly be subject to a number of econometric issues, arguably the most serious being aggregation bias. Estimates of its parameters should therefore be treated with more than the usual degree of caution. However, its role is purely econometric, being to provide efficient estimates of the parameters of the other 10 equations in (16).

12. The studies which have tested for the relevance of these categories of variables include McKinlay and Little (1977, 1978a, 1978b, 1979), Maizels and Nissanke (1984), Gounder (1999), and Gounder and Sen (1999), and have done so by separately estimating recipient need and donor interest models of aid allocation. The former are comprised by recipient need variables only and the latter by donor interest variables. Conclusions regarding the overall significance of these vectors tend to be based on the adjusted R^2 of each model. This approach is inherently problematic econometrically if one posits *a priori* that both recipient need and donor interests influence aid allocation. If this is the case one must accept *a priori* that both models are mis-specified due to the omission of relevant variables. The relevant variables omitted from the recipient need model are the donor interest variables and *vice versa*. Unless it can be shown that none of the donor interest variables omitted from the recipient need model are orthogonal with the recipient need variables omitted from the donor interest model, which is unlikely in the extreme, then it in turn follows that the error terms of both models are not independent of their respective explanatory variables. The *t* ratios, *F* tests and R^2s resulting from separate estimation of the models are therefore invalid and the conclusions based on these statistics are likely to be misleading.

13. This dummy is treated as an indicator of need given the widespread (although not necessarily correct) perception that earlier stages of liberalisation are associated with adverse socioeconomic impacts, particularly in terms of health and education outcomes.

References

Arvin, B.M. and Drewes, T. (2001). 'Are there Biases in German Bilateral Aid Allocations?', *Applied Economics Letters*, vol.8, pp. 173-177.

Barnett, R.R., Levaggi, R. and Smith, P. (1991). 'Does the Flypaper Model Stick? A Test of the Relative Performance of the Flypaper and Conventional Models of Local Government Budgetary Behaviour', *Public Choice*, vol. 69, pp. 1-18.

Dalgaard, C. and Hansen, H. (2001). 'On Aid, Growth and Good Policies', *Journal of Development Studies,* vol.37, pp.17-35.

Dudley, L. and Montmarquette, C. (1976). 'A Model of the Supply of Bilateral Foreign Aid', *American Economic Review,* vol.66, pp.132-142.

Gang, I. and Khan, H.A. (1990). 'Some Determinants of Foreign Aid to India, 1960-85', *World Development*, vol.18, pp.431-442.

Gounder, R. (1999). 'Modelling of Aid Allocation Using Time Series Data: The Case of Papua New Guinea', *Oxford Development Studies*, vol.27, pp.233-250.

Gounder, R. and Sen, K. (1999). 'What Motivates Foreign Aid: A Case Study of Australia's Aid to Indonesia', *Journal of Developing Areas,* vol.33, pp.379-394.

Hansen, H. and Tarp, F. (2000). 'Aid Effectiveness Disputed', *Journal of International Development,* vol. 12, pp.375-398.

Hansen, H. and Tarp, F. (2001). 'Aid and Growth Regressions', *Journal of Development Economics,* vol. 64, pp.547-570.

IMF (various). *International Financial Statistics Yearbook*, IMF, Washington.

IMF (various). *Direction of Trade Statistics Yearbook*, IMF, Washington.

Lahiri, S. and Raimondos-Møller, P. (2000). 'Lobbying by Ethnic Groups and Aid Allocation', *Economic Journal*, vol.110, pp.62-79.

Maizels, A. and Nissanke, M.K. (1984). 'Motivations for Aid to developing Countries', *World Development*, vol.12, pp.879-900.

McGillivray, M and Oczkowski, E. (1992). 'A Two-part Sample Selection Model of British Bilateral Aid Allocation', *Applied Economics*, vol. 24, pp.1311-1319.

McKinlay, R.D. and Little, R. (1977). 'A Foreign Policy Model of U.S. Bilateral Aid Allocation', *World Politics*, vol. XXX, pp.58-86.

McKinlay, R.D. and Little, R. (1978a). 'A Foreign Policy Model of the Distribution of British Bilateral Aid, 1960-70', *British Journal of Political Science*, vol. 8, pp. 313-332.

McKinlay, R.D. and Little, R. (1978b). 'The French Aid Relationship: A Foreign Policy Model of the Distribution of French Bilateral Aid, 1964-70', *Development and Change*, vol. 9, pp. 459-78.

McKinlay, R.D. and Little, R. (1979). 'The U.S. Aid Relationship: A Test of the Recipient Need and Donor Interest Models', *Political Studies*, vol. XXVII, pp. 236-250.

OECD. (1999). *Geographical Distribution of Financial Flows to Developing Countries*, Paris, OECD.

OECD. (2000). *OECD Database*, Paris, OECD.

Stockholm International Peace Research Institute. (2000). *Arms Transfers Database*, Stockholm Stockholm International Peace Research Institute.

Tarp, F., Bach, C. F., Hansen, H. and Baunsgaard, S. (1999). 'Danish Aid Policy: Theory and Empirical Evidence', in Gupta, K. L. (ed). *Foreign Aid: New Perspectives,* Massachusetts Kluwer.

Trumball, W.N. and Wall, H.J. (1994). 'Estimating Aid-Allocation Criteria with Panel Data', *The Economic Journal*, vol. 104, pp. 876-882.

Wall, H.J. (1995). 'The Allocation of Official Development Assistance', *Journal of Policy Modelling*, vol. 13, pp. 307-314.

White, H. (1998). 'British Aid and the White Paper on International Development: Dressing a Sheep's Clothing in the Emperor's New Clothes', *Journal of International Development*, vol. 10, pp, 151-166.

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

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Research Fellows (Internal)

Simon Appleton – poverty, education, household economics
Adam Blake – CGE models of low-income countries
Mike Bleaney - growth, international macroeconomics
Indraneel Dasgupta – development theory, household bargaining
Norman Gemmell – growth and public sector issues
Ken Ingersent - agricultural trade
Tim Lloyd – agricultural commodity markets
Paula Lorgelly – health, gender and growth
Andrew McKay - poverty, peasant households, agriculture
Chris Milner - trade and development
Wyn Morgan - futures markets, commodity markets
Christophe Muller – poverty, household panel econometrics
Tony Rayner - agricultural policy and trade

Research Fellows (External)

V.N. Balasubramanyam *(University of Lancaster)* – foreign direct investment
David Fielding *(University of Leicester)* – investment, monetary and fiscal policy
Ravi Kanbur (*Cornell*) – inequality, public goods – Visiting Research Fellow
HenrikHansen *(University of Copenhagen)* – aid and growth
Stephen Knowles *(University of Otago)* – inequality and growth
Sam Laird (*UNCTAD*) – trade policy, WTO
Robert Lensink *(University of Groningen)* – aid, investment, macroeconomics
Scott McDonald *(University of Sheffield)* – CGE modelling, agriculture
Mark McGillivray *(RMIT University)* – aid allocation, aid policy
Doug Nelson *(Tulane University)* - political economy of trade
Shelton Nicholls *(University of West Indies)* – trade, integration
David Sapsford *(University of Lancaster)* - commodity prices
Eric Strobl *(University College Dublin)* – labour markets
Finn Tarp *(University of Copenhagen)* – aid, CGE modelling
Howard White *(IDS)* – aid, poverty