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Aid, Economic Reform and Public Sector Fiscal Behaviour in Developing Countries

by

Mark McGillivray

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

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Abstract
This paper looks at interactions between foreign development aid, economic reform and public sector fiscal behaviour. It proposes a model of the public sector fiscal response to aid inflows, which allows for changes in structural relationships due to an exogenously imposed program of economic reform. This model is applied to 1960-97 time series data for the Philippines, which embarked on an IMF- and World Bank-funded liberalisation program in 1980. Estimates of structural and reduced-form equations paint a very dismal picture of the effectiveness of foreign aid in general and liberalisation in particular in the Philippines. Both bilateral and multilateral aid inflows, and the presence of an economic reform program, are associated with decreases in public fixed capital expenditure, decreases in taxation and other recurrent revenue and decreases in public sector saving. Multilateral aid also appears to be highly fungible.

Contents

1. Introduction

The macroeconomic impact of foreign development aid is a contested, often controversial issue. More than thirty years of research has done little to lessen this controversy; it has actually fuelled it. Much of this research has its origins in the two-gap model of Chenery and Strout (1966): low income countries at a given point in time have insufficient domestic savings to finance the level of investment required to achieve their target growth rates, or insufficient foreign exchange earnings to finance required capital imports. These savings and foreign exchange gaps constrain growth. Foreign aid can fill these gaps and help poor countries achieve target growth rates. This appealing case for aid has spurned numerous studies of aid and growth. Much of the early literature on this nexus failed to produce conclusive results and has been comprehensively reviewed and justifiably criticised, on both theoretical and econometric grounds, by White (1992), Hansen and Tarp (2000, 2001) and others. More recent studies purport to provide less-ambiguous results, obtained from better data sets and econometric methods. The well-cited World Bank study *Assessing Aid* (1998) and the related work by Burnside and Dollar (2000) concluded that aid works in promoting growth, provided that the accompanying policy environment is sound. Other studies dispute this finding, purporting to show that aid works irrespective of the policy environment (Hansen and Tarp, 2000, 2001, and Dalgaard and Hansen, 2001).

A core deficiency of the aid-growth literature is that it overlooks the simple fact that most aid, conventionally defined, is allocated by donor governments to the public sector of recipient countries. These flows numerically important, being roughly equal in magnitude to taxation and constituting approximately half of all public expenditure in low-income countries during the mid- to late-1990s (World Bank, 2001). As a consequence the impact of aid on the economy will depend on government behaviour, in particular how fiscal decisions on revenue and expenditure are affected by aid revenues. More recent strands in the literature avoid this criticism to varying degrees by explicitly modelling how the impact of aid is mediated by public sector behaviour. Mosley *et al.* (1987) Gang and Khan (1991), picking-up on an earlier paper by Heller (1975), model the public sector fiscal response to foreign aid inflows by looking at interactions between aid and various categories on public expenditure and revenue.[1] Others have looked specifically at the fungibility of aid, that is, whether recipients of aid have used it for the purposes intended by donors (Swaropp *et al.*, 2000, Feyzioglu *et al.*, 1998, Pack and Pack, 1993).[2] Accordingly, these studies look at the determinants of expenditure, but treat revenues as exogenous and

do not look at the interaction between revenues and expenditures.

This paper looks interactions between aid, structural adjustment and public sector fiscal behaviour in developing countries. It is an attempted contribution to, and extension of, the first of the above-discussed strands in the literature on aid. It proposes a new fiscal response model of aid, taxation, borrowing and public expenditure, which differs from those used in all previous studies by *iner alia* accommodating structural breaks in underlying behavioural relationships. These breaks can occur for a number of reasons; in this case it is due to exogenously-determined, externally-financed program of economic reforms or structural adjustment. Most developing countries have or have had in place an IMF- and/or World Bank-funded structural adjustment program. While these programs have been widely criticised, often due to a lack of developing countries ownership of them, many valid questions remain as to their impacts. The paper also contributes, therefore, to the literature on public sector aspects of structural adjustment. The impact of adjustment on the public sector expenditure and revenue is modelled formally; this is a significant departure from most previous studies which have tended to rely on simple data inspection techniques.

The model is applied to 1960-97 time series data for the Philippines. After a decade of poor macroeconomic performance and various (including IMF-supported) attempts to stabilise its economy, the Philippines embarked on a World Bank-supported adjustment program in late 1980. This program was subsequently supported also by the IMF. Among the aims of this program, and thus the various loans which have supported it, are to increase the tax base and public investment (Mosley *et al.*, 1991 and World Bank, 1987). A specific interest of the paper is whether the impacts of the aid inflows, to which reforms are tied, are compatible with the intended structural or behavioural reforms of the adjustment program. Aid flows are therefore disaggregated into those from multilateral and bilateral sources in the formulation and application of the fiscal response model.

This paper consists of a further four sections. Section II commences by outlining an extended public sector fiscal response model with aid. Building on recent advances in modelling the fiscal response to aid inflows, this model is based on that developed by Franco-Rodriguez *et al.* (1998). This model differs that from of Franco-Rodriguez *at al.* in that the aid variable is disaggregated into multilateral and bilateral aid. This model is then,

in Section II, augmented to allow analysis of the impact of exogenous policy reform or, as it is more commonly known, structural adjustment. Section III discusses the data and econometric techniques used to estimate this model. Section IV provides results and interpretations and Section V concludes.

II. A Model of Aid, Economic Reform and Public Sector Fiscal Behaviour

A Fiscal Response Model of Aid

A fundamental task, facing public sector fiscal decision making agencies in all countries, is to allocate revenue among various expenditure categories subject to budgetary constraints. In developing countries these agencies will be the government departments or ministries with the prime responsibility for the design and implementation of fiscal policy and co-ordination and liaison with international aid donor agencies. Fiscal response models assume, with validity, that the agencies of developing or aid-receiving countries derive utility from the dollar amounts of the various categories of expenditure and revenue or financing at their disposal. It is also assumed that these agencies have a well-behaved, homothetic preference map and behave as if they were a single individual.[3] In the current model distinction is made between two categories of public expenditure: recurrent expenditure or government consumption (G) and fixed capital expenditure or public sector investment (I_g). Government revenue or financing is obtained from both domestic and foreign sources in the forms of taxation and other recurrent revenue (T), aid inflows from bilateral and multilateral sources (A_b and A_m respectively) and borrowing (B). Note that aid inflows will include loans, concessional or otherwise, and as such B may be considered as borrowing from all sources, domestic and international, *other* than development aid agencies. The utility function of the relevant recipient government fiscal agencies (hereinafter usually referred to as "the recipient") can be represented as:

$$U = f\left(I_g, G, T, A_b, A_m, B\right). \tag{1}$$

The recipient acts in a rational, utility-maximising manner, setting annual targets for each revenue and expenditure category and striving consciously to attain these targets. Following Mosley *et al* (1987) and Binh and McGillivray (1993), the utility function in (1) can be represented as a quadratic loss function:

$$U = \alpha_0 - \frac{\alpha_1}{2}\left(I_g - I_g^*\right)^2 - \frac{\alpha_2}{2}\left(G - G^*\right)^2 - \frac{\alpha_3}{2}\left(T - T^*\right)^2 - \frac{\alpha_4}{2}\left(A_b - A_b^*\right)^2 - \frac{\alpha_5}{2}\left(A_m - A_m^*\right)^2 - \frac{\alpha_6}{2}\left(B - B^*\right)^2 \quad (2)$$

where the asterisks denote exogenous target levels of the endogenous variables and $\alpha_i > 0$ for $i = 1, ..., 6$. All variables are for a given period t. It is clear from (2) that its maximum unconstrained value is α_0, which is achieved if the recipient meets all targets exactly. The principle of diminishing marginal utility is ensured for all levels of I_g, G, T, A_b, A_m and B and since $\alpha_i > 0$. The utility function given in (2) is perfectly symmetric: undershooting a target by a given amount is equally as bad as overshooting by that amount. This may appear restrictive if, as Binh and McGillivray (1993) point out, one believes that the recipient would be more concerned with undershooting revenue targets than with overshooting. However, obtaining revenue has political costs, whether from public objection to paying taxes or concern with aid dependency, while a revenue shortfall imposes the political costs associated with a budget deficit (and/or the opportunity costs of reduced spending). There is no reason, *a priori*, why a revenue shortfall generates more disutility than a revenue overshoot. A similar argument applies to expenditures, as the opportunity cost of overspending is in raising the revenue. For these reasons, which the recipient will take into account when setting targets, the symmetric representation of (2) is appropriate.

Some comments on the endogenous and exogenous aid variables are warranted at this stage. These comments relate to the mechanics of aid allocation.[4] Donors allocate aid to recipients on the basis of a number of criteria, including the need of the recipient, its economic performance, its commercial and political importance to and closeness of its diplomatic relationships with the donor. The decision to allocate aid to a country for period t is invariably made in the preceding period or periods. The criteria on which this decision must therefore be contemporaneously exogenous with respect to actual economic and other conditions within the recipient in period t.[5] The amount which donors decide to allocate to the recipient government for this period is recorded as a commitment. It is primarily a choice variable of the donor and not the recipient. While donors can influence the amount of this commitment which is disbursed, the amount actually disbursed is

ultimately up to the recipient. This amount is therefore a recipient choice variable. A recipient's failure to fully disburse a commitment in the current period can result in less aid in subsequent periods. Overspending on a commitment can also result in this outcome, as well as the need to raise finance, often unanticipated, from sources other than development aid agencies. Both outcomes can thus be considered to result in a loss of utility to the public sector of the recipient. A_b and A_m are therefore treated as aid disbursements and their target values as the respective aid commitments, on these grounds.

Following Franco-Rodriguez *et al.* (1998), (2) is maximised subject to:

$$I_g + G = T + A_b + A_m + B \quad \text{and} \tag{3}$$

$$G \leq \rho_1 T + \rho_2 A_b + \rho_3 A_m + \rho_4 B \tag{4}$$

where ρ_1, ρ_2, ρ_3 and ρ_4 are the proportions of taxation and other recurrent revenue, bilateral aid, multilateral aid and borrowing allocated, respectively, to consumption. It follows from (3) that $1-\rho_1$, $1-\rho_2$, $1-\rho_3$ and $1-\rho_4$ are the proportions of these respective variables allocated to investment. Equation (3) is simply the government's overall budget constraint which must always hold. The rationale for the inequality written in (4) is that there are *external* constraints which limit the manner in which the public sector in developing countries allocates revenues. The actions of donors or domestic interests cause the values of the ρs in (4) to be imposed on those involved in setting targets and allocating revenue, with there being no guarantee that targets can be met even though revenues may satisfy (3). In other words, on the assumption that (4) is binding (the possible value of G is upper bound), these external constraints prevent the attainment of α_0 because at least one expenditure target cannot be met. Our analysis is premised on this assumption. If (4) is not binding the government is not prevented from reaching specific expenditure targets, utility is maximised subject to (3) only and the government can attain α_0 if revenues are sufficient.

Like the Heller (1975), Mosley *et al.* (1987), Gang and Khan (1991) and almost all previous fiscal response studies we assume *ex ante* that targeted domestic borrowing B^* is equal to zero. Maximising (2) subject to (3) and (4) with $B^* = 0$ yields the following system of structural equations:

$$
\begin{aligned}
I_g &= (1-\rho_1)\beta_1 I_g^* + (1-\rho_1)\beta_2 G^* + (1-\rho_1)\left[1-(1-\rho_1)\beta_1-\rho_1\beta_2\right]T^* \\
&+ \left[(1-\rho_2)-(1-\rho_1)(1-\rho_2)\beta_1-(1-\rho_1)\rho_2\beta_2\right]A_b \\
&+ \left[(1-\rho_3)-(1-\rho_1)(1-\rho_3)\beta_1-(1-\rho_1)\rho_3\beta_2\right]A_m \\
&+ \left[(1-\rho_4)-(1-\rho_1)(1-\rho_4)\beta_1-(1-\rho_1)\rho_4\beta_2\right]B
\end{aligned} \tag{5}
$$

$$
\begin{aligned}
G &= \rho_1\beta_1 I_g^* + \rho_1\beta_2 G^* + \rho_1\left[1-(1-\rho_1)\beta_1-\rho_1\beta_2\right]T^* \\
&+ \left[\rho_2-\rho_1(1-\rho_2)\beta_1-\rho_1\rho_2\beta_2\right]A_b + \left[\rho_3-\rho_1(1-\rho_3)\beta_1-\rho_1\rho_3\beta_2\right]A_m \\
&+ \left[\rho_4-\rho_1(1-\rho_4)\beta_1-\rho_1\rho_4\beta_2\right]B
\end{aligned} \tag{6}
$$

$$
\begin{aligned}
T &= \beta_1 I_g^* + \beta_2 G^* + \left[1-(1-\rho_1)\beta_1-\rho_1\beta_2\right]T^* - \left[(1-\rho_2)\beta_1+\rho_2\beta_2\right]A_b \\
&- \left[(1-\rho_3)\beta_1+\rho_3\beta_2\right]A_m - \left[(1-\rho_4)\beta_1+\rho_4\beta_2\right]B
\end{aligned} \tag{7}
$$

$$
\begin{aligned}
A_b &= \beta_3 I_g^* + \beta_4 G^* - \left[(1-\rho_1)\beta_3+\rho_1\beta_4\right]T + \left[1-(1-\rho_2)\beta_3-\rho_2\beta_4\right]A_b^* \\
&- \left[(1-\rho_3)\beta_3+\rho_3\beta_4\right]A_m - \left[(1-\rho_4)\beta_3+\rho_4\beta_4\right]B
\end{aligned} \tag{8}
$$

$$
\begin{aligned}
A_m &= \beta_5 I_g^* + \beta_6 G^* - \left[(1-\rho_1)\beta_5+\rho_1\beta_6\right]T - \left[(1-\rho_2)\beta_5+\rho_2\beta_6\right]A_b \\
&+ \left[1-(1-\rho_3)\beta_5-\rho_3\beta_6\right]A_m^* - \left[(1-\rho_4)\beta_5+\rho_4\beta_6\right]B
\end{aligned} \tag{9}
$$

$$
\begin{aligned}
B &= \beta_7 I_g^* + \beta_8 G^* - \left[(1-\rho_1)\beta_7+\rho_1\beta_8\right]T - \left[(1-\rho_2)\beta_7+\rho_2\beta_8\right]A_b \\
&- \left[(1-\rho_3)\beta_7+\rho_3\beta_8\right]A_m
\end{aligned} \tag{10}
$$

where

$$
\beta_1=\frac{\alpha_1(1-\rho_1)}{\Phi_1},\ \beta_2=\frac{\alpha_2\rho_1}{\Phi_1},\ \beta_3=\frac{\alpha_1(1-\rho_2)}{\Phi_2},\ \beta_4=\frac{\alpha_2\rho_2}{\Phi_2},\ \beta_5=\frac{\alpha_1(1-\rho_3)}{\Phi_3},\ \beta_6=\frac{\alpha_2\rho_3}{\Phi_3},
$$
$$
\beta_7=\frac{\alpha_1(1-\rho_4)}{\Phi_4},\ \beta_8=\frac{\alpha_2\rho_4}{\Phi_4}
$$

and

$$
\Phi_1=\alpha_1(1-\rho_1)^2+\alpha_2\rho_1^2+\alpha_3,\ \Phi_2=\alpha_1(1-\rho_2)^2+\alpha_2\rho_2^2+\alpha_4,\ \Phi_3=\alpha_1(1-\rho_3)^2+\alpha_2\rho_3^2+\alpha_5,
$$
$$
\Phi_4=\alpha_1(1-\rho_4)^2+\alpha_2\rho_4^2+\alpha_6.
$$

The reduced form equations, obtained from simultaneously solving the structural equations (5) to (10), are:

$$I_g = \pi_1 I_g^* + \pi_2 G^* + \pi_3 T^* + \pi_4 A_b^* + \pi_5 A_m^*, \quad (11)$$

$$G = \pi_6 I_g^* + \pi_7 G^* + \pi_8 T^* + \pi_9 A_b^* + \pi_{10} A_m^*, \quad (12)$$

$$T = \pi_{11} I_g^* + \pi_{12} G^* + \pi_{13} T^* + \pi_{14} A_b^* + \pi_{15} A_m^*, \quad (13)$$

$$A_b = \pi_{16} I_g^* + \pi_{17} G^* + \pi_{18} T^* + \pi_{19} A_b^* + \pi_{20} A_m^* \quad (14)$$

$$A_m = \pi_{21} I_g^* + \pi_{22} G^* + \pi_{23} T^* + \pi_{24} A_b^* + \pi_{25} A_m^* \quad (15)$$

$$B = \pi_{26} I_g^* + \pi_{27} G^* + \pi_{28} T^* + \pi_{29} A_b^* + \pi_{30} A_m^*$$

A Fiscal Response Model of Aid and Economic Reform

Introducing a program of structural economic reform, involving more than stabilisation measures alone, is often a complex and time-consuming task, involving input from a wide range of parties. It will be subject to informational and implementation time lags and consequently the decision to introduce a program will typically be made well prior to the period in which it is introduced. Moreover, public sector fiscal decision makers in aid-receiving countries will be only one of many parties involved in the decision to implement a program; a program can even be foisted upon them. These reasons combine to suggest that while presence of a structural reform program will affect the utility of public sector fiscal decision makers in aid-receiving countries, it should in the current context be modelled as an exogenous variable.[6] Equation (1) is therefore replaced by:

$$U = f\left(I_g, G, T, A_b, A_m, B, R\right). \quad (16)$$

where *R* a binary variable indicating the presence or otherwise of a program of economic reform. The specific interest of this paper is in the presence of a World Bank- and/or IMF-supported structural adjustment program.

It is further assumed that the utility derived from a given level of expenditure or revenue, relative to its target, differs between reform and non-reform periods. Equation (16) can be represented by:

$$U = \alpha_0 + \sigma_0 R - \frac{\alpha_1}{2}\left(I_g - I_g^*\right)^2 - \frac{\sigma_1}{2}R\left(I_g - I_g^*\right)^2 - \frac{\alpha_2}{2}\left(G - G^*\right)^2 - \frac{\sigma_2}{2}R\left(G - G^*\right)^2$$
$$- \frac{\alpha_3}{2}\left(T - T^*\right)^2 - \frac{\sigma_3}{2}R\left(T - T^*\right)^2 - \frac{\alpha_4}{2}\left(A_b - A_b^*\right)^2 - \frac{\sigma_4}{2}R\left(A_b - A_b^*\right)^2 \quad (17)$$
$$- \frac{\alpha_5}{2}\left(A_m - A_m^*\right)^2 - \frac{\sigma_5}{2}R\left(A_m - A_m^*\right)^2 - \frac{\alpha_6}{2}\left(B - B^*\right)^2 - \frac{\sigma_5}{2}R\left(B - B^*\right)^2$$

The utility function written in (17) is also perfectly symmetric, with undershooting a target by some amount yielding the same utility as overshooting it by that amount, and reaches a maximum at $\alpha_0 + \sigma_0 R$. During an adjustment programme (when R=1), (17) becomes

$$U = \alpha_0 + \sigma_0 - \frac{\alpha_1 + \sigma_1}{2}\left(I_g - I_g^*\right)^2 - \frac{\alpha_2 + \sigma_2}{2}\left(G - G^*\right)^2 - \frac{\alpha_3 + \sigma_3}{2}\left(T - T^*\right)^2$$
$$- \frac{\alpha_4 + \sigma_4}{2}\left(A_b - A_b^*\right)^2 - \frac{\alpha_5 + \sigma_5}{2}\left(A_m - A_m^*\right)^2 - \frac{\alpha_6 + \sigma_6}{2}\left(B - B^*\right)^2 \quad (18)$$

and in the absence of a programme (when R=0) reduces to (2).

The differences between (2) and (17) is that the former, provided that $\sigma_0 > 0$, provides more utility if all targets are exactly achieved and greater utility reductions as the absolute gap between actual and target variables increases. This is a valid representation or reality; fiscal decision makers are under greater pressure to attain targets during reform periods, with their performance being monitored more closely by a greater range of interested parties. The difference between the two utility functions (for simple versions containing investment only) is depicted diagrammatically in Figure 1.

Maximising (3) with R=1 and B^*=0 subject to (5) and (6) and re-arranging the first-order conditions yields the following system of simultaneous structural equations, which apply during the adjustment period:

$$
\begin{aligned}
I_g = {} & (1-\rho_1)(\beta_1+\delta_1) I_g^* + (1-\rho_1)(\beta_2+\delta_2) G^* + (1-\rho_1)\left[1-(1-\rho_1)(\beta_1+\delta_1)-\rho_1(\beta_2+\delta_2)\right] T^* \\
& + \left[(1-\rho_2)-(1-\rho_1)(1-\rho_2)(\beta_1+\delta_1)-(1-\rho_1)\rho_2(\beta_2+\delta_2)\right] A_b \\
& + \left[(1-\rho_3)-(1-\rho_1)(1-\rho_3)(\beta_1+\delta_1)-(1-\rho_1)\rho_3(\beta_2+\delta_2)\right] A_m \\
& + \left[(1-\rho_4)-(1-\rho_1)(1-\rho_4)(\beta_1+\delta_1)-(1-\rho_1)\rho_4(\beta_2+\delta_2)\right] B
\end{aligned} \tag{19}
$$

$$
\begin{aligned}
G = {} & \rho_1(\beta_1+\delta_1) I_g^* + \rho_1(\beta_2+\delta_2) G^* + \rho_1\left[1-(1-\rho_1)(\beta_1+\delta_1)-\rho_1(\beta_2+\delta_2)\right] T^* \\
& + \left[\rho_2-\rho_1(1-\rho_2)(\beta_1+\delta_1)-\rho_1\rho_2(\beta_2+\delta_2)\right] A_b + \left[\rho_3-\rho_1(1-\rho_3)(\beta_1+\delta_1)-\rho_1\rho_3(\beta_2+\delta_2)\right] A_m \\
& + \left[\rho_4-\rho_1(1-\rho_4)(\beta_1+\delta_1)-\rho_1\rho_4(\beta_2+\delta_2)\right] B
\end{aligned} \tag{20}
$$

$$
\begin{aligned}
T = {} & (\beta_1+\delta_1) I_g^* + (\beta_2+\delta_2) G^* + \left[1-(1-\rho_1)(\beta_1+\delta_1)-\rho_1(\beta_2+\delta_2)\right] T^* - \left[(1-\rho_2)(\beta_1+\delta_1)+\rho_2(\beta_2+\delta_2)\right] A_b \\
& - \left[(1-\rho_3)(\beta_1+\delta_1)+\rho_3(\beta_2+\delta_2)\right] A_m - \left[(1-\rho_4)(\beta_1+\delta_1)+\rho_4(\beta_2+\delta_2)\right] B
\end{aligned} \tag{21}
$$

$$
\begin{aligned}
A_b = {} & (\beta_3+\delta_3) I_g^* + (\beta_4+\delta_4) G^* - \left[(1-\rho_1)(\beta_3+\delta_3)+\rho_1(\beta_4+\delta_4)\right] T + \left[1-(1-\rho_2)(\beta_3+\delta_3)-\rho_2(\beta_4+\delta_4)\right] A_b^* \\
& - \left[(1-\rho_3)(\beta_3+\delta_3)+\rho_3(\beta_4+\delta_4)\right] A_m - \left[(1-\rho_4)(\beta_3+\delta_3)+\rho_4\beta_4+\delta_4)\right] B
\end{aligned} \tag{22}
$$

$$
\begin{aligned}
A_m = {} & (\beta_5+\delta_5) I_g^* + (\beta_6+\delta_6) G^* - \left[(1-\rho_1)(\beta_5+\delta_5)+\rho_1(\beta_6+\delta_6)\right] T - \left[(1-\rho_2)(\beta_5+\delta_5)+\rho_2(\beta_6+\delta_6)\right] A_b \\
& + \left[1-(1-\rho_3)(\beta_5+\delta_5)-\rho_3(\beta_6+\delta_6)\right] A_m^* - \left[(1-\rho_4)(\beta_5+\delta_5)+\rho_4(\beta_6+\delta_6)\right] B
\end{aligned} \tag{23}
$$

$$
\begin{aligned}
B = {} & (\beta_7+\delta_8) I_g^* + (\beta_8+\delta_8) G^* - \left[(1-\rho_1)(\beta_7+\delta_7)+\rho_1(\beta_8+\delta_8)\right] T - \left[(1-\rho_2)(\beta_7+\delta_7)+\rho_2(\beta_8+\delta_8)\right] A_b \\
& - \left[(1-\rho_3)(\beta_7+\delta_7)+\rho_3(\beta_8+\delta_8)\right] A_m
\end{aligned} \tag{24}
$$

where

$$
\delta_1 = \frac{(\alpha_1+\sigma_1)(1-\rho_1)}{\Psi_1} - \beta_1,\ \delta_2 = \frac{(\alpha_2+\sigma_2)\rho_1}{\Psi_1} - \beta_2,\ \delta_3 = \frac{(\alpha_1+\sigma_1)(1-\rho_2)}{\Psi_2} - \beta_3,
$$

$$
\delta_4 = \frac{(\alpha_2+\sigma_2)\rho_2}{\Psi_2} - \beta_4,\ \delta_5 = \frac{(\alpha_1+\sigma_1)(1-\rho_3)}{\Psi_3} - \beta_5,\ \delta_6 = \frac{(\alpha_2+\sigma_2)\rho_3}{\Psi_3} - \beta_6,
$$

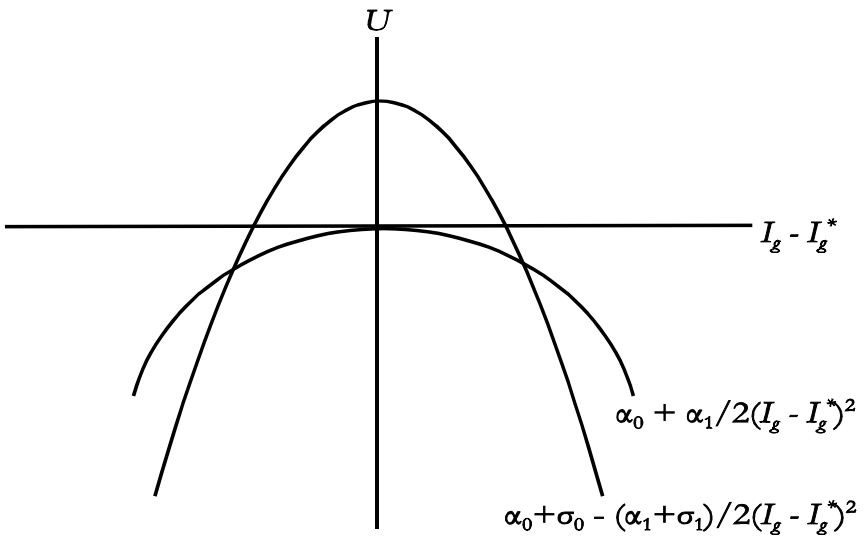
$$
\delta_7 = \frac{(\alpha_1+\sigma_2)(1-\rho_4)}{\Psi_4} - \beta_7,\ \delta_8 = \frac{(\alpha_2+\sigma_2)\rho_4}{\Psi_4} - \beta_8
$$

and

$$
\Psi_1 = (\alpha_1+\sigma_1)(1-\rho_1)^2 + (\alpha_2+\sigma_2)\rho_1^2 + (\alpha_3+\sigma_3),\ \Psi_2 = (\alpha_1+\sigma_1)(1-\rho_2)^2 + (\alpha_2+\sigma_2)\rho_2^2 + \alpha_4,
$$

$$
\Psi_3 = (\alpha_1+\sigma_1)(1-\rho_3)^2 + (\alpha_2+\sigma_2)\rho_3^2 + \alpha_5,\ \Psi_4 = (\alpha_1+\sigma_1)(1-\rho_4)^2 + (\alpha_2+\sigma_2)\rho_4^2 + (\alpha_6+\sigma_4).
$$

Figure 1: Utility Functions



Reduced form equations corresponding to R=1 are:

$$I_g = (\pi_1 + \eta_1)I_g^* + (\pi_2 + \eta_2)G^* + (\pi_3 + \eta_3)T^* + (\pi_4 + \eta_4)A_b^* + (\pi_5 + \eta_5)A_m^* \quad (25)$$

$$G = (\pi_6 + \eta_6)I_g^* + (\pi_7 + \eta_7)G^* + (\pi_8 + \eta_8)T^* + (\pi_9 + \eta_9)A_b^* + (\pi_{10} + \eta_{10})A_m^* \quad (26)$$

$$T = (\pi_{11} + \eta_{11})I_g^* + (\pi_{12} + \eta_{12})G^* + (\pi_{13} + \eta_{13})T^* + (\pi_{14} + \eta_{14})A_b^* + (\pi_{15} + \eta_{15})A_m^* \quad (27)$$

$$A_b = (\pi_{16} + \eta_{16})I_g^* + (\pi_{17} + \eta_{17})G^* + (\pi_{18} + \eta_{18})T^* + (\pi_{19} + \eta_{19})A_b^* + (\pi_{20} + \eta_{20})A_m^* \quad (28)$$

$$A_m = (\pi_{21} + \eta_{21})I_g^* + (\pi_{22} + \eta_{22})G^* + (\pi_{23} + \eta_{23})T^* + (\pi_{24} + \eta_{24})A_b^* + (\pi_{25} + \eta_{25})A_m^* \quad (29)$$

$$B = (\pi_{26} + \eta_{26})I_g^* + (\pi_{27} + \eta_{27})G^* + (\pi_{28} + \eta_{28})T^* + (\pi_{29} + \eta_{29})A_b^* + (\pi_{30} + \eta_{30})A_m^*$$

III. Data and Estimation Procedure

The parameters of equations (19) to (24) and (25) to (29) were estimated using 1960-97 time series data for the Philippines. As mentioned at the outset of this paper, the Philippines has had in place a World Bank- and IMF supported adjustment program since 1980. Moreover, it has received reasonably large levels of aid (around 1.5 percent of GNP during the late 1980s and early to mid-1990s) and persistent fiscal deficits (World Bank,

1997). Data were obtained mainly from Ahmed (1997), but supplemented by *Philippines Statistical Yearbook* (National Statistical Coordination Board, 1992-99), *Statistical Yearbook* (Central Bank of the Philippines, 1991-99) and the OECD's *Geographical Distribution of Financial Flows to Developing Countries* (OECD, 1991-99).[7] All financial data are expressed in millions of Philippine pesos at constant 1987 prices.

Data for the target variables, I_g^*, and G^* and T^* could not be obtained directly. Estimates of I_g^*, and G^* were consequently derived from a cointegrating regression of vectors of exogenous regressors on each actual variable. The fitted values obtained from these regressions were taken as approximations of the target values. This is basically the approach used by Gang and Khan (1991), Khan and Hoshino (1992), Franco-Rodriguez *et al.* (1998) and most other fiscal response studies.[8] Private investment, GDP and the PSBR were regressed on I_g and GDP, primary and secondary school enrolments and the PSBR were regressed on G. Each regressor was lagged one period in accordance with a naive expectations framework. A constant term was used in each regression.

The structural equations were estimated using the non-linear three-stage least squares method. This method is appropriate given that the system is simultaneous and that it contains cross-equation restrictions with respect to the ρ and β parameters. In particular, it is relatively efficient compared to alternatives, such as two-stage least squares. Estimates of the reduced form parameters were obtained via simulations of the estimated structural equations. All estimates of structural parameters which were judged to be insignificantly zero were set to zero in this exercise.

IV. Results

Statistically satisfactory results were obtained from estimating the structural equations, despite the relatively large number of parameters involved. In the final analysis, each equation has high functional fits and few estimation problems were encountered with convergence being achieved after relatively few iterations.[9] The adjustment programme variable R was initially set to zero, for all years up to 1980 and one thereafter. This corresponds with the first policy-based loan to the Philippines in 1980. After some experimentation R was subsequently set to zero for all years prior to 1986 and one thereafter. Results reported below correspond to this treatment. The conclusion one is

tempted to draw from this is that economic reform was ineffective with respect to the public sector, either due to lagged impacts, policy defects, political will, non-implementation or a combination of such factors until 1986.

Structural parameter estimates are shown in Table 1. Twelve of the twenty estimates are significantly different from zero. The estimated values of the ρ parameters, from the inequality constraint, equation (4), provide insights into the allocation of aid, taxes and borrowing between the consumption and investment budgets. Each of these four parameters is significantly different from zero. Overall, a degree of fiscal indiscipline is suggested, especially with respect to the allocation of borrowing and multilateral aid. The entirety of multilateral aid inflows has remained in the consumption budget based on the estimate of ρ_3, which is unity. It follows that none of these funds have been allocated to fixed investment. Donors would certainly be unhappy with this as aid is typically intended for capital accumulation. While some proportion of consumption expenditure will have a human capital orientation (such as salaries of school teachers), that all multilateral aid has been allocated to consumption expenditure is clearly at extreme variance with this principle. That 100 percent of this form of aid has been allocated to consumption also suggests that multilateral aid to the Philippines has been highly fungible. Broadly similar conclusions can be drawn for bilateral aid. Based on the estimate of ρ_2, the majority of these funds have been allocated to consumption and the minority, therefore, to fixed investment. Policy observers would perhaps frown on the finding that 99.9 percent of borrowing being allocated to the consumption budget, which appears to be the case in the Philippines given the estimate of ρ_4. Finally, with respect to the constraint equation parameters, it would appear that just over three-quarters of taxation and other recurrent revenue have been allocated to consumption, given the estimate of ρ_1.

Table 1
Econometric Estimates of Structural Equation Parameters

Parameter	Estimate	*t*-ratio
ρ_1	0.755*	27.51
ρ_2	0.659*	2.63
ρ_3	1.000*	2.65
ρ_4	0.999*	15.27
β_1	4.498*	4.33
β_2	-0.077*	-0.23
β_3	0.815	2.40
β_4	0.381*	2.78
β_5	-0.009	-0.21
β_6	-0.013	-0.31
β_7	2.210*	3.68
β_8	-0.114	-0.22
δ_1	-14.449*	-5.59
δ_2	1.838	1.59
δ_3	4.651*	1.99
δ_4	-1.467*	-2.35
δ_5	0.607*	1.80
δ_6	-0.076	-0.63
δ_7	2.386	0.48
δ_8	0.373	0.34

* significantly different from zero at 90% confidence level

Summaries of the direct impacts of the aid and adjustment variables, which can be judged from the estimated structural equations, are shown in Table 2. Parameters which are insignificantly different from zero at set to zero in calculating these impacts. Multilateral aid (including that tied to policy reform) appears to have a negative direct incremental impact on investment, consumption, taxation and bilateral aid in the presence of an adjustment program and positive such impact in these variables in the absence of a program. Multilateral aid has a positive direct incremental impact on borrowing irrespective of whether a program is present. The numerical extent of this impact does not differ between program and non-program presence scenarios. Of these results, those relating to investment and consumption are the most worrying for structural adjustment

Table 2
Econometric Estimates of Direct Impacts of Aid Variables

Impact		Mechanism	Estimate
A_b on I_g	(R=1)	$(1-\rho_2)-(1-\rho_1)(1-\rho_2)(\beta_1+\delta_1) - (1-\rho_1)\rho_2(\beta_2+\delta_2)(1-\rho_2) - (1-\rho_1)(1-\rho_2)\beta_1-(1-\rho_1)\rho_2\beta_2$	0.88
	(R=0)		-0.04
A_b on G	(R=1)	$\rho_2 - \rho_1(1-\rho_2)(\beta_1+\delta_1) - \rho_1\rho_2(\beta_2+\delta_2)\rho_2 - \rho_1(1-\rho_2)\beta_1 - \rho_1\rho_2\beta_2$	2.29
	(R=0)		3.20
A_b on T	(R=1)	$-[(1-\rho_3)(\beta_1+\delta_1)+\rho_3(\beta_2+\delta_2)] - [(1-\rho_3)\beta_1+\rho_3\beta_2]$	2.17
	(R=0)		3.38
A_b on A_m	(R=1)	$-[(1-\rho_2)(\beta_5+\delta_5)+\rho_2(\beta_6+\delta_6)] - [(1-\rho_2)(\beta_5+\delta_5)+\rho_2\beta_6]$	-0.21
	(R=0)		0.00
A_b on B	(R=1)	$-[(1-\rho_2)(\beta_7+\delta_7)+\rho_2(\beta_8+\delta_8)] - [(1-\rho_2)\beta_7+\rho_2\beta_8]$	-0.75
	(R=0)		-0.75
A_m on I_g	(R=1)	$(1-\rho_3)-(1-\rho_1)(1-\rho_3)(\beta_1+\delta_1) - (1-\rho_1)\rho_3(\beta_2+\delta_2)(1-\rho_3) - (1-\rho_1)(1-\rho_3)\beta_1-(1-\rho_1)\rho_3\beta_2$	-0.85
	(R=0)		0.01
A_m on G	(R=1)	$\rho_3 - \rho_1(1-\rho_3)(\beta_1+\delta_1) - \rho_1\rho_3(\beta_2+\delta_2)\rho_3 - \rho_1(1-\rho_3)\beta_1-\rho_1\rho_3\beta_2$	-1.16
	(R=0)		1.44
A_m on T	(R=1)	$-[(1-\rho_2)(\beta_1+\delta_1)+\rho_2(\beta_2+\delta_2)] - [(1-\rho_2)\beta_1+\rho_2\beta_2]$	-3.02
	(R=0)		0.45
A_m on A_b	(R=1)	$-[(1-\rho_3)(\beta_3+\delta_3)+\rho_3(\beta_4+\delta_4)] - [(1-\rho_3)\beta_3+\rho_3\beta_4]$	1.75
	(R=0)		-0.34
A_m on B	(R=1)	$-[(1-\rho_3)(\beta_7+\delta_7)+\rho_3(\beta_8+\delta_8)] - [(1-\rho_3)\beta_7+\rho_3\beta_8]$	0.22
	(R=0)		0.22

Table 2 (continued)
Econometric Estimates of Direct Impacts of Aid Variables

Impact	Mechanism	Estimate
R on I_g	$(1-\rho_1)\delta_1 + (1-\rho_2)\delta_2+(1-\rho_1)[1-(1-\rho_1)\delta_1-\rho_1\delta_2] + [(1-\rho_2)-(1-\rho_1)(1-\rho_2)\delta_1-(1-\rho_1)\rho_2\delta_2] + [(1-\rho_3)-(1-\rho_1)(1-\rho_3)\delta_1-(1-\rho_1)\rho_3\delta_2] + [(1-\rho_4)-(1-\rho_1)(1-\rho_4)\delta_1-(1-\rho_1)\rho_4\delta_2]$	-2.50
R on G	$\rho_1 +\delta_1\rho_1 + [1-(1-\rho_1)\delta_1-\delta_1\rho_2] + [\rho_2-\rho_1(1-\rho_2)\delta_1-\delta_1\rho_2\delta_2] + [\rho_3-\rho_1(1-\rho_3)\delta_1-\rho_1\rho_3\delta_2] + [\rho_4-\rho_1(1-\rho_4)\delta_1-\rho_1\rho_4\delta_2]$	-5.48
R on T	$\delta_1 + \delta_2 + [1-(1-\rho_1)\delta_1-\rho_1\delta_2] - [(1-\rho_2)\delta_1-\rho_2\delta_2] - [(1-\rho_3)\delta_1-\rho_3\delta_2] - [(1-\rho_4)\delta_1-\rho_4\delta_2]$	0.70
R on A_b	$\delta_3 + \delta_4 - [(1-\rho_1)\delta_3-\rho_1\delta_4] + [1-(1-\rho_2)\delta_3-\rho_2\delta_4] - [(1-\rho_3)\delta_3-\rho_3\delta_4] - [(1-\rho_4)\delta_3-\rho_4\delta_4]$	7.06
R on A_m	$\delta_5 + \delta_6 - [(1-\rho_1)\delta_5-\rho_1\delta_6] - [(1-\rho_2)\delta_5-\rho_2\delta_6] + [1-(1-\rho_3)\delta_5-\rho_3\delta_6] - [(1-\rho_4)\delta_5-\rho_4\delta_6]$	1.31
R on B	$\delta_8 + \delta_8 - [(1-\rho_1)\delta_7-\rho_1\delta_8] - [(1-\rho_2)\delta_7-\rho_2\delta_8] - [(1-\rho_3)\delta_7-\rho_3\delta_8]$	0.00

as they suggest that the presence of a program is associated with changes in behaviour relationships which run counter to the program's objectives. The direct incremental impacts of bilateral aid are more encouraging. These impacts are positive in the cases of consumption and taxation in both program and non-program presence scenarios, although are numerically smaller in the latter scenario. This form of aid has a negative impact on borrowing, of equal magnitudes in both scenarios. It has relatively small, negative impact on investment in the presence of a program and a positive impact in the absence of a program. Among the direct results of the presence of a program itself, as opposed to any behaviour changes with which it is associated, are reductions in both consumption and fixed investment expenditure. The second of these outcomes is also counter to the aims of the Philippines' IMF- and World Bank-supported structural adjustment program. It has though increased taxation and other recurrent revenue slightly, but led to larger increases in the inflow of multilateral and especially bilateral aid inflows. There seems to have been no direct impact of the presence of a program on borrowing.

The preceding results are of course partial to the extent that they ignore indirect feedbacks, operating through the simultaneous system of structural equations. Most also relate to changes in endogenous variables. Of greater policy relevance is the total, direct and indirect, impacts of exogenously determined changes in revenues, especially the impact of multilateral aid on saving, taxation and investment as shown by the reduced equation parameters. In the case of multilateral aid, these largely result from decisions by donors (including the World Bank and the IMF) to alter the level of aid commitments to the Philippines. Given equations (3) and (25) to (29), it follows that multilateral aid is associated with improvements in public sector saving and increases in taxes (and the tax base for a given level of GNP) and in public investment if, respectively, $\pi_{15} > \pi_{10}$, $\pi_{15} > 0$ and $\pi_5 > 0$. Bilateral aid is associated with these respective outcomes if $\pi_{14} > \pi_9$, $\pi_{14} > 0$ and $\pi_4 > 0$. Similarly, the presence of an adjustment programme further contributes to these respective outcomes if $\eta_{11} + ... + \eta_{15} > \eta_6 + ... + \eta_{10}$, $\eta_{11} + ... + \eta_{15} > 0$ and $\eta_1 + ... + \eta_5 > 0$.

Estimates of selected reduced form parameters are reported in Table 3. Two sets of parameters are reported: point estimates and (non-point) estimates, the latter obtained in simulations in which structural parameters found above to be insignificantly different

Table 3
Estimates of Selected Reduced Form Parameters

		Estimate	
Impact	**Parameter**	**Non-point**	**Point**
A_b^* on I_g	π_4	-0.001	-0.0001
A_m^* on I_g	π_5	-0.0004	-0.0005
A_b^* on G	π_9	-0.0003	-0.003
A_m^* on G	π_{10}	-0.0004	-0.0004
A_b^* on T	π_{14}	-0.003	-0.003
A_m^* on T	π_{15}	-0.003	-0.002
A_b^* on A_b	π_{19}	-0.14	-0.140
A_m^* on A_b	π_{20}	0.001	0.001
A_b^* on A_m	π_{24}	0.0003	0.002
A_m^* on A_m	π_{25}	1	1.090
A_b^* on B	π_{29}	0.0001	0.0003
A_m^* on B	π_{30}	0.0002	-0.0001
R on I_g	$\eta_1 + ... + \eta_5$	-134.55	-134.73
R on G	$\eta_6 + ... + \eta_{10}$	-403.6	-403.82
R on T	$\eta_{11} + ... + \eta_{15}$	-538.25	-538.97
R on A_b	$\eta_{16} + ... + \eta_{20}$	52.46	52.94
R on A_m	$\eta_{21} + ... + \eta_{25}$	60.96	47.72
R on B	$\eta_{26} + ... + \eta_{30}$	0.26	332.16

from zero were set to zero. Multilateral aid, based on both estimates, is associated with slight incremental reductions in public sector saving, decreases in public fixed investment and taxation and other recurrent revenue. Bilateral aid is also associated with these changes, although it had no net impact on saving is guided solely by the point estimates. These are not good results for aid to the Philippines, multilateral aid especially given the structural reforms to which much of this aid has been tied since 1980. Results for the presence of a structural adjustment program *per se* are even worse. Indeed, they are damning. The presence of a program from 1986 onwards, however, has had a strongly negative impact on saving. Given the estimates of $\eta_6 + ... + \eta_{10}$ and $\eta_{11} + ... + \eta_{15}$, such a programme has from 1986 been associated with reductions in public sector saving in the Philippines by 135 million pesos per year in 1987 prices. The Philippines' reform programme has since 1986

been associated with reductions in taxation and public investment given the estimates of $\eta_1 + ... + \eta_5$ and $\eta_{11} + ... + \eta_{15}$, by 135 million and just under 539 million peso per year, respectively, in 1987 prices. These outcomes are consistent with a very stringent, perhaps pulverising "big-bang" implementation of stabilisation measures which do not discriminate between the various public sector fiscal aggregates.

V. Conclusion

This paper attempted to analyse expenditure and revenue decision of the public sector in the Philippines, taking special account of the impact of multilateral aid flows and the presence of a programme of economic reform on these decisions. Included in these flows are World Bank and IMF structural adjustment loans; the Philippines introduced an adjustment programme in late 1980 and received this sort of lending throughout the 1980s and early 1990s. A motive for the paper's analysis was to consider whether this aid promotes behaviour which is inconsistent with the aims of the Philippines' adjustment program, which is typical of programs world-wide. These aims include the expansion of the tax base, reductions in fiscal deficits and increases in public investment. Behaviour such as aid- induced reductions in taxation, public sector saving and is counter to these aims. Evidence of such behaviour was observed with respect to investment and taxation. Moreover, the presence of a programme actually seemed to worsen these outcomes, hence confirming the fears expressed at the outset of this paper.

Notes

1. See, for example, Chisti and Hasan (1992), Binh and McGillivray (1993), Gang and Khan (1993), McGillivray (1994, 2000), Khan (1994) and White (1994), Gang and Khan (1999) and Franco-Rodriguez (2000),

2. Other fungibility studies include Khilji and Zampelli (1991, 1994), Cashell-Cordo and Craig (1990) and Pack and Pack (1990).

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

4. The following comments are based on research on aid allocation. McGillivray and White (1993) provide a survey of the relevant literature, along with a discussion of the analytical differences between disbursements and commitments.

5. This is also a justification for treating the targets for investment, consumption, taxation and borrowing as exogenous. They apply to period t, but are determined in period t-1 or earlier. Moreover, in some cases they will not be determined by the fiscal decision makers. These decision makers are given targets, and they must work towards their achievement. As such they are not a choice variable, subject to the preferences of these decision makers.

6. Conway (1994a, 1994b) and Fielding (1997) also consider this issue. They overlook the issue of lags and treat the presence of a program as endogenous.

7. It is not possible on econometric and data availability grounds to disaggregate multilateral aid into that tied to structural reforms and that not tied to such reforms. Conclusions drawn below should be treated with this in mind.

8. It is acknowledged that this is a problematic means of obtaining the target values, but in the absence of actual values or an established theory of target determination there would appear to be little option but to use this approach. This is an important area for future research.

9. Further details can be obtained from the author.

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