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Foreign Aid and the Financing of Service Delivery in Papua New Guinea

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ABSTRACT

How much foreign aid given to PNG has stayed within the sectors to which it has been allocated and how much has it allowed the PNG Government to free up its own resources for other spending priorities? This paper measures the extent to which donor finance has contributed to higher rates of spending in three key development sectors of the PNG economy—health, education and infrastructure between 1974 and 2008. Results show that high rates of fungibility have occurred within PNG during this time. The PNG Government has placed the least priority on additional rates of health spending and most priority on additional infrastructure spending, although all sectors have increased by only a fraction of the amount of aid given. The results also compare the impact of budget support *vis-à-vis* project and program aid to induce higher rates of spending in each of these sectors. A number of policy implications follow.

1. Introduction

Papua New Guinea's (PNG's) continued slow rates of progress towards achieving key social welfare targets such as the Millennium Development Goals (MDGs) reflects poor rates of access by large portions of the population to essential public services such as health, education and national infrastructure networks. Helping the PNG Government to improve access to these basic services is thus a central challenge for PNG's major bilateral and multilateral donor partners, particular as they increasingly focus their efforts towards MDG targets.

Batten (2009) considered how donor finance has influenced the PNG Government's management of its fiscal aggregates such as levels of borrowing, domestic revenue collection and its impact on aggregate expenditure levels. This analysis showed that at the aggregate level it was the PNG Government's response to the aid inflow, rather than donor priorities, that determined its overall impact on financing additional spending on pro-development activities. In particular it highlighted that large portions of foreign aid have had a weak overall impact on improving the amount of resources made available to pay for key social service delivery items within the PNG budget. This analysis was, however, limited in its ability to account for the impact of donor finance on spending in specific sectors by not accounting for the proportion of aid which has actually been delivered to those sectors.

This paper seeks to build on the analysis of Batten (2009) by addressing two additional questions. Firstly, what impact has foreign aid had on total funding levels for three core service delivery priorities—health, education and infrastructure—in relation to the funding of general government consumption expenditure? Secondly, to what extent has the shift from general budgetary support to earmarked aid modalities such as project and program aid improved the amount of funding being provided to these three key service delivery sectors?

Calculations of fungibility parameters in PNG are complicated by the fact that between 1975 and 2008 it has received approximately 57 per cent of its foreign assistance in the form of direct budgetary support. As such, this paper extends the literature by calculating three different sets of parameters to measure the impact of foreign aid on sectoral expenditure levels. The first, measure the extent to which project and program aid has augmented or replaced PNG Government funding to that sector; the second, measure the proportion of budget support which was allocated to these

sectors vis-à-vis general government consumption; and the third, combines the first two sets of parameters to measure the aggregate impact of a dollar increase in foreign aid allocated at its mean historical values.

A number of authors have outlined their opposition using inter sectoral fungibility as a means of assessing the effectiveness of foreign aid (White 1998; Holmqvist 2000; McGillivray and Morrissey 2000; McGillivray and Morrissey 2001a; McGillivray and Morrissey 2001b). These authors highlight that from a theoretical standpoint there is little a priori reason to believe that fungible aid will be any less effective than non fungible aid. Indeed, all that is required in order for fungibility to exist is a simple difference in the expenditure priorities between donor and recipient. This issue was analysed by Peterson (2007) who showed that despite an average of 65 per cent of sectoral aid being spent outside of its intended sector, there was no evidence that non fungible aid works better at encouraging growth than fungible aid (Peterson 2007:1081).

This is an important point and it should be noted at the outset that this paper does not seek to judge the effectiveness of aid flows in PNG on the basis of whether they have been fungible, nor would the existence of fungibility constitute a justification for a reduction of aid flows. Rather, this paper uses the categorical fungibility framework to analyse both the impact of aid on sectoral expenditure levels and on the ability of earmarked aid vis-à-vis budgetary support to induce higher expenditure in priority development sectors of the PNG economy. Understanding how these two competing forms of aid delivery influence sectoral spending outcomes can offer some important insights into the design of future aid modalities seeking to provide additional finance for the attainment of MDG priorities.

2. Literature Review

The categorical fungibility literature is concerned specifically with how aid funds have influenced the total availability of resources within sectors of the recipient economy. In particular it seeks to determine to what extent the recipient government has altered its own sectoral expenditure in response to foreign resource inflows. Two approaches have been taken to measuring this sectoral fungibility.

2.1 Utility Maximisation Studies

The first approach to measuring the sectoral fungibility of aid derives a set of simultaneous linear expenditure equations from a recipient government that, it is assumed, maximises its utility function by distributing resources across each sector of the economy. Using this approach, Khilji and Zampelli (1991) find that in the case of Pakistan aid has indeed been highly fungible. However, instead of financing unproductive expenditure the majority of freed up resources are transferred to lower the tax burden on domestic constituents.¹ Studying the effects of foreign aid on intergovernmental financing in India, Swaroop et al. (2000) find on the other hand that foreign aid simply acted as a substitute for spending that the government would have undertaken anyway—with freed up funds almost entirely reallocated to non-development activities such as defence and public administration. Feyzioglu et al. (1998) consider a panel of 38 aid recipients for the period 1970–90. These authors also find that for three of the five sectors examined foreign aid has been highly fungible. The authors then conclude that because most aid appears to be fungible assessing the impact of aid on individual sectors offers little in the way of capturing the full effect of foreign assistance. Instead they argue, foreign aid should be assessed against its contribution to the entire public sector expenditure behaviour of the recipient government.

One criticism of the method adopted in papers such as Feyzioglu et al. (1998) is that because individual recipient bureaucracies respond in vastly different ways to aid inflow, a panel data approach is likely to aggregate important heterogeneous impacts of aid, resulting in a loss of important information. Another criticism of papers such as those by Feyzioglu et al. (1998) and Swaroop et al. (2000) relates to the utility specification which they adopt for government preferences. Their approach distinguishes between two types of expenditure—those to which aid is allocated and others which receive no aid. Authors such as McGillivray and Morrissey (2000a:421) have argued that this assumption is acceptable only if there is reason to believe that these two types of expenditure can be separated within the government's utility function such that aid funds can only affect government consumption decisions through the fungible portion whilst non fungible aid has no impact. Indeed, as Feyzioglu et al. (1998:34) highlight, this requires that 'aid affects the government's choice [over all public goods] only through the fungible portion; public goods purchased from the non fungible part do not affect this choice'. Given the inter related nature of all

¹ Khilji and Zampelli (1994) also find that aid flows had been highly fungible with a large portion of the assistance being used to finance higher levels of private sector consumption and allowing the government to lower aggregate tax collection efforts.

these expenditures, however, there is no reason for this to be the case. In fact, one of the central features of categorical fungibility highlights that if aid funding of one sector increases, then the fungible portion of that aid allows government to increase all other expenditures.

2.2 Community Indifference Curve Studies

The second method of calculating categorical fungibility also focuses on estimating a system of interdependent fiscal equations following an inflow of aid. In this case, government choices are made via indifference curves which express preferences for combinations of expenditure, subject to budget constraints which include both domestic revenues plus foreign aid (Pack and Pack 1993:259). While this approach is more ad hoc than the previous one, it does have the advantage of allowing the impact of aid receipts to affect government expenditure allocations across all areas of the budget, both aid-receiving and non aid-receiving. This approach is also useful for this paper because it helps distinguish between types of aid which are allocated to specific sectors (project and program aid) and those which simply augment general government revenue (budgetary support).

Pack and Pack (1990) provide one of the earliest examples of this literature. The authors estimate the impact of aid inflows on a number of development and non development (current) expenditures for Indonesia between 1966 and 1986. They find that aid has tended to increase development expenditures, with funds remaining within those sectors for which they were intended. Additionally, they find that aid has tended to stimulate rather than reduce domestic revenue collection, alleviating concerns about the ability of aid to undermine the government's incentive to tax domestic constituents. Cashel-Cordo and Craig (1990) study a panel of 46 countries between 1975 and 1980 to determine what impact total aid flows have had on the size and composition of government expenditure by focusing on expenditure categories which distinguish between defence and non defence spending. They find that, in general, aid has had a stimulatory effect on public spending but that little to none of this has spilt over into the defence budget.

Pack and Pack (1993) follow a similar method to their earlier paper in analysing the affect of aid on the Dominican Republic between 1968 and 1986. In contrast to the findings of their earlier paper, the authors find that the receipt of aid by recipients had been followed by major shifts in allocation from development expenditures to deficit reduction, debt service and, to a lesser extent, own-source

revenue reduction.² This shift in allocation, they conclude, has dramatically thwarted donors' attempts to increase funding levels to key development sectors of the economy which the authors say may also be why cross-country analyses have found that aid contributes little to GDP growth (Pack and Pack 1993:264). Likewise, Van de Sijpe (2004:30) finds that after controlling for both on and off-budget aid flows for a panel of 105 countries between 1990 and 2003, education aid has had no discernible effect on education spending, while the effect of health aid on public health spending has been much smaller than the additional aid resources.

Tiwara (2007) then replicates the model developed in Pack and Pack (1990) to study the effects of aid fungibility in Nepal between 1976 and 2001. The author finds that aid intended for a particular sector has, by and large, been spent within that sector and, in some cases, has induced the government to augment its own spending to that sector.

2.3 Research Gap

A limitation of community indifference curve studies has been their treatment of what are termed 'residual' aid flows. The approach taken in all of these studies has been to select a number of sectors, i , for which fungibility is a concern (typically pro poor expenditure sectors such as health and education). All the residual, non i th sector expenditures are then placed into an 'other' or 'general' expenditure category. Likewise, aid flows are then classified on a similar sectoral basis such that all non i th sector aid flows are also included in a 'general' aid category. However, the assumption here is that project and program aid intended for other sectors not included in i , and other forms of aid delivery, such as non earmarked budget support, are treated equally by the government in its decisions over inter sectoral transfers. The weakness with this assumption is that project and program aid not included in any of the i -sectors has still been allocated to a specific activity whereas aid delivered through budgetary support has simply augmented domestic revenue collection.

This means that budgetary support will be allocated entirely on the basis of government preferences whilst the portion of the residual project aid which is transferred will depend upon the degree to which the recipient government perceives it to be fungible. Given this, the inclusion of budgetary support in the residual project and program aid variable is likely to lead to an over estimate of the

² Notably, the authors do find some evidence of the flypaper effect in the agriculture, public works and social services sectors. However, this effect did not appear to translate into more than proportional increases in government expenditures at the aggregate level (Pack and Pack 1993:264).

amount of fungibility taking place from these residual aid allocations. This issue is particularly important in the case of PNG which has received approximately 57 per cent of its total foreign assistance in the form of budgetary support in the post independence era.

In its analysis of PNG, this paper extends the literature by considering a model which allows for divergent impacts between each of these different types of aid delivery. In addition to reducing the potential for an upward bias of fungibility estimates, this model also facilitates a comparison of the impact of budgetary support and project/program aid on key development sectors of government spending.

3. The Model

The basic model to be estimated builds on Peterson (2007) and Pack and Pack's (1990; 1993) model, to which is added the disaggregation of foreign grants into project aid and budgetary support. This creates a number of differences in the fungibility calculations which are discussed in the text. This paper also focuses on three categorical expenditure items—health, education and infrastructure. The decision to consider these three sectors was made on the basis of data availability and on the basis of the prominent role that each sector plays in PNG's ability to achieve a large number of its MDG targets.³ All remaining project and program aid flows and expenditure are included in a general expenditure/aid category. The basic model to be estimated consists of a system of interdependent fiscal relationships of the form:

$$ED_{i,t} = f(gdp_t, AD_{i,t}, AO_{i,t}, BS_t) \quad (1)$$

$$EG_t = f(gdp_t, AG_t, AO_{G,t}, BS_t) \quad (2)$$

$$REV_t = f(gdp_t, A_t, BS_t) \quad (3)$$

Where $ED_{i,t}$ is government expenditure on development sector i at time t . $AD_{i,t}$ is project aid allocations made to development sector i at time t . $AO_{i,t}$ is the remaining project aid allocations made to all development sectors other than sector i at time t . EG_t is general government expenditure made to all other non development sectors at time t . $AO_{G,t}$ is aid allocations not made to the general

³ For example, four of the eight MDGs are primarily concerned with health and education. These include MDG2: Achieve universal primary education; MDG4: Reduce child mortality; MDG5: Improve maternal health; and MDG6: Combat HIV/AIDS, malaria, and other diseases.

category at time t . A_t is total project aid allocations to all sectors which is equal to $\sum_i AD_{i,t} + AG_i$. BS_t is non sector or activity specific budget support grants at time t and REV_t is domestically generated revenue. Because of the static nature of the estimation process and the need for consistency with the literature, the fiscal system also includes a measure of GDP per capita, gdp_t , to control for the impact of the economic environment on spending and revenue levels. All variables are measured in per capita natural logarithms in constant 1999 prices.

The Bougainville crisis was a traumatic episode for the political, economic and fiscal management of PNG. To control for this event and to determine whether it has had any structural effect on the expenditure and revenue management of the PNG economy, a dummy variable (dum) is also included in the estimations. This variable takes the value of zero for 1974–88 and one for 1989–2008. This leads to the estimation of the following system of equations:

$$\begin{aligned} \ln EE_t = & \beta_{0,EE} + \beta_{1,EE} \ln GDP_t + \beta_{2,EE} \ln AE_t + \beta_{3,EE} \ln AO_{EE,t} \\ & + \beta_{4,EE} \ln BS_t + \beta_{5,EE} dum + \varepsilon_{EE,t} \end{aligned} \quad (4)$$

$$\begin{aligned} \ln EH_t = & \beta_{0,EH} + \beta_{1,EH} \ln GDP_t + \beta_{2,EH} \ln AH_t + \beta_{3,EH} \ln AO_{EH,t} \\ & + \beta_{4,EH} \ln BS_t + \beta_{5,EH} dum + \varepsilon_{EH,t} \end{aligned} \quad (5)$$

$$\begin{aligned} \ln EI_t = & \beta_{0,EI} + \beta_{1,EI} \ln GDP_t + \beta_{2,EI} \ln AI_t + \beta_{3,EI} \ln AO_{EI,t} \\ & + \beta_{4,EI} \ln BS_t + \beta_{5,EI} dum + \varepsilon_{EI,t} \end{aligned} \quad (6)$$

$$\begin{aligned} \ln EG_t = & \beta_{0,EG} + \beta_{1,EG} \ln GDP_t + \beta_{2,EG} \ln AG_t + \beta_{3,EG} \ln AG_{EG,t} \\ & + \beta_{4,EG} \ln BS_t + \beta_{5,EG} dum + \varepsilon_{EG,t} \end{aligned} \quad (7)$$

$$\begin{aligned} \ln REV_t = & \beta_{0,REV} + \beta_{1,REV} \ln GDP_t + \beta_{2,REV} \ln A_t \\ & + \beta_{3,REV} \ln BS_t + \beta_{4,REV} dum + \varepsilon_{REV,t} \end{aligned} \quad (8)$$

In each period the government must satisfy an inter temporal budget constraint equal to:

$$\begin{aligned} REV_t + AE_t + AH_t + AI_t + AG_t + BS_t + DEF_t \\ = EE_t + EH_t + EI_t + EG_t + DS_t \end{aligned} \quad (9)$$

Which upon aggregation of the project aid and expenditure variables simplifies to:

$$REV_t + \sum_{i=1} A_{i,t} + BS_t + DEF_t = \sum_{i=1} E_{i,t} + DS_t \quad (10)$$

Where DS_t is debt servicing costs and DEF_t is the government's budget deficit or surplus. As has become standard in the literature, debt servicing is assumed to be exogenous and in this case included in the general government expenditure category, both to preserve degrees of freedom and to keep the model tractable.

Equation (10) implies that the identities shown in Equations (4–8) are jointly determined and hence not independent of one another. This situation violates the OLS assumption of zero error term correlation and will lead to any OLS coefficient estimates being both biased and inconsistent. To deal with this issue, a systems estimation procedure known as SUR is utilised. SUR is a version of multivariate linear regression developed by Zellner (1962) which solves the minimal error variance for the estimated parameters through the simultaneous estimation of the system of equations.⁴ This procedure corrects for the correlation across the error terms in each equation, improving the efficiency of the coefficient estimates (Wooldridge 2002:144).⁵ For the purposes of estimation, the budget deficit or net borrowing is taken as the excluded variable from the system of jointly determined equations to prevent the estimation of an identity in Equations (4–8).

For each of the development expenditure Equations (4–6), a positive elasticity coefficient on the respective aid allocation variable ($\beta_{2,Ei} > 0 \ i = E, H, I$) would indicate that an increase in aid funding results in increased categorical expenditures for each respective sector. On the other hand, a positive elasticity estimate on the other aid allocation variable ($\beta_{3,Ei} > 0 \ i = E, H, I$) would indicate a transfer of resources from other aid funded activities to that expenditure category. Likewise, a positive elasticity estimate on the budgetary support coefficient ($\beta_{4,Ei} > 0 \ i = E, H, I$) would

⁴ Seemingly unrelated regression estimates are obtained by first estimating a set of non linear equations with cross-equation constraints imposed, but with a diagonal covariance matrix of the disturbances across equations. These parameter estimates are used to form a consistent estimate of the covariance matrix of the disturbances, which is then used as a weighting matrix when the model is re estimated to obtain new values of the parameters. These estimates are consistent and asymptotically normal and, under some conditions, asymptotically more efficient than the single equation estimates.

⁵ Notably, estimating a system of equations simultaneously only improves the efficiency of the coefficient estimates if there is some connection between each of the equations of interest (Kennedy 2003:314).

indicate that an increase in un earmarked aid funding leads to an increase in expenditure for that development expenditure category.⁶

The aggregate impact of fungibility on expenditure allocations will then depend on all three of these estimated coefficients. This total affect of aid will determine the degree to which fungibility has distorted, if at all, final expenditure allocations for each sector. This approach builds on Pack and Pack (1990:192) and simulates the effect of a percentage increase in total foreign aid per capita (project aid and budgetary support) on each of the expenditure categories.

To do this, the elasticity coefficients together with the historical averages of each of the categories for aid are used to calculate the change in each of the expenditure categories, as well as own-revenues, which results from a simultaneous change in each of the categories of foreign aid. The initial categorical levels of foreign aid are equal to \bar{A}_i/\bar{A} where \bar{A} is total foreign aid and \bar{A}_i is the average level of foreign aid given to category i across the period. For Equation (6.4) the elasticity effect with respect to education aid is equal to:

$$\frac{\partial \ln EE}{\partial \ln EA} = \hat{\beta}_{2EE}$$

where given that EE and EA are measured in natural logarithms, $\hat{\beta}_{2EE}$ represents an elasticity coefficient. This elasticity of education expenditures with respect to education project and program aid can thus be written as:

$$\begin{aligned}\hat{\beta}_{2EE} &= \frac{\Delta EE_t}{\Delta AE_t} \cdot \frac{AE_t}{EE_t} \\ \Rightarrow \frac{\Delta EE_t}{\Delta AE_t} &= \beta_{2EE} \cdot \frac{EE_t}{AE_t}\end{aligned}$$

Multiplying this term by the proportion of an overall aid per capita increase which is allocated to the education sector based on historical averages gives:

$$\frac{\Delta EE_t}{\Delta AE_t} = \beta_{2EE} \frac{EE_t}{AE_t} \frac{\bar{A}_E}{\bar{A}}$$

⁶ It should be noted that from a theoretical perspective it is also required that the sum of the budgetary support coefficients across all the expenditures not exceed 1.

where \overline{A} is total foreign aid and $\overline{A_e}$ is the average amount of total aid given to the education sector. This can then be rewritten as:

$$d\hat{E}E_{EA,t} = \hat{\beta}_{2EE} \frac{EE_t}{AE_t} dAE$$

where $d\hat{E}E_{EA,t}$ is the total change in education expenditure from a prorated change in project aid allocated to the education sector. Completing the same process for the other project aid and budgetary support variables then gives the total effect of an increase in aid on education expenditures. This can be written as:

$$d\hat{E}E_t = \hat{\beta}_{2EE} \frac{EE_t}{AE_t} dAE + \hat{\beta}_{3EE} \frac{EE_t}{AO_{EEt}} dAO + \hat{\beta}_{4EE} \frac{EE_t}{BS_t} dBS \quad (11)$$

where $d\hat{E}E_t$ is the total change in education expenditures from an increase in foreign aid of all types—project aid given to education, other project aid and budgetary support—allocated at historical averages. Equally, the total effect of an increase in aid for the other expenditure and revenue items considered in Equations (6.4–6.9) can be written as:

$$d\hat{E}H_t = \hat{\beta}_{2EH} \frac{EH_t}{AH_t} dAH + \hat{\beta}_{3EH} \frac{EH_t}{AO_{EHt}} dAO + \hat{\beta}_{4EH} \frac{EH_t}{BS_t} dBS \quad (12)$$

$$d\hat{E}I_t = \hat{\beta}_{2EI} \frac{EI_t}{AI_t} dAI + \hat{\beta}_{3EI} \frac{EI_t}{AO_{EIt}} dAO + \hat{\beta}_{4EI} \frac{EI_t}{BS_t} dBS \quad (13)$$

$$d\hat{E}G_t = \hat{\beta}_{2EG} \frac{EG_t}{AG_t} dAG + \hat{\beta}_{3EG} \frac{EG_t}{AO_{EGt}} dAG + \hat{\beta}_{4EG} \frac{EG_t}{BS_t} dBS \quad (14)$$

$$d\hat{R}EV_t = \hat{\beta}_{2REV} \frac{REV_t}{A_t} dA + \hat{\beta}_{3REV} \frac{REV_t}{BS_t} dBS \quad (15)$$

This model thus has a number of important features which are useful in the analysis of the fiscal effects of aid in the PNG context. Firstly, it distinguishes between ‘other project and program aid’

and ‘general budgetary support aid’, which has typically been included in the ‘other aid’ category in the literature. Secondly, it allows aid to all expenditure categories to influence the consumption choices of government in all, even non aid-receiving, sectors of the economy. Thirdly, it distinguishes between government expenditure and aid revenue according to their function rather than the recurrent and development classifications used in much of the literature. This distinction gives a more relevant assessment of the contribution of fiscal policy settings to key welfare targets such as the MDGs. Lastly, the SUR estimation procedure accounts for the interdependent nature of these fiscal relationships, which allows the estimation procedure to correct for any simultaneity bias which may have occurred within a non simultaneous equation framework.

4. Data Collection

GDP, expenditure and revenue data is obtained from official PNG budget documents as described in Appendix 1. This paper uses the same methodology as established in Batten (2009) for the allocation of government expenditure by sector, with the IMF GFS database being used for pre 2002 expenditure data and government budget documents being used for post 2002. This paper does, however, require a more detailed matching up of aid allocations with sectoral expenditures. The IMF GFS and OECD DAC databases are not directly comparable and require an element of discretion on the author’s behalf as to which expenditure is allocated to which sector. A full description of this can be found in Appendix 1.

As is typical within the literature, the OECD DAC database was used to obtain sectoral aid flows. Optimally, this aid data would record disbursements by sector; however, the database only has a sufficiently complete time series of categorical expenditures on a donor commitment basis—with aid disbursement data only available at an aggregate level. To overcome this, Petterson’s (2007) method is followed—sectoral commitment data is used to calculate the share of project and program aid going to each sector as well as the share being given as budgetary support each year. These proportions are then applied to the total disbursements data to give aid allocations by sector and by type (project and program aid vs. budgetary support). Whilst there is little a priori evidence to suggest that certain types of aid would be disbursed more than others following donor commitments, a fundamental assumption of this paper is that aid disbursements by sector are allocated in the same proportion to which donor commitments are made. A full description of the alignment of sectoral aid flows to sectoral expenditure can be found in Appendix 2.

The general budgetary support variable measures commodity aid and general unallocated program assistance. This includes contributions for general development purposes without sector allocation, with or without restrictions on the specific use of the funds (and irrespective of any control by the donor of the use of counterpart funds). Funds supplied on the general condition that they be used for capital projects at the recipient's choice, but not subject to agreement by the donor, are also included (OECD DAC 2007). Project aid, on the other hand, is defined by the direct participation of the donors in the design and implementation of a developmental project with a specific purpose. This data is measured in US\$ and converted into Kina with period average exchange rates. All nominal data are deflated into 1999 constant prices with the consumer price index and measured in per capita natural logarithms. A summary of this data is presented in Table 1.

Table 1: Summary Statistics of Key Variables—Per Capita Values in 1999 Values (1974–2008)

Variable	Description	Obs	Mean	Std Dev	Min	Max
gdppc	GDP per capita	35	2,323.44	334.20	1,634.80	3,417.37
a_h	Health sector project aid	35	7.11	7.77	0.00	24.39
a_e	Education sector project aid	35	11.32	13.14	0.00	42.16
a_in	Infrastructure sector project aid	35	23.22	17.50	0.00	66.78
a_g	All other general project aid	35	47.66	40.97	4.69	225.87
a_pr	Total project aid	35	89.83	48.90	9.04	251.83
a_bs	Non sector allocated and/or budgetary support aid	35	125.54	119.94	0.00	458.22
e_h	Government expenditure on health	35	52.75	14.43	25.00	73.79
e_e	Government expenditure on education	35	106.66	33.30	29.93	145.56
e_in	Government expenditure on infrastructure	35	58.85	30.08	12.92	130.26
e_g	All other general government expenditure	35	450.79	58.69	325.58	553.42
e	Total government expenditure	35	669.05	103.85	425.05	853.40
rev	Domestic revenue collection	35	489.84	78.28	366.99	637.79

Note: All variables in the table are measured in constant 1999 per capita Kina. Data transformed with natural logarithms for estimations.

It should be noted that in some ways this data contradicts that used in Batten (2009). In that paper for example, project aid flows only began in 1989. The current data has sectoral allocations, albeit relatively small in comparison to budgetary support, beginning in 1974. This reflects the use in the previous paper of on-budget aid flows whereas the OECD DAC database records aid flows from the perspective of the donor. Prior to the 1990s, little attempt was made in PNG to incorporate project aid flows into the budgetary process.⁷ In part, this was because project aid comprised such a small proportion of total foreign assistance. It is also likely to be a reflection of the lower priority that aid donors placed during this period on strengthening local institutional and bureaucratic processes, with aid delivery channels often circumventing domestic budgetary processes. Nevertheless, it is this inconsistency in the available data which is exploited to facilitate the current analysis.

5. Results

5.1 SUR Estimation Results

Table 2 presents the results of the simultaneous estimation of Equations (4–8) using the SUR estimation technique. Each of the equations is well identified with adjusted R^2 values ranging from 0.74 for the education equation to 0.54 for the revenue equation. The only exception is the general expenditure category, which records an R^2 of 0.25, most likely reflecting the much greater degree of aggregation of both the project aid and expenditure data for this category.

Although the above coefficient estimates do not take into account the full effects of foreign aid fungibility as described through Equations (11–15), a number of important inferences can be made. Firstly, it can be seen that the budgetary support variable has a significant and positive impact on each of the expenditure and revenue equations. The size of these elasticities ranges from 0.162 in the education equation to 0.026 in terms of revenue collection. In addition, the size of the budgetary support coefficients is much larger for the education, health and infrastructure equations than it is for the general category, indicating that a majority of this financial assistance has tended to be allocated towards these three core development priorities.

The positive budgetary support coefficient and the negative total project aid coefficient in the revenue equation provide further evidence for the results obtained in Batten (2009). In this case, the estimations were only able to distinguish a close to zero net effect for both types of aid delivery on

⁷ It was not until 1996, for example, that the PNG Government decided to include project aid flows as part of its revenues (World Bank 1999:25).

domestic revenue collection, despite overall grants having an unambiguous negative effect. These results suggest however that it has in fact been project aid that has been responsible for a large portion of the negative impact of grants on domestic revenue collection.

Table 2: SUR Estimation Results for Categorical Expenditure

SUR	(1)	(2)	(3)	(4)	(5)
	lnEE	lnEH	lnEI	lnEG	lnRev
lngdp	1.213*** (0.351)	-0.306 (0.260)	0.302 (0.511)	-0.032 (0.178)	0.174 (0.170)
lnAE	0.057* (0.029)	-	-	-	-
lnAH	-	-0.051* (0.030)	-	-	-
lnAI	-	-	0.015 (0.051)	-	-
lnAG	-	-	-	0.001 (0.024)	-
lnOA_i[‡]	-0.034 (0.074)	-0.044 (0.055)	0.093 (0.086)	0.043 (0.032)	-
lnBS	0.162*** (0.033)	0.112*** (0.024)	0.102** (0.048)	0.034** (0.017)	0.026* (0.014)
lnA	-	-	-	-	-0.095** (0.042)
Dum	0.137 (0.123)	0.023 (0.101)	-0.534*** (0.175)	-0.038 (0.063)	0.344*** (0.057)
Constant	-5.448** (2.578)	6.142*** (1.925)	1.133 (3.793)	6.090*** (1.319)	4.951*** (1.242)
Obs	33	33	33	33	33
F-Stat	20.47	16.55	10.54	2.51	9.45
(P-value)	(0.000)	(0.000)	(0.000)	(0.033)	(0.000)
Adj. R-Sq	0.743	0.697	0.616	0.248	0.537

Standard errors in parentheses; * significant at 10% level; ** significant at 5% level; *** significant at 1% level. ‡ lnOA_i measures total project aid allocations less aid allocations from the dependent variable category (*i*).
Note: For the purposes of estimation, the origin is re-based to +1 by adding one to each observation. A number of variables in a number of years have observations which are close or equal to zero. Taking the natural logarithm of these values would thus lead to them turning negative and also result in the low values of aid and expenditure allocations becoming more dispersed whilst the higher values become more compressed. In the estimation, this would give undue weight to the lower valued aid and expenditure observations which is likely to cause a bias in the results. Adding one to each of the observations also has the added advantage of allowing the inclusion of the zero valued aid and expenditure observations and allowing all values to remain strictly positive (Van de Sijpe 2007:36).

The positive coefficients of the categorical aid variables for education and infrastructure indicate that in the first instance an increase in aid to these sectors leads to an increase, albeit small, in total expenditure levels for their respective categories. The negative coefficient on the health foreign aid variable indicates a diversion of aid from this category to other purposes.⁸ The degree to which this has taken place will be discussed shortly.

⁸ This could include, for example, the financing of a tax reduction or repayment of government debt.

It also appears that there has been a limited amount of redirection of categorical aid amongst each of the development expenditures. For example, education and health have negative coefficients for their other aid variables whilst infrastructure has a positive coefficient, although none are significant. The positive coefficient estimate suggests that a redirection of categorical aid from other expenditure categories has occurred towards the infrastructure sector. In contrast, the negative coefficient estimates arise when there has been a diversion of categorical aid from each of the categorical expenditure items toward other expenditure items. This could include, for example, an increase in debt servicing or a reduction in tax collection.⁹

Of particular interest are the highly significant negative and positive coefficient estimates for the dummy variable in the infrastructure and revenue equations respectively. The former result suggests that in the post Bougainville crisis era, there has been a significant structural reduction in the financing of infrastructure development after controlling for changes in the GDP level and both budgetary support and project aid receipts. This finding supports the conclusion that the crisis has had long lasting impacts on fiscal management and the government's ability to finance critical national infrastructure development projects well beyond the immediate 1991 revenue collapse and the following foreign currency shortages experienced in 1994.

The latter result also suggests, however, that in the post Bougainville crisis era, the government has sought to augment its domestic revenue collection. This may, for example, reflect an inherent preference by the government not to rely on aid receipts as a source of revenue in order to avoid a replication of the early 1990s, when the Australian Government's decision to switch from budgetary support to project aid exacerbated an already stressed fiscal situation.¹⁰

To determine the full impact which foreign grants have had on levels of sectoral expenditure, it is, however, necessary to aggregate the impact of both aid given to each of the categorical sectors as well as the influence of other categorical aid and budgetary support. Column 1 in Table 3 shows the prorated foreign aid allocations which measure the historical average of aid allocated to that sector. Column 2 shows the individual effects of each type of aid on each expenditure and revenue item

⁹ As argued by Pack and Pack (1993:262), 'negative coefficients may arise in the other foreign aid coefficients when there is a diversion of categorical aid from development investment toward, for example, debt service'.

¹⁰ Given the congruence of timing between the crisis and the major switch between aid types, this coefficient may also reflect a desire by the government to generate additional own-source revenues in order to maintain funding to expenditure areas which were not being supported by project aid receipts.

calculated according to the method shown in Equations (11–15). Column 3 shows the total change in expenditure or revenue expected from a one dollar increase in total aid flows allocated according to its historical mean.

Table 3: PNG ODA Allocations by Development Expenditure Category

Sector	(1) Prorated change in foreign aid	(2) Change in expenditure/revenue $\Delta EXP_i = \beta_i \cdot \frac{\bar{A}_i}{A} \cdot \frac{E_i}{A_i} \cdot \Delta A$	(3) Total change in expenditure/ revenue		
Education	$\frac{\bar{A}_i}{A}$	β_i	E_i/A_i^{11}	ΔEXP_i	
a) AE	0.056	0.057	8.741	0.0279	
b) AO _E	0.369	-0.034	0.191	-0.0024	(2a+2b) 0.0255
c) BS	0.575	0.162	0.851	0.0793	(2a+2b+2c) 0.1048
Health					
a) AH	0.036	-0.051	6.628	-0.0122	
b) AO _H	0.389	-0.044	0.631	-0.0108	(2a+2b) -0.023
c) BS	0.575	0.112	0.425	0.0274	(2a+2b+2c) 0.0044
Infrastructure					
a) AI	0.110	0.015	2.471	0.0041	
b) AO _I	0.315	0.093	0.866	0.0254	(2a+2b) 0.0295
c) BS	0.575	0.102	0.473	0.0277	(2a+2b+2c) 0.0572
General					
a) AG	0.221	0.001	9.283	0.0021	
b) AO _G	0.204	0.043	10.119	0.0888	(2a+2b) 0.0909
c) BS	0.575	0.034	3.570	0.0910	(2a+2b+2c) 0.0182
Domestic Revenue					
a) A	0.425	-0.095	5.260	-0.212	(2a+2b) -0.154
b) BS	0.575	0.026	3.879	0.0579	

* Indicates that the total calculated change in expenditure level is significantly different from the prorated change in expenditure levels at a 5 per cent significance level.

5.2 Impact of Project Aid Allocated at Historical Averages (2a+2b)

For every dollar of foreign aid given since independence, 42.5 cents has been in the form of sector allocated project aid. Of this 42.5 cents, 5.6 cents has been allocated to the education sector. The results show that the direct impact of this education aid has been to increase education expenditure by approximately 2.8 cents. The negative result on the other project aid variable, however, indicates that there has also been a diversion of categorical expenditures away from this sector. In addition to

¹¹ Such that for the education equation the following calculations are made for rows 1-3 respectively: 1) e_c/a_e 2) ee/a_e_o 3) e_c/bs.

debt and revenue responses, this diversion of funds may be suggestive of the existence of aid-induced flypaper effects occurring in other sectors of the economy, whereby an increase in funding for other project aid sectors tends to draw government resources away from the education sector. In this case, however, this effect is relatively small such that the total impact of project aid on education funding is still equal to 2.5 cents for every 5.6 cents of education aid. Whilst a degree of fungibility has taken place, approximately half of the allocated funds appear to have remained within the sector and have not been diverted to other uses. As a result, aid funds have managed to substantially increase the availability of resources in the sector—albeit at a less than one to one ratio.

In contrast to this result, project aid allocated to health and other project aid appear to have had a negative impact on overall expenditure levels within the sector. Here it is observed that the historical average of a 3.6 cent increase in health aid leads to a 1.2 cent decrease in total health expenditures. When combined with the additional diversionary effects of the other project aid variable, this then leads to a total 2.3 cent decline in health expenditure for the additional 42.5 cents of project aid allocated at a historical mean.

Observations of negative fungibility are in general un intuitive as there is little theoretical reason to believe that an inflow of aid resources to a sector would induce the recipient government to subtract more than that amount of their own funding from the sector. However, one plausible explanation for this result is the use of aid to pressure the PNG Government to scale-back spending in pursuit of fiscal balance or to increase debt repayments (as found in Batten 2009). Compliance with these conditions requires a decision over which sectors of the budget will receive reduced funding, and in the event that these funding cuts are greater than the inflow of aid, there may be a net outflow of funds from the sector. Another explanation of this effect is the tendency of project aid to reduce domestic revenue collection, which in turn may lower the aggregate availability of domestic resources, which in turn results in reduced funding for the health sector. More broadly, this result also supports the notion that, despite an increasing amount of donor resources allocated to the health sector, total per capita expenditure levels have continued to fall throughout the past two decades.

Of the three development sectors, infrastructure has been the largest recipient of categorical aid flows, receiving 11 out of every 42.5 cents given as project aid. Of this, only a small portion appears to have remained in the sector, with expenditure increasing by just 0.4 cents for each 11 cents of

infrastructure aid. In this case, however, there is also a positive diversion of other project aid funds into the sector equal to approximately 2.5 cents for each additional 31.5 cents of other project aid. This leads to a total increase of infrastructure funding equal to just under 3 cents for each additional 11 cents of infrastructure project aid.

This result appears to be counter intuitive. Why would the PNG Government withdraw resources given directly to the sector and then allocate resources freed up from project aid in other sectors back into infrastructure? There are at least two possible explanations. The first is an issue of timing. These results represent historical averages and the years in which the PNG Government perceives infrastructure funding to be inadequate and the years in which donors tend to increase or decrease their funding to the sector need not necessarily overlap. As a result, the estimates may be observing the transfer of funds between time periods.

The second explanation relates to the within-sector priorities of recipients and donors. In the case of PNG, for example, donors have, particularly in the past, focused a majority of their road building and maintenance attention on highly visible projects with large scale but generally diffused economic benefits, such as the Highlands Highway. The PNG Government may, however, place a higher priority on funding other roads which generate more political benefit, such as those connecting regions within their particular electorate. One response of the PNG Government to this circumstance could then be to reallocate freed up resources from the donor funded road project to its other expenditure priorities and then divert funds made available from other project aid back into the infrastructure sector to fund its own road building preferences. In any event, both of these arguments highlight the point that sectoral funding levels of the infrastructure sector have been predominately determined by the public sector fiscal behaviour of the PNG Government—despite the high levels of aid being channeled into the sector.

In the general expenditure category, it is again observed that large scale inter sectoral fungibility has taken place, but that the effect of project aid on the sector has remained positive. For every 22 cents of project aid allocated to the general category, expenditure has increased by just over 9 cents. The majority of this increase has, however, occurred as a result of a positive diversion of funds from other sectors into the general category.

Finally, project aid is shown to have had a large negative impact on domestic revenue collection. For each additional 42.5 cents of project aid, domestic revenue collection has, on average, declined by approximately 21 cents.

5.3 Impact of Budgetary Support Allocated at Historical Averages (2c)

Despite not being tied by donors to any specific activities, budgetary support is shown to have a positive impact on each of the development expenditure categories and on general expenditures. Of the 57 cents of each additional aid dollar allocated as budgetary support, there is a requisite 7.9 cent increase in education funding, 2.7 cent increase in health funding, 2.8 cent increase in infrastructure funding and a 9 cent increase in general government expenditure. To an extent, these results reject the concerns raised in Paper 4 by various authors about the tendency of budgetary support to fund general government consumption rather than productive investment activities. Every 13.4 cents out of 57 cents given as budgetary support has been allocated to the three development sectors, whilst just 9 cents is allocated towards general expenditure—despite this general category accounting for just over 67 per cent of total government expenditures. Translating these effects into a situation whereby an additional dollar of aid was given entirely as budgetary support also reveals that education expenditure would increase by roughly 14 cents, health and infrastructure would both increase by 5 cents and other general expenditures would increase by 16 cents.

The period of budgetary support is also shown to have augmented domestic revenue collection, with the additional 57 cents of non allocated aid leading to an average 5.7 cent increase in domestic revenue collection. As shown in Equation (16), the total change in donor resources for budgetary support (ΔBS_t) in any period t , must equal the sum of the total change in expenditure for the four expenditure categories ($\sum_{i=1}^4 \Delta E_{i,t}$) plus the change in domestic revenue (ΔT_t) and any change in the government's debt liabilities (where $\Delta D_t = \Delta DEF_t + \Delta DS_t$).

$$\Delta BS_t = \sum_{i=1}^4 \Delta E_{i,t} + \Delta T_t + \Delta D_t \quad (16)$$

Assuming a constant level of project aid, it can be said that the effect of the 57 cents of budgetary support will be to fund an additional 22.4 cents of expenditure and generate an additional 5.8 cents of domestic revenue, which, by implication, also means that it funded a 40.4 cent reduction in the government's deficit/debt liabilities.

5.4 Total Impact of Foreign Aid Allocated at Historical Averages (2a+2b+2c)

For each spending category, an additional dollar of foreign aid leads to a positive impact on expenditure levels. Only in the case of the education sector, however, does the increase in categorical expenditure meet or exceed the increase in categorical aid flows. For every dollar of aid, about 5.6 cents has been allocated to the education sector, which when combined with the positive impact of budgetary support, has led to an increase in total education funding by just over 10 cents.

In contrast, for every additional dollar of aid, about 3.6 cents has been allocated to the health sector. This additional 3.6 cents of directly targeted assistance has, however, managed to increase total funding for the sector by only approximately 0.44 cents. Likewise, despite the infrastructure sector receiving approximately 11 cents in each aid dollar since independence, the resulting increase in total funding to the sector has only increased by approximately half that amount, at 5.7 cents. For these last two categories then it is clear that there has been a substantial diversion of funds by the government away from the intended donor expenditure patterns. In the general expenditure category, for each additional dollar of grant aid, of which 22 cents per aid dollar has been allocated towards general expenditure, there is a relatively small 2 cent increase in expenditure levels for the sector.

Finally, as discussed, the 57 per cent of aid allocated as budgetary support has tended to have a positive impact on domestic revenue collection, whilst the 43 per cent allocated as project aid has had a negative impact. The positive effect of budgetary support is, however, approximately one-quarter the size of the negative impact of project aid, which leads to an overall negative impact of aid on revenue collection equal to 15 cents for each additional dollar of aid allocated. These results are consistent with those observed in Paper 5, which found that grant aid had undermined domestic revenue collection. These results are also consistent with Feeny (2007:29) who found that aid to the Melanesian region as a whole has had a limited impact on encouraging growth in rural areas, partly as a result of the negative effect of aid on domestic revenue collection efforts.¹²

¹² This shifting impact of aid on revenue may also reflect the changing quality of governance observed in PNG during this period. Gupta et al. (2003), for example, find that whilst foreign aid has in general tended to have only a relatively small dampening effect on the revenue collection efforts of recipient governments, in countries plagued by high levels of corruption, the decline in revenues tends to completely offset any increase in grants. As such, the widely acknowledge decline in governance and bureaucratic quality experienced in PNG, especially during the 1990s may in part then help to explain why budgetary support has been more effective at stimulating an increase in domestic revenue collection.

6. Discussion and Conclusion

This paper has analysed a variety of issues related to the impact of aid on sectoral expenditure in post independence PNG. In particular, it has sought to assess the relative impact of budgetary support vis-à-vis project-based aid on increasing aggregate expenditure levels in three key development sectors of the PNG economy—health, education and infrastructure. It has also analysed the extent to which funds allocated to these sectors have been diverted to general government consumption activities. In total, aid has made a positive contribution to the overall funding levels of all expenditure categories in PNG since independence. This result does, however, mask a number of important differences between project aid and budgetary support across sectors.

Firstly, there is significant evidence for project aid showing that large scale fungibility has taken place across a number of sectors of the PNG economy, with expenditure increases far below the allocated project aid amounts. According to historical averages, for a given increase in education funding, total resources to that sector increase by about half that amount whilst total infrastructure spending increases by approximately one-third of the amount allocated as project aid. Likewise, just under half of the project aid allocated to the general category has remained in the sector. In contrast, project aid by itself appears to have had a negative impact on overall expenditure levels within the health sector.

Secondly, approximately half of the budgetary support has been used to finance higher levels of government expenditure. Of this increased expenditure, 60 per cent has been allocated to the health, education and infrastructure sectors whilst the remaining 40 per cent has been allocated to the general government expenditure category. This is a relatively positive result, especially given that this general category accounts for two-thirds of total government expenditures. The remaining budgetary support funds have been used primarily to achieve a reduction in the government's deficit and debt liabilities.

Thirdly, in terms of revenue collection, the majority of the negative impact of foreign grants appears to have occurred during the project aid rather than budgetary support period. An explanation for this result is that even though during the budget support era the PNG Government was receiving far greater levels of foreign assistance, there was a clear mandate provided by Australia for a reduction in aid flows—on average budget support declined by 8 per cent per annum in real per capita terms between 1975 and 1989. In contrast, the project aid period, whilst contributing less to overall government resources, has experienced relatively stable real per capita funding levels—imposing less pressure on the PNG Government to find domestic resources to replace aid funds.

The results offer a number of important policy implications as donors seek to help PNG reach its MDG targets. Firstly, it must be said that the existence of fungibility is not a sufficient condition to establish the effectiveness or ineffectiveness of foreign aid per se. Rather, it offers an important insight into how foreign aid interacts with public sector behaviour to influence aggregate fiscal outcomes. In particular, these results highlight that it is the way in which the recipient government responds to an aid inflow that matters most in determining the effectiveness of that aid in improving service delivery to specific sectors. The lesson for donors here is that efforts to alter how they give aid in order to control its usage will almost inevitably be circumvented by a government who wishes to fund other priorities. The focus of development discourse therefore must remain on establishing a productive dialogue between donor and recipient to determine mutually agreeable expenditure priorities and not on increasingly tying aid to specific activities which the donor finds appealing.

This evidence also disputes the notion that PNG health, education and infrastructure outcomes can be improved simply by aid agencies choosing to re-align their aid allocations towards these sectors. This highlights the point that achieving the MDGs rests not with the provision of donor-funded resources to a particular sector but rather with the PNG Government's desire and, just as importantly, ability, to effectively resource and implement programs in each one of these sectors. Hence, the effectiveness of aid should not be judged on how stringent the expenditure controls are or how tightly aligned aid-funded expenditures are with donor priorities but rather how useful that assistance has been in promoting improvements in the recipient government's own expenditure management systems, processes and outcomes.

Finally, as Australia seeks to increase the performance orientation of its aid program, it may consider opening up the potential for using alternative un earmarked aid modalities—such as budgetary support. The results have shown that tying aid funds to specific expenditure priorities has given donors a false sense that their aid allocations can influence aggregate spending outcomes. Loosening the grip which donors place on their funding in return for specific expenditure behaviour may thus prove to be a productive way forward for the Australian aid program in PNG. Indeed, this type of aid delivery is now being carried out in numerous other regions including Latin America, Africa and Eastern Europe. How this may be implemented in a PNG context is a fruitful area for further research and discussion.

References

- Batten, A., 2009. *Foreign aid, government behavior and fiscal policy outcomes in Papua New Guinea*, Crawford School of Economics and Government, Working Paper No. 09-03, Australian National University, Canberra.
- Cashel-Cordo, P. and Craig, S., 1990. 'The public spending impact of international resource transfers', *Journal of Development Economics*, 32(1):17–42.
- Feeny, S., 2007. 'Foreign aid and fiscal governance in Melanesia', *World Development*, 35(3):439–53.
- Feyzioglu, T., Swaroop, V. and Zhu, M., 1998. 'A panel data analysis of the fungibility of foreign aid', *World Bank Economic Review*, 12(1):29–58.
- GoPNG, various years. *National Budget Documents*, Department of Finance and Treasury, Government of Papua New Guinea, Port Moresby.
- Holmqvist, G., 2000. *Fungibility parameters: a comment on their reliability and policy implications from an aid practitioner*, Paper presented at the SIDA conference on Aid and Development, 20–21 January, Stockholm.
- IMF, 2008. *Government Financial Statistics Database*, International Monetary Fund, Washington D.C. Available from www.imf.org (accessed 12 January 2008).
- Khiliji, N. and Zampelli, E., 1991. 'The fungibility of US assistance to developing countries and the impacts on recipient expenditures: a case study of Pakistan', *World Development*, 19(8):1095–106.
- McGillivray, M., and Morrissey, O., 2000. 'Aid fungibility in assessing aid: red herring or true concern?', *Journal of International Development*, 12(3):413–28.
- , and ———, 2001a. *A review of evidence of the fiscal effects of aid*, CREDIT Research Paper, No. 01/13, Centre for Research in Economic Development and International Trade, University of Nottingham, Nottingham.
- , and ———, 2001b. 'Aid illusion and public sector fiscal behaviour', *Journal of Development Studies*, 37(6):118–36.
- ODI, 2008. *Aid effectiveness after Accra: how to reform the 'Paris agenda'*, ODI Briefing Note No. 39, Overseas Development Institute, London.
- OECD DAC, 2007. *Key Terms Glossary*, DAC Development Cooperation Directorate, Paris. Available from www.oecd.org (accessed 11 May 2008).

——, 2008, 2009. *International Development Statistics*, Organisation for Economic Cooperation and Development, Development Assistance Committee. Available from www.oecd.org/statisticsdata/ (accessed 1 January–30 June 2008).

Pack, H. and Pack, J., 1990. 'Is foreign aid fungible? the case of Indonesia', *Economic Journal*, 100(399):188–94.

——, and ——, 1993. 'Foreign aid and the question of fungibility', *Review of Economics and Statistics*, 75(2):258–65.

Peterson, J., 2004. *Foreign sectoral aid fungibility, growth and poverty reduction*, Working Paper, Department of Economics, Stockholm University.

Sims, R. and Daniel, P. 1986. *Foreign Investment in Papua New Guinea: policies and practices*, National Centre for Development Studies, Australian National University, Canberra.

Swaroop, V., Jha, S. and Rajkumar, A., 2000. 'Fiscal effects of foreign aid in a federal system of governance: the case of India', *Journal of Public Economics*, 77(3):307–30.

Tiwari, S., 2007. 'Putting money where the mouth is: does aid to Nepal finance what the donors say they want to finance?', *Himalayan Journal of Development and Democracy*, 2(1):1–15.

Van de Sijpe, N., 2007. *Is aid fungible? evidence from the education and health sectors*, CSAE Working Paper, Centre for the Study of African Economies, University of Oxford, Oxford.

White, H., 1998. 'Aid and macroeconomic performance', in H. White (ed.), *Aid and Macroeconomic Performance*, Palgrave Macmillan, London.

Wooldridge, J., 2000. *Introductory Econometrics: A Modern Approach*, South Western College Publishing, USA.

World Bank, 1977. *Papua New Guinea: its economic situation and prospects for development*, Country Economic Report, World Bank, Washington D.C.

Zellner, A., 1962. 'An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias', *Journal of American Statistical Association*, 57(1):348–68.

Appendix 1: Data Collection and Sources

In order to obtain a complete time series of PNG's fiscal and GDP data, a number of data sources were used. In the first instance, data was sourced from a number of documents containing budget actuals data in order to obtain a complete time series for the period from a consistent source. These budget actuals data were sourced from the following sources for the corresponding years.

Table 4: Sources for Government Revenue and Grant Data

Document	Years of Budget Actuals Covered
World Bank (1977)	1970–72
Sims and Daniel (1986)	1972–82
Stein (1991)	1983–86
1993 Budget	1987–91
1995 Budget	1992–94
1997 Budget	1995
1998 Budget	1996–97
2000 Budget	1998
2004 Budget	1999–2001
2007 Budget	2002
2008 Budget	2003–2008

In terms of expenditure, between 1974 and 2002 sectoral expenditure allocations were made in accordance with the IMF Government Financial Statistics Database. In this case, expenditure was classified into five categories. These included health, education, law and order, infrastructure, and other. The classifications used from the IMF database to allocate these expenditures are shown below in Table 5.

Table 5: Categorisation of IMF GFS Data into Expenditure Categories

Category	IMF GFS Code (Table 7)
1. Health	11. Health
2. Education	13. Education
3. Law and Order	4. Public order and safety
4. Infrastructure	6. Agriculture, forestry, fishing and hunting
	8. Mining, manufacturing and construction
5. General	8. Recreation, culture, and religion
	2a. Public Debt Transactions
	3. Defence
	5e. Other Economic Affairs and Services
	7. Fuel and energy
	9. Transport
	6. Housing and community amenities
	10. Social Welfare and Protection
	11. Other Non Allocated Expenditures
	2b. General public services (less Public debt transactions)

The most recent 2008 version of the IMF database only covers up to 2002. As a result, another data collection effort was undertaken decomposing recent government expenditures into each of the five classifications listed above. This involved allocating expenditures from both the recurrent and development components of the national PNG budget.

Recurrent expenditures were allocated according to Volume II, Part 1, Table 2 of the budget which calculates recurrent expenditures on a functional basis. These expenditures were first allocated according to the IMF categories and then allocated into each of the five expenditure categories as shown in Table 6.

Table 6: Allocation of Recurrent Budget Expenditures to IMF Classifications

IMF Classification	Budget Volume II, Part 1, Table 2 Classification Code
General public services	11, 13, 14, 15, 19, 41, 51, 52, 53
<i>Public debt transactions</i>	51, 52, 53
General public services (less Public debt transactions)	11, 13, 14, 15, 19, 41
Defence	18
Public order and safety	17
Economic affairs	12, 31, 32, 33, 34, 35, 36, 39
<i>Agriculture, forestry, fishing and hunting</i>	31
<i>Fuel and energy</i>	33
<i>Mining, manufacturing and construction</i>	35
<i>Transport and communications</i>	36
<i>Other economic affairs</i>	12, 32, 34, 39
Housing and community amenities	24, 25
Health	22
Recreation, culture and religion	27, 28
Education	16, 21
Social protection	23
Other expenditure	42

Development budget expenditures are not calculated on a functional basis. This component of the budget was allocated to each of the five categories through departmental allocations from both the National Department and Statutory Authority Tables from Volume II, Part 1, Section III of the budget documents. Table 7 shows the allocation rules used for the transfer from the development budget to IMF classifications.

Table 7: Allocation of Development Budget Expenditures

Category	National Department (N) or Statutory Authority (S)
1. Health	240: Dept of Health (N)
	241: Hospital Management Services (N)
	519: National AIDS Secretariat (S)
	520: Institute of Medical Research (S)
2. Education	235: Dept of Education (N)
	236: Commission for Higher Education (N)
	512: Uni PNG (S)
	513: Uni Tech (S)
	514: Uni Goroka (S)
3. Law and Order	515: Uni Vudal (S)
	226: Dept of Corrective and Institutional Services (N)
	228: Dept of Police (N)
4. Infrastructure	223: Judiciary Services (N)
	258: Dept of Information and Communication (N)
	259: Dept of Transport (N)
	264: Dept of Works and Implementation (N)
	540: Water and Sewerage Board (S)
5. General	567: National Road Authority (S)
	All Remaining National Department and Statutory Authority Development Budget Expenditures

Appendix 2: Categorisation of IMF GFS and OECD DAC Databases

Category	OECD DAC Code	IMF GFS Code (Table 7)
1. Health	120: I.2 Health 130: I.3 Population Programmes	11. Health
2. Education	110: I.1 Education	13. Education
3. Infrastructure	140: I.4 Water Supply and Sanitation	210: II.1 Transport and Storage
	220: II.2 Communications	230: II.3 Energy
		7. Fuel and Energy
		9. Transport
		8. Mining, Manufacturing and Construction
		10. Housing and Community amenities
4. General	160: I.6 Other Social Infrastructure and Services	150: I.5 Government and Civil Society
	920: X. Support to NGOs	930: XI. Refugees in Donor Countries
	310: III.1 Agriculture - Forestry - Fishing, Total	410: IV.1 General Environment Protection
	430: IV.3 Other Multi-sector	700: VIII. Emergency Assistance and Reconstruction
	240: II.4 Banking and Financial Services	250: II.5 Business and Other Services
	320: III.2 Industry - Mining - Construction	331: III.3 Trade Policy and Regulations
	332: III.4 Tourism	
	600: VII. Action Relating to Debt	998: XII. Unallocated/ Unspecified
	910: IX. Administrative Costs of Donors	
5. Budget Support	510: VI.1 General Budget Support	520: VI.2 Developmental Food Aid/Food Security Assistance
	530: VI.3 Other Commodity Assistance	
		2a. Public Debt Transactions
		2b. General Public Services (less Public Debt Transactions)
		8. Recreation, Culture and Religion
		3. Defence
		11. Other Non Allocated Expenditures
		5e. Other Economic Affairs and Services
		4. Public Order and Safety
		6. Agriculture, Forestry, Fishing and Hunting
		10. Social Welfare and Protection