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How Effective is Japanese Foreign Aid?
Econometric Results from a Bounded Rationality Model for Indonesia

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Abstract:

How does Japanese aid influence the allocation of government expenditures and the raising of government revenues? Using a non-linear model with an asymmetric loss function the case of Japanese aid to Indonesia is examined at the macroeconomic level. It turns out that Japanese aid led to proportionately more development expenditures than other aid. It also might have been positively related to an increased effort by the Indonesian government to raise taxes. Economic explanations based on a bounded rationality models are advanced. Econometric and institutional explanations are also offered. The three sets of explanations can be seen as overlapping and complementary.

Key Words: Japanese aid, Non-linear Models, Development Expenditures, Non-Development Expenditures, Bounded Rationality, Asymmetric Loss, Indonesian Policy Makers.

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I. Introduction

Japan's role in overseas development assistance is quite significant. Most of the increase in Japanese aid came in late 80's. As Table 1 shows, between 1975 and 1989, the amount of ODA increased eight-fold in dollar terms.

Much of Japanese aid has historically been directed to Asia. As Yanagihara and Emig pointed out:

> This feature reflects not only geographic proximity, but also close historical, cultural, and economic relations, as well as Tokyo's recognition of Asia as its logical sphere of responsibility in global burden-sharing.[1]

Given the importance of Japanese aid overall, but especially in Asia, it is appropriate to undertake systematic econometric investigation of the impact of this aid. In this paper I propose to do this for a single case by using time-series data. By using continuous annual time-series data for Indonesia from 1970 to 1996(this covers the beginning of recovery during the new order regime and the period of fast growth and skips the crisis years beginning in 1997) it is possible to trace systematically within an economic model the impact of Japanese aid on development and non-development expenditures of the Indonesian government. The model also brings out the response on the revenue side of the budget as well.

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[1] Shafiqul Islam(ed.), Yen for Development, New York, Council on Foreign Relations Press, 1991.

As explained in section III, the government of Indonesia especially through the Development Plans (beginning with REPELITA I) has been active in promoting development.[2] Thus it becomes important to explore the links, if any, between Japanese aid and development expenditures.

In addition to using a consistent time-series, the economic model itself may be of some interest to the reader. I use a model of bounded rationality to describe the behavior of aid-recipients. As Simon (1982) points out, policy-making in the real world inevitably encounters institutional bounds to rational behavior. In such a context, policymakers may know their targets (e.g., development expenditures) only provisionally. They may wish to minimize losses from such targets; but these targets almost certainly are not the ones that are the solutions of an optimizing exercise. Thus in my model, the policymaker minimizes a loss function incorporating targets that reflect institutional limits to rational prediction.

Existing work on the impact of aid on the recipient countries is not conclusive. Heller (1975) and Khan and Hoshino (1992) did not find much difference between bilateral and multilateral sources of aid. Pack and Pack (1990, 1993) found conflicting patterns of fungibility in the two cases they study. One of them, Indonesia, actually seemed from their econometric work to be a country where, overall, aid was going to development. However, they did not look at the effect of Japanese aid *per se*. In fact, there is no available econometric study on the impact of Japanese foreign aid on Indonesia. Thus, I hope to break some new ground by using a bounded rationality model and deriving econometric estimates from such a model. Although

[2] Although, since 1985, the regulative aspect of government has been loosened, its role in development (especially for infrastructure development) still remains very strong. See theassessment of the articles in various recent issues of Bulletin of Indonesian Economic Studies, for example.

not expected to be definitive, my results can throw some light on the behavior of Indonesian policymakers with respect to both Japanese and other foreign aid.

II. The Model

The following model is a variation of the model introduced by Gang and Khan (1989, 1994,1999) and Khan(1997). The model describes how foreign aid influences the recipient's expenditure and revenue-raising behavior in a bounded-rationality setting. In meeting preassigned values of indicator levels of expenditures and receipts the decision-makers respond in a predictable manner to any flows of aid from abroad.

It is important to use an explicitly asymmetric loss function because policy-makers may weigh the overshooting and the undershooting of these indicator levels differently. For some policy-makers the under-achievement of some indicators may be more significant than overshooting. For others the opposite may be the case.

Following Gang and Khan (1989, 1994,1999) I consider the decision-making process of boundedly rational policy-makers who consider *ex ante* in their budgetary planning certain indicators of the "proper" level of (planned) expenditures and revenues. Although these levels are treated as targets *ex ante* the assumption of an asymmetric loss function implies that these are not the utility maximizing values. In fact, the policy-makers possess a loss function in which they try to minimize upward and downward deviations which are weighted differently.

The indicator levels from which such deviations are measured can be thought of as outcomes of bureaucratic negotiations within the state and between the recipient and the donors.

By this theoretical and modelling strategy it is possible to estimate the marginal impact of aid on budgetary expenditure and revenue categories. Earlier works such as Heller (1975), Mosley, Hudson and Horrell (1989), Gang and Khan (1991), and Khan and Hoshino (1992) employed linear-quadratic or quadratic representations of the objective function. In this paper I follow the recent work by Gang and Khan (1994) by using an objective function with higher degrees of both non-linearity and asymmetry.

The model takes into account the potential effect of aid on development and non-development expenditures. The former type of expenditures include the public sector's contribution to capital formation. Human as well as non-human capital are included. A third component of development expenditures is the government's contribution to **social** and **economic** services, e.g. expenditure on health and general welfare. Non-development expenditures are the expenditures on state administration. These two types of government expenditures are financed by internal and external means. Domestic revenues include taxes, public enterprise surpluses and borrowing. External assistance comes in the form of Japanese bilateral and other aid.

Much of the literature on the macroeconomic effects of foreign assistance focuses on aid's effect on economic growth. Our modeling approach is to analyze the impact of aid on public sector variables. Since aid funds pass through policy-maker's hand prior to reaching their destination, understanding where these funds are allocated by policy-makers is a

prerequisite to understanding the long-term effects of aid. The distinction made here is between current development and current non-development expenditures. As a rule the former will contribute to the long run health of the economy while the latter will not.[3]

The policy-makers minimize a loss function subject to expenditure constraints. In most general terms, the (quadratic-ratio) loss function, L, is given by

$$\alpha_0 + \Sigma_i \, (\alpha_i/2) \, (i^j/i^k)^\beta,$$

if $j = *$, then $i^k = i$,

if $k = *$, then $i^j = i$,

$i = R, D, N$,

$\beta \geq 2$.

(1)

"j" and "k" are related in the following way: if j (respectively k) represents the indicator value (symbolized by *) then i^k (respectively, i^j) equals i. "i" and "j" can be R, D, or N (domestic revenues, development expenditures and nondevelopment expenditure, respectively). The simplest non-linear model which is also asymmetric and economically meaningful, is obtained when $\beta = 2$. Note that for exact fulfillment of chosen indicator levels, $L = \alpha_0 + (\alpha_R/2) + (\alpha_D/2) + (\alpha_N/2)$. The policy-maker is making decisions on various categories of public expenditures. Each decision will reflect on her abilities, possibly her status, or even her job. In an uncertain environment, the best she can do is to reach the stated chosen indicator value.

[3] There can be some complementarity between development and nondevelopment expenditures. For example, legal and other kinds of services and certain types of regulatory environment for "normal" business activities could be productive, in conjunction with directly productive development expenditures.

The loss function stated in equation (1) has the advantage of allowing for asymmetries in loss when the policy-maker over- or undershoots the chosen indicator level. It also allows us to examine different assumptions about the "type" of the policy-maker. For example, writing the loss function explicitly as

$$\alpha_0 + (\alpha_D/2)(D^*/D)^2 + (\alpha_N/2)(N/N^*)^2 + (\alpha_R/2)(R/R^*)^2,$$

illustrates a policy-maker who is "developmentalist" in orientation: undershooting the development expenditure indicator value is worse than overshooting it. At the same time, the above policy-maker is a "fiscal liberal" since overshooting the revenue raising indicator value is worse then undershooting. Such policy-makers are not very anxious about the emergence of the inflationary gap. These bureaucrats are also "non-statist" in that overshooting nondevelopment expenditures is worse than undershooting. Statist bureaucrats who seek to maximize the resources which the state uses to reproduce itself would have loss functions that are asymmetric in exactly the opposite direction with regard to the composition of public expenditure. All in all, there are eight possible characterizations. These are summarized in Table 2. Part of our problem is to explore which of these characterizations captures the behavior of policy-makers "best" in an empirical setting.

Given the type of policy-maker, the decision making problem can be described as the minimization of a specific form of equation (1). The economic and institutional constraint to which this minimization problem is subjected is the following:

$$N + D = R + A_B + A_m$$

Table 1

Policymakers Alternative Preferences

Type of Policymaker	Development Expenditure	Non Development Expenditure	Domestic Revenue	Specific Loss Function
Type I: Nondevelopmental, non-statist,fiscal liberal	overshooting worse than undershooting	overshooting worse than undershooting	overshooting worse than undershooting	$\alpha_0 + (\alpha_D/2)(D/D^*)^2 + (\alpha_N/2)(N/N^*)^2 + (\alpha\alpha_R/2)(R/R^*)^2$
Type II: Nondevelopmental, non-statist, fiscal conservative	overshooting worse than undershooting	overshooting worse than undershooting	undershooting worse than overshooting	$\alpha_0 + (\alpha_D/2)(D/D^*)^2 + (\alpha_N/2)(N/N^*)^2 + (\alpha_R/2)(R^*/R)^2$
Type III: Nondevelopmental, statist, fiscal liberal	overshooting worse than undershooting	undershooting worse than overshooting	overshooting worse than undershooting	$\alpha_0 + (\alpha_D/2)(D/D^*)^2 + (\alpha_N/2)(N^*/N)^2 + (\alpha_R/2)(R/R^*)^2$
Type IV: Nondevelopmental, statist, fiscal conservative	overshooting worse than undershooting	undershooting worse than overshooting	undershooting worse than overshooting	$\alpha_0 + (\alpha_D/2)(D/D^*)^2 + (\alpha_N/2)(N/N^*)^2 + (\alpha_R/2)(R^*/R)^2$
Type V: Developmental, non-statist, fiscal liberal	undershooting worse than overshooting	overshooting worse than undershooting	overshooting worse than undershooting	$\alpha_0 + (\alpha_D/2)(D^*/D)^2 + (\alpha_N/2)(N/N^*)^2 + (\alpha_R/2)(R/R^*)^2$
Type VI: Developmental, non-statist, fiscal conservative	undershooting worse than overshooting	overshooting worse than undershooting	undershooting worse than overshooting	$\alpha_0 + (\alpha_D/2)(D^*/D)^2 + (\alpha_N/2)(N/N^*)^2 + (\alpha_R/2)(R^*/R)^2$
Type VII: Developmental, statist, fiscal liberal	undershooting worse than overshooting	undershooting worse than overshooting	overshooting worse than undershooting	$\alpha_0 + (\alpha_D/2)(D^*/D)^2 + (\alpha_N/2)(N^*/N)^2 + (\alpha_R/2)(R/R^*)^2$
Type VIII: Developmental, statist, fiscal conservative	undershooting worse than overshooting	undershooting worse than overshooting	undershooting worse than overshooting	$\alpha_0 + (\alpha_D/2)(D^*/D)^2 + (\alpha_N/2)(N^*/N)^2 + (\alpha_R/2)(R^*/R)^2$

The above, of course, is the accounting identity that expenditures equal receipts. To capture the distribution of foreign aid and domestic revenues into budgetary categories we instead write,

$$D = (1 - \rho_R)R + (1 - \rho_B)A_B + (1 - \rho_M)A_M, \qquad (2)$$

and,

$$N = \rho_R R + \rho_B A_B + \rho_M A_M. \qquad (3)$$

$(1 - \rho_R)$, $(1 - \rho_B)$, and $(1 - \rho_M)$ are the fractions of domestically raised revenues, aid, Japanese bilateral aid and other aid, respectively, allocated to government development expenditures. There two constraints reflect alternative uses of government revenues augmented by foreign assistance.[4] The first constraint allows for the possibility that D can be financed partly by domestic revenues and partly by different sources of foreign aid. The second constraint assumes that domestically raised revenues, and foreign aid not used for development purposes, go towards nondevelopment government expenditure. The model thus involves a trade-off between development and other spending by the government. It is a theoretical model of the implications of recipient preferences that can be used to determine the fiscal behavior of the government in the presence of foreign aid.

Solving the constrained loss minimization problem leads to a set of nonlinear simultaneous equations. The direction and extent of the impact of Japanese bilateral and other

[4] Incorporating fungibility into a decision making problem as a subproblem is extremely difficult. Use of a single budgetary constraint *a priori* assumes that aid is 100 percent fungible. While not directly addressing the fungibility issue, our approach does not *a priori* assume 100 percent fungibility; it does look at the allocation of aid among budgetary categories. See Pack and Pack (1990, 1993) for further discussion of fungibility.

foreign aid on N and D can be estimated. The eight sets of estimating simultaneous systems equations appear in Table 2.

III. Data and Estimation Issues

The data set comprises of Japanese Foreign Aid to Indonesia from 1970-1996. This is the period when the New Order Government under Soeharto undertook successive development efforts in Indonesia. In addition to the aid data the annual fiscal statistics on revenues and expenditures were also collected both from Indonesian and non-Indonesian sources. Among Indonesian sources are the documents of BPS (the central bureau of statistics) and Bank of Indonesia (annual reports). Indonesia Source Book from the National Development Information Office also served as a source of information. After reconciling the statistics from various sources, all the data were converted to constant Rupiahs at 1980 purchasing power parity prices.

For the purpose of estimating and interpreting the model correctly, it is important to remember that the policymakers work with actual budgetary data and not with theoretical entities we have in the model. A translation between the two modes is necessary. Fortunately for our purpose, however, the Indonesian budgetary categories do correspond to Development and Non-development expenditures to a large extent. All the published categories such as Agriculture and Irrigation, Industry, Mining and Energy, Transportation, and Communications, Public Works and Transmigration, Education, Health and Family Planning can be used directly, Local and Regional Development and expenditures also occur as a separate category. There is a large "other" or residual category. After discussion with the Indonesian scholars and

Table 2

Structural Equations

Langrangian	Estimating equations
Type I: min. $V = \alpha_0 + (\alpha_D/2)(D/D^*)^2 + (\alpha_N/2)(N/N^*)^2 + (\alpha_R/2)(R/R^*)^2 - \lambda_D(D - (1 - \rho_R)R - (1 - \rho_B)A_B - (1 - \rho_M)A_M) - \lambda_N(N - \rho_R R - \rho_B A_B - \rho_M A_M)$	$D = (1 - \rho_R)R + (1 - \rho_B)A_B + (1 - \rho_M)A_M$ $N = \rho_R R + \rho_2 A_B + \rho_M A_M$ $R = [-(\alpha_D/\alpha_R)(1-\rho_R)(D/D^{*2}) - (\alpha_N/\alpha_R)\rho_R(N/N^{*2})]R^{*2}$
Type II: min. $V = \alpha_0 + (\alpha_D/2)(D/D^*)^2 + (\alpha_N/2)(N/N^*)^2 + (\alpha_R/2)(R^*/R)^2 - \lambda_D(D - (1 - \rho_R)R - (1 - \rho_B)A_B - (1 - \rho_3)A_M) - \lambda_N(N - \rho_R R - \rho_B A_B - \rho_M A_M)$	$D = (1 - \rho_R)R + (1 - \rho_B)A_B + (1 - \rho_M)A_M$ $N = \rho_R R + \rho_2 A_B + \rho_M A_M$ $R = \{[(\alpha_D/\alpha_R)(1-\rho_R)(D/D^*)^2 + (\alpha_N/\alpha_R)\rho_R(N/N^{*2})][1/R^{*2}]\}^{(-1/3)}$
Type III: min. $V = \alpha_0 + (\alpha_D/2)(D/D^*)^2 + (\alpha_N/2)(N^*/N)^2 + (\alpha_R/2)(R/R^*)^2 - \lambda_D(D - (1 - \rho_R)R - (1 - \rho_B)A_B - (1 - \rho_M)A_M) - \lambda_N(N - \rho_R R - \rho_B A_B - \rho_M A_M)$	$D = (1 - \rho_R)R + (1 - \rho_B)A_B + (1 - \rho_M)A_M$ $N = \rho_R R + \rho_2 A_B + \rho_M A_M$ $R = [-(\alpha_D/\alpha_R)(1-\rho_R)(D/D^{*2}) + (\alpha_N/\alpha_R)\rho_R(N^{*2}/N^{*3})]R^{*2}$
Type IV: min. $V = \alpha_0 + (\alpha_D/2)(D/D^*)^2 + (\alpha_N/2)(N^*/N)^2 + (\alpha_R/2)(R^*/R)^2 - \lambda_D(D - (1 - \rho_R)R - (1 - \rho_B)A_B - (1 - \rho_M)A_M) - \lambda_N(N - \rho_R R - \rho_2 A_B - \rho_M A_M)$	$D = (1 - \rho_R)R + (1 - \rho_B)A_B + (1 - \rho_M)A_M$ $N = \rho_R R + \rho_2 A_B + \rho_M A_M$ $R = \{[(\alpha_D/\alpha_R)(1-\rho_R)(D/D^*)^2 - (\alpha_N/\alpha_R)\rho_R(N^{*2}/N^{*3})][1/R^{*2}]\}^{(-1/3)}$
Type V: min. $V = \alpha_0 + (\alpha_D/2)(D^*/D)^2 + (\alpha_N/2)(N/N^*)^2 + (\alpha_R/2)(R/R^*)^2 - \lambda_D(D - (1 - \rho_R)R - (1 - \rho_B)A_B - (1 - \rho_M)A_M) - \lambda_N(N - \rho_R R - \rho_B A_B - \rho_M A_M)$	$D = (1 - \rho_R)R + (1 - \rho_B)A_B + (1 - \rho_M)A_M$ $N = \rho_R R + \rho_2 A_B + \rho_M A_M$ $R = [(\alpha_D/\alpha_R)(1-\rho_R)(D^{*2}/D^3) - (\alpha_N/\alpha_R)\rho_R(N/N^{*2})]R^{*2}$
Type VI: min. $V = \alpha_0 + (\alpha_D/2)(D^*/D)^2 + (\alpha_N/2)(N/N^*)^2 + (\alpha_R/2)(R^*/R)^2 - \lambda_D(D - (1 - \rho_R)R - (1 - \rho_B)A_B - (1 - \rho_M)A_M) - \lambda_N(N - \rho_R R - \rho_B A_B - \rho_M A_M)$	$D = (1 - \rho_R)R + (1 - \rho_B)A_B + (1 - \rho_M)A_M$ $N = \rho_R R + \rho_2 A_B + \rho_M A_M$ $R = \{[(-\alpha_D/\alpha_R)(1-\rho_R)(D^{*2}/D^3) + (\alpha_N/\alpha_R)\rho_R(N/N^{*2})][1/R^{*2}]\}^{(-1/3)}$
Type VII: min. $V = \alpha_0 + (\alpha_D/2)(D^*/D)^2 + (\alpha_N/2)(N^*/N)^2 + (\alpha_R/2)(R/R^*)^2 - \lambda_D(D - (1 - \rho)R - (1 - \rho_B)A_B - (1 - \rho_M)A_M) - \lambda_N(N - \rho_R R - \rho_B A_B - \rho_M A_M)$	$D = (1 - \rho_R)R + (1 - \rho_B)A_B + (1 - \rho_M)A_M$ $N = \rho_R R + \rho_2 A_B + \rho_M A_M$ $R = [(\alpha_D/\alpha_R)(1-\rho_R)(D^{*2}/D^3) + (\alpha_N/\alpha_R)\rho_R(N^{*2}/N^3)]R^{*2}$
Type VIII: min. $V = \alpha_0 + (\alpha_D/2)(D^*/D)^2 + (\alpha_N/2)(N^*/N)^2 + (\alpha_R/2)(R^*/R)^2 - \lambda_D(D - (1 - \rho_R)R - (1 - \rho_B)A_B - (1 - \rho_M)A_M) - \lambda_N(N - \rho_R R - \rho_B A_B - \rho_M A_M)$	$D = (1 - \rho_R)R + (1 - \rho_B)A_B + (1 - \rho\square_M)A_M$ $N = \rho_R R + \rho_2 A_B + \rho_M A_M$ $R = \{[-(\alpha_D/\alpha_R)(1-\rho_R)(D^{*2}/D^3) - (\alpha_N/\alpha_R)\rho_R(N^{*2}/N^{*3})][1/R^{*2}]\}^{(-1/3)}$

officials, it was decided that part of this "catch-all" category, in fact, caught some "non-development expenditures." It was estimated to be between 25% and 40%. After further discussions and checking (a very time-consuming process) with the Ministry of Finance and BPS officials an estimate of linkage to non-development expenditures was arrived at for each year between 1970 and 1996.

On the revenue side Development Funds including Project Aid are clearly marked off from the other items. The flow from income, value added tax, excise and import tax receipts constitute the major sources of government tax revenues. The tax-collection system was standardized and modernized as a result of the post-1983 reform program. Corporate and personal income taxes are now set at the top marginal rate of 35 percent on annual incomes above Rp. 50 millions. Tax revenues have risen in recent years. However, a large part of revenues has traditionally come from the oil and gas sectors. In 1987 Indonesia was the lowest taxed nation in Southeast Asia with a tax to GDP ratio of 9.1 percent. By 1990 the ratio rose to 12.5 percent.

The econometric estimation procedure for the models in Table 3 follows a system-wide approach. The simultaneous non-linear 3 stage SURE (seemingly unrelated regression estimation procedure) method is used. The econometric package used is SHAZAM. The estimation procedure also includes correction for autocorrelation in simultaneous equations framework.

As mentioned in the previous section the "boundedly rational" nature of the policy-makers means that the chosen indicator levels of budgetary targets are not exact but are

only roughly accurate. Since there is very little empirical evidence of Indonesian policy-makers' actual chosen indicator levels for these targets it becomes an important problem to estimate these. The planning documents are not adequate since they are drawn up at infrequent intervals and represent longer term targets. The categorizations are also different from those required by the approach adopted here. Therefore I try to approximate the chosen indicator levels by regressing the actual *ex post* values on a series of instrumental variables and then forecasting the indicator values. As Sargent has recently pointed out in the context of rational expectations, the economist or the econometrician actually works in a bounded rationality sense when predicting values such as these from models such as the ones I have used.[5]

Each indicator level is estimated by specifying an equation relating the actual variable to some instruments. I then regress the actual variable on the chosen instruments (with correction for auto-correlation). Planned D is obtained by estimating an equation where D is a linear function of GDP and total gross domestic investment in the private sector together with proxies for investment in human capital. The fitted values of the dependent variable serve as indicator levels. Planned R is found in a similar manner, by regressing R on GDP and lagged imports and then using the fitted values of the dependent variable as the indicator value. Planned N is obtained by regressing N on the lagged value of itself.

[5] Sargent, Thomas, 1993, Bounded Rationality in Macroeconomics (Oxford: Clarendon Press), pp. 21, 34, 160.

IV. Results and Interpretation

How has Japanese aid influenced the fiscal behavior of the Indonesian policy makers? In order to answer this question, it is important to understand how the allocation between budgetary categories can be influenced by the injection of foreign aid.

According to the theoretical approach adopted here the policy-makers respond to the availability of foreign aid by reallocating money to the various budgetary categories. Although the model assumes bounded rationality, the reallocation itself is in response to additional amounts of foreign aid and is therefore in keeping with allocation at the margin. Thus comparative statistics exercises can be performed legitimately. My major concern here is to examine the allocation of finance to development and non-development expenditures. An additional area of interest is the impact of aid on domestic revenue raising.

The results of the empirical exercise for Indonesia are given in Table 3. The structural equations in Table 2 contain parameters ρ_R, ρ_B and ρ_M by way of constraints (2) and (3). These three parameters show the nondevelopment expenditure responses to an increase in domestic revenues, bilateral Japanese aid, and other multilateral and non-Japanese bilateral aid respectively. In the table estimates for these three parameters together with some others are shown for the eight different models describing eight different policy maker types as described in Table 1. For the structural equations I refer the reader to Table 2. After some general observations, I have chosen to discuss two cases in detail for illustrative purposes. Others can be interpreted following a similar approach.

Table 3

The Impact of Japanese and Non-Japanese Aid to Indonesia 1960-1996
Non-linear SURE Parameter Estimates
(Standard errors in parentheses)

MODEL	ρ_M	ρ_B	ρ_R	α_D/α_R	α_N/α_R	AIC
Type I	.7882 (.0311)	.6962 (.0122)	.8226 (.0311)	-.4143 (.0209)	-.6134 (.0230)	63.82
Type II	.7836 (.0236)	.6582 (.0125)	.6458 (.0509)	.1862 (.0852)	.7121 (.0152)	64.97
Type III	.8228 (.0829)	.7393 (.0333)	.6912 (.0481)	.5312 (.0211)	.4915 (.0982)	63.33
Type IV	.7241 (.0099)	.6123 (.0212)	.7215 (.0012)	.1972 (.0731)	.1693 (.0112)	62.13
Type V	.6287 (.0215)	.4681 (.0510)	.5284 (.0922)	-.0801 (.2310)	-.0428 (.5212)	61.12
Type VI	.4772 (.0212)	.4183 (.0121)	.7235 (.0809)	-.0213 (.0721)	-.0235 (.0412)	60.92
Type VII	.5043 (.0181)	.3283 (.0282)	.4581 (.0319)	.0312 (.0329)	.1912 (.0818)	59.24
Type VIII	.6568 (.0392)	.3581 (.0351)	.5281 (.0828)	.7214 (.0082)	.5866 (.0923)	61.16

Looking across the rows in Table 3, it is striking that for both developmentalist and non-developmentalist types of policymakers Japanese bilateral aid seems to have had a greater impact than the rest of the world aid in almost every case on development expenditures. It may be recalled from Table 2 that Types I-IV are the non-developmental policymakers and Types V-VIII are the developmental ones. It is also interesting to see the difference between the two types. The co-efficients (with varying degrees of significance) ρ_B vary between .6123 and .7393 for models I-IV. That means that in the presence of Japanese aid approximately 26 to 39 percent of this aid goes to development expenditure on the margin if the policymaker is non-developmental. On the other hand, from models V-VIII, the corresponding percentage of aid going to development expenditures is between 67 and 53 percent. For models I to IV, ρ_M varies between .7241 and .8228. For models V to VIII, the range is between .4772 and .6568. Thus in terms of influencing development expenditures in Indonesia Rupiah for Rupiah Japanese bilateral aid has been more successful than the non-Japanese aid. In addition to revealing the influence of Japanese aid, the above co-efficients also indicate that the type of the policymaker really can make a difference. This is also true in terms of financing development expenditures out of domestic revenue. For a non-developmental policymaker ρ_R varies between .7215 and .8226. Rather dismally, this implies that between 72 and 82 percent of domestic revenues may go to non-development expenditures in the presence of aid.

What kind of policymakers did make the decisions in Indonesia regarding development? This is a particularly fascinating question, but is hard to answer in a definitive fashion. The "best guess" one can make must use a great deal of reliable institutional history. In case of Indonesia this is largely unavailable. The books and articles written on this subject deal at best with particular episodes. On the whole, however, a picture of at least partial

commitment to genuine development objective emerges. This is also consistent with my own visits to Indonesia and extensive investigations with the Indonesian and non-Indonesian academics and development practitioners on the subject.

I am also able to offer some econometric evidence to corroborate the above characterization. In Table 4, the last column presents the value of the Akaike Information Criterion (AIC) for each of the eight models. AIC is a model selection criterion that can be applied to any model that can be estimated by the maximum likelihood method. One simply minimizes (2LogL)/n + 2k/n where k=the number of parameters in the likelihood function L and n is the number of observations. Particularly for a non-linear model the AIC is a convenient econometric discriminator among different model specifications. It would seem that by this criterion at least type VII policy-maker model may be the most appropriate one for Indonesia during the period of observation. This means that both developmental and statist concerns dominated the real fiscal agenda during this period. This too, seems to be consistent with the institutional studies and my own informed observations.

Let us consider then the type VII policy maker first. According to the typology in table 2 this is further a fiscally liberal policy maker. All the ρ's are positive and significant at .05 level.[6] In the presence of foreign aid almost 50% of the additional revenue goes to non-development expenditures. For bilateral Japanese foreign aid the percentage going to development expenditures is 67% whereas 54% of aid from all other sources is spent for non-developmental purposes. Thus, a straightforward interpretation would have been to claim the

[6] From here on wherever the phrase "statistically significant" occurs it will mean significant at .05 level unless otherwise specified.

superiority of Japanese aid over other aid in this case. However, some caution is required. We do not know if the **presence** of aid pulls some money out of the domestic revenue to non-development purposes. It is reasonable to suspect that for some categories of aid (for both generally Japanese and other aid) this may be partially the case. Under these circumstances if the substitution effect is not too high (i.e. aid doesn't replace completely development expenditures that would have been financed out of domestic revenues) only then there is an incremental effect of aid on development expenditures. Under this scenario, Japanese bilateral aid would seem to be more effective Rupiah for Rupiah than other aid. I show next that in case of Indonesia this may be a reasonable conclusion.

The ratios of the parameters from the loss function (the α's) can be readily interpreted by referring to the structural equations. In the simultaneous equations framework, given the specific objective function and constraints, the ratios of α's (e.g. α_D/α_R or α_N/α_R) indicate how to explain the changes in domestic revenue in the presence of foreign aid. For the type VII policy-maker both α_D/α_R and α_N/α_R are significantly different from zero. The interpretation of the first of these coefficients is as follows: in the presence of foreign aid any increase in development expenditures reduces the domestic revenue raising effort. The quantitative magnitude is given in a non-linear fashion by the product of this coefficient and (1-ρ_R). However raising the target for development expenditures even with aid coming in will lead to an increase in R. The coefficient α_N/α_R also gives an estimate of (partial) impact of non-development expenditures on R. In this case an increase in non-development expenditures also leads to an increase in R. Also this magnitude is further increased by the magnitude of R*. Thus, bureaucratic or political decision to increase R* will lead to an increase in revenues as well. We may call the above description the aid-dependent revenue effect.

If aid-dependent revenue effect is positive, then the presence of aid actually increases domestic revenue. In the case of Indonesia for model VII type of policymaker this will be true. Let us now turn to the model which has the least AIC value among the rest; this is model VI. As can be seen from Table 2 this is the developmental, non-statist and fiscally conservative type.

Looking across the row under the headings for the various parameters the contrast is indeed quite reassuring empirically. More than 52% of the domestic revenue goes towards development expenditures even in the presence of foreign aid. The coefficient is significant both statistically and economically. Out of bilateral Japanese aid, again in a statistically significant sense, about 61% goes to development expenditures. Of the other aid receipts about 55% goes to development expenditures. Thus, a major hypothesis of this study is verified: the more developmental the orientation of the policy-maker the more foreign aid influences spending in the direction of development. It also corroborates the earlier finding that bilateral Japanese aid performed well in general.

Turning now to the other coefficients $\alpha_D/_R$ and $\alpha_N/_R$ have absolute values of .0213 and .0235 and both are statistically significant. Looking at the revenue equation for this type of policy maker in Table 3 we can see that the negativity of α_D/α_R (estimated) implies that revenue increases as indicator levels of development expenditures increase although the rate of increase is quite slow. This is consistent with a developmentalist but fiscally conservative preference. Aid finances development expenditures more than domestic revenue raising efforts. In the absence of aid such expenditures may drop dramatically. Non-development expenditures also lead to an increase in revenue raising. This is consistent with a balancing the

budget fiscal conservatism. It also suggests that foreign aid is only marginally diverted to non-development expenditures when finance is needed. It is more likely that domestic revenues are increased more than proportionately to cover these non-development expenditures.

From the discussion of the two cases, it would seem that developmental, statist Indonesian policymaking environment contributed to the salutary effects of Japanese aid. Whether the policymakers were fiscally conservative or liberal may not have made that much difference although the budget deficits point towards the latter type. If we go by the evidence of budget deficits model VII would indeed seem to be the right model and my earlier observations would be strengthened.

These results are very much at variance with the received wisdom on the effect of foreign aid on public expenditures. Japanese aid may be more effective because of the links with infrastructure investment. It may also be the case that the microlevel projects are more successfully managed through technical cooperation. There is some evidence for this (Khan,1997).

These results also confirm Howard Pack and Janet Pack's findings with regards to fungibility of aid in Indonesia (Pack and Pack, 1990). Their study did not separate out Japanese aid which this paper does. But they find "that in the largest categories aid is spent for which it is given." They also find as in some of the models discussed above that taxes are raised in the presence of aid. In the present study, the econometric reasons for this are given by the signs and parameter estimates. However, the institutional explanation is more obscure. Indonesian officials suggest that a drive for independence leads to the raising of taxes. It could

also be the case that some aid flow requires matching funds (Cashel-Cordo and Craig, 1986; Booth, 1988).

V. Conclusions

Contrary to the anti-aid literature Japanese aid to Indonesia seems to have had considerable effect on development expenditures in the public sector in Indonesia. Japanese aid also performed better than other aid regardless of the type of policymakers in Indonesia. It may also be accompanied by an increase in revenue raising efforts on the part of Indonesia.

That Japanese aid is more effective than other aid is surprising but not completely counter-intuitive in the Asian context. Japan's field experience, technical cooperation and mainly infrastructure-oriented aid can go a long distance toward an adequate explanation (Khan, 1995; Browne, 1990). Of course, as Japanese aid becomes more diversified, the situation may change.

In addition to exploring the effect of Japanese aid systematically, this study is also able to confirm the Packs' findings with regards to Indonesia. It is rare in economics to use different models and somewhat different data and find similar types of answers. Thus aid-development expenditures relation in case of Indonesia seem to be robust. If this is indeed the case, then the results with regards to the effects of Japanese aid would seem to be credible.

Further work disaggregating both the types of Japanese aid and the categories of expenditures will throw more light on the aid-public sector expenditures relationship. Also

results from one or two countries can not be generalized readily without falling a ready prey to the fallacy of induction. Careful work covering more countries will reveal in the future just how effective Japanese aid is in each case.

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