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Econometric Results from a Bounded Rationality
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Japanese Foreign Aid, Development Expenditures and Taxation in Thailand: Econometric Results from a Bounded Rationality Model of Fiscal Behavior

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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 Thailand is examined at the macroeconomic level. It turns out that Japanese aid led to proportionately more development expenditures than did other aid. It also might have been positively related to an increased effort by the Thai government to raise taxes. Economic explanations based on a set of bounded rationality model are advanced. Econometric and institutional explanations are also offered. The three sets of explanations can be seen as overlapping and complementary in this case.

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

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I. Introduction

Among the rapidly growing countries in Southeast Asia, Thailand seemed the closest to joining the ranks of NIC's (Schlosstein, 1991; Warr, 1993) up until the Asian financial crisis which began with the Thai currency and financial crisis in July, 1997. Until then Thailand had posted an average growth rate of almost 8% per year in the decade prior to the financial crisis. From 1986-1990, the Thai economic growth rate was the highest in the world (Warr, 1993). Both internal and external factors have been responsible for this growth (Jansen, 1991; Warr, 1993). Many observers have pointed to the external financial flows in the form of aid and investment. In particular, the role of Japanese aid and investment has been noted. However, no systematic quantitative research based on economic and econometric modeling has been published so far on the effect of Japanese aid on the Thai economy.

The purpose of this paper is to contribute to a quantitative study of the impact of Japanese aid on the Thai economy during the precrisis period of high growth.. More specifically, I investigate the impact of Japanese aid on the public sector behavior in Thailand. Using an economic model of public sector behavior and time-series data, I make an attempt to estimate the impact of aid flows from Japan as well as other donors on public investment, consumption, and revenue raising efforts in Thailand. Thus, I am also able to compare the effects of Japanese aid with those of non-Japanese aid as well.

The econometric work uses a simultaneous equations model derived from the policymakers' optimizing decision in the presence of foreign aid. I use a model of bounded rationality. Following Simon (1982), I assume that policy-making in the real world (especially in LDC's) inevitably encounters institutional bounds to full rationality. Under such

circumstances, the policymakers may know their targets (e.g., development expenditures, tax revenues, etc.) only provisionally. They may wish to minimize deviations from such targets.¹ However, the targets themselves can not be the ones that are the solutions of an optimizing exercise. Bureaucratic behavior in the presence of uncertainty can be rational only in a bounded sense. In the model described in the next section 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 studied. 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*. Since there is no available econometric study on the impact of Japanese foreign aid on Thailand at all, we are on virgin territory here. Thus, I hope to break some new ground by using a bounded rationality model and deriving econometric estimates from such a model for Thailand. Although not expected to be definitive, my results can throw some light on the behavior of Thai policymakers with respect to both Japanese and other foreign aid.

¹ In general, as in the formal model used in this paper, some function of the deviations is minimized.

II. **The Model**

The following model is a variation of the model introduced by Gang and Khan (1989, 1994). 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 policymakers may weigh the overshooting and the undershooting of these indicator levels differently. For some policymakers 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) and Khan (1996-7) I consider the decision-making process of boundedly rational policymakers 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 policymakers 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 policymaker's hand prior to reaching their destination, understanding where these funds are allocated by policymakers 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.²

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

² 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.

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

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 expenditures, 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 policymaker 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.

The loss function stated in equation (1) has the advantage of allowing for asymmetries in loss when the policymaker over- or undershoots the chosen indicator level. It also allows us to examine different assumptions about the "type" of the policymaker. 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 policymaker who is "developmentalist" in orientation: undershooting the development expenditure indicator value is worse than overshooting it. At the same time, the above policymaker is a "fiscal liberal" since overshooting the revenue raising indicator

value is worse than undershooting. Such policymakers 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 1. Part of our problem is to explore which of these characterizations captures the behavior of policymakers "best" in an empirical setting.

Given the type of policymaker, 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:

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

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

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

and,

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

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

$(1 - \rho_R)$, $(1 - \rho_B)$, and $(1 - \rho_M)$ are the fractions of domestically raised revenues, aid, Japanese bilateral aid and other aid, respectively, allocated to government development expenditures. These two constraints reflect alternative uses of government revenues augmented by foreign assistance.³ 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 foreign aid on N and D can be estimated. The eight sets of estimating simultaneous systems equations appear in Table 2.

³ 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.

Table 2
Structural Equations

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

III. **Data and Estimation Issues**

The data set comprises of Japanese Foreign Aid to Thailand plus Thai budgetary data from 1960-1996. This is the period during which the high growth process in Thailand took place. Historically, three overlapping political processes created the possibility of this growth. First, the revolution of 1932 replaced the traditional monarchy with a modern, growth-oriented leadership. Secondly after the second world war, Thailand was able to participate in the new economic and political dynamics resulting from the decolonization movement. Although Thailand was never a formal colony, arrangements such as the Bowring treaty of 1855, limited its freedom of choice in the prewar period. Finally, the revolution in China cut off the Chinese merchant class in Thailand from its "home." The resident Chinese could no longer remit capital to China on the prorevolutionary level. The drop in such remittances forced them to become more interested in investing in Thailand (Siamwalla, 1975).

A fourth process began with the commitment by the western powers to channel foreign aid to LDC's. During 1950's this flow was fairly small, and in the case of Japan, almost non-existent. But, since 1960, it has gradually become a sizable amount. In 1960, total Japanese aid was only US \$0.32 million. By 1971 it grew to a (still small) sum of 15.5 million. However, in 1992 the total Japanese aid to Thailand was \$546.15 million.

In addition to the aid data the annual fiscal statistics on revenues and expenditures were also collected both from Thai and non-Thai sources. Among Thai sources are the documents of the Bank of Thailand (annual reports and other documents) and those out of the various ministries. After reconciling the statistics from various sources, all the data were converted to constant Bahts 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. Unfortunately, the Thai budgetary categories do not always correspond to Development and Non-development expenditures automatically. At the same time, many of the published categories such as Agriculture and Irrigation, Industry, Mining and Energy, Transportation, and Communications, Public Works and Education, Health and Family Planning can be used either directly or with slight modifications. However, there is a large "other" or residual category. After discussion with the Thai scholars and officials, it was decided that part of this "catch-all" category, in fact, caught some "non-development expenditures." It was estimated to be between 20% and 40%. After further discussions and checking with the Ministry of Finance and Bank of Thailand officials an estimate of linkage to non-development expenditures was arrived at for each year between 1960 and 1996.

On the revenue side Development Funds including Project Aid can be marked off from the other items. The flow from personal and corporate income tax, excise and import tax receipts constitute the major sources of government tax revenues. The tax-collection system is complicated. For example, the tax rate schedule contains rates ranging from 5 to 55 percent over six income brackets and allows many exemptions. Corporate tax rate is currently 30% for companies listed on SET and 35 percent when not listed (Chaipat, 1993). Tax revenues have risen in recent years. However, business excise and import taxes still account for 75 percent of total tax revenue. Since the structural adjustment programs in 1982 Thailand has been reducing export and import duties; but there is a small upward trend in personal income taxes.

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 policymakers 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 Thai policymakers' 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.⁴

⁴ Sargent, Thomas, 1993, Bounded Rationality in Macroeconomics (Oxford: Clarendon Press), pp. 21, 34, 160.

Table 3

**The Impact of Japanese and Non-Japanese Aid
to Thailand 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	.7618 (.0125)	.7269 (.0315)	.8476 (.0882)	-.4215 (.0430)	-.6311 (.0312)	62.03
Type II	.8335 (.0082)	.7128 (.0628)	.6952 (.3113)	.1463 (.0326)	.6911 (.0213)	62.38
Type III	.8135 (.0212)	.7128 (.0812)	.6635 (.0325)	.5913 (.0916)	.5251 (.1101)	63.55
Type IV	.7628 (.1137)	.6639 (.0901)	.7318 (.0212)	.2328 (.0401)	.1838 (.0211)	62.01
Type V	.6029 (.0391)	.4218 (.0226)	.5319 (.0018)	-.0907 (.0301)	-.0526 (.1212)	61.82
Type VI	.4688 (.0725)	.3986 (.0215)	.6282 (.0983)	-.0218 (.0635)	-.0386 (.0983)	59.08
Type VII	.4826 (.0416)	.2788 (.0683)	.4832 (.0911)	.0525 (.0738)	.1617 (.0212)	58.08
Type VIII	.7129 (.0080)	.3288 (.0123)	.5683 (.0512)	.0719 (.0172)	.0938 (.0282)	60.91

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.

IV. **Results and Interpretation**

How has Japanese aid influenced the fiscal behavior of the Thai policymakers? 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 policymakers 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 statics 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 Thai data 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 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 policymaker 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.

Looking across the rows in Table 3, it is striking that for both developmentalist and non-developmental types of policymakers Japanese bilateral aid seems to have had a greater impact than the rest of the world aid in almost every case of development expenditures. It may be recalled from Table 1 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 .6639 and .7269 for models I-IV. That means that in the presence of Japanese aid approximately 27 to 33 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 58 and 72 percent. For models I to IV, ρ_M varies between .7618 and .8335. For models V to VIII, the range for ρ_m is between .4826 and .7129. Thus, it would be appropriate to conclude that in terms of influencing development expenditures in Thailand Baht for Baht 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 .6952 and .8476. Rather dismally, this implies that between 76 and 84 percent of domestic revenues may go to non-development expenditures in the presence of

aid when the policymakers are non-developmentalists. Thus, a major hypothesis of this study is verified: the more developmental the orientation of the policymaker the more foreign aid influences spending in the direction of development. It also corroborates the earlier finding that bilateral Japanese aid has performed well in general for development purposes.

What kind of policymakers did make the decisions in Thailand regarding development? This is a particularly fascinating question, but is hard to answer in a definitive fashion. Within the context of the model, the "best guess" one can make must use a great deal of reliable institutional history. In the case of Thailand, this is largely unavailable in English. While more is available in Thai, the evidence there is far from conclusive. 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 objectives emerges. This is also consistent with my own visits to Thailand and extensive conversations with the Thai and non-Thai academics and development practitioners on the subject.

It is also possible to offer some econometric evidence to corroborate the above characterization. In Table 3, 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 $(2\text{Log}L)/n + 2k/n$ 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 policymaker model may be the most appropriate one for Thailand 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 informal observations.

Let us consider then the type VII policymaker first. According to the typology in Table 2 this is further a fiscally liberal policymaker. All the ρ 's are positive and significant at .05 level.⁵ In the presence of foreign aid almost 48% of the additional revenue goes to non-development expenditures. For bilateral Japanese foreign aid the percentage going to development expenditures is 72% whereas almost 52% of aid from all other sources is spent for developmental purposes. Thus, a straightforward interpretation would have been to claim the 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 Baht for Baht than other aid. I show next that in case of Thailand this may be a reasonable conclusion.

In order to do this, we need to look at the connection between aid and the revenues by looking at the ratios of the parameters from the loss function. 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

⁵ From here on wherever the phrase "statistically significant" occurs it will mean significant at .05 level unless otherwise specified.

changes in domestic revenue in the presence of foreign aid. For the type VII policymaker 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 $(1-\rho_R)$. 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 Thailand 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 1 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 as far as a comparison between the effects of Japanese bilateral and other aid is concerned. More than 53% 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, more than 60% goes to development expenditures. Of the other aid receipts about 37% goes to development expenditures.

Turning now to the other coefficients α_D/α_R and α_N/α_R have absolute values of .0218 and .0386 and both are statistically significant. Looking at the revenue equation for this type of policymaker in Table 2 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 Thai policymaking environment contributed to the observed effects of Japanese aid. Whether the policymakers were fiscally conservative or liberal may not have made that much difference although the gradual narrowing of budget deficits points towards the former type. Chaipat (1993, p.200) points out that the government revenues and expenditures grew at rates of 13.9% and 12.8% respectively during 1970-1988. Thus the budget deficit must have shrank. In fact, according to his calculations using budgetary statistics the rate of shrinkage was 3.1% per annum. Therefore, if we go by the evidence of budget deficits model VI would indeed seem to be the right model. What is important to note is that regardless of which one of the two models (VI of VII) we accept Japanese aid is qualitatively strongly linked with an increase in development expenditures. It also performs better in this sense than other aid quantitatively in both the models.

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. Finally, it may be the case that some aid flows require matching funds (Cashel-Cordo and Craig, 1986).

V. **Conclusions**

Contrary to much of the aid literature, Japanese aid to Thailand seems to have had considerable effect on development expenditures in the public sector in that country. Japanese aid also seems to have performed better than other aid regardless of the type of policymakers in Thailand. It may also have been accompanied by an increase in revenue raising efforts on the part of the Thai government.

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 b; Browne, 1990). Of course, as Japanese aid becomes more diversified, this situation may change.

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 empirical work covering more countries will reveal in the future just how effective Japanese aid is in each case. The

present model can be disaggregated and extended for this purpose. The major hurdle, however, will be generating the appropriate disaggregated data sets.

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