The Effect of U. S. Assistance on Public and Private Expenditures in Pakistan: 1960–1988

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1. INTRODUCTION

The Gulf crisis and the suspension of U. S. bilateral assistance to Pakistan for 1990 threaten to have profound economic and political consequences for the country. These developments are bound to further exacerbate the traditional Balance of Payments difficulties and the unemployment problem in the short run, and possibly the future long-run economic growth of the country.

The termination of U. S. assistance for this year is more a reflection of the changing realities of the world today, rather than the alleged temporary measure by the U. S. designed to elicit Pakistan's cooperation in nuclear non-proliferation. It is highly probable that future U. S. assistance to Pakistan is going to be curtailed and is likely to be on more stringent terms than before.[1]

In such circumstances, an essential question that needs to be answered is that will a reduction in U. S. military and non-military assistance to Pakistan affect significantly its defense capabilities and/or weaken its economy?" Clearly, any objective answer requires an understanding of how the allocation of resources by Pakistan among defense, public non-defense, private investment, and private consumption goods and services is affected by U. S. foreign aid. It is only through this understanding that policy-makers in Pakistan can formulate the requisite strategies to minimize the adverse impacts of the reduction in U. S. assistance. This paper is a step toward furthering that understanding.

In a case study of Pakistan, for the period 1960–1986, we found that U. S. assistance was converted into pure fungible resources regardless of whether

it was earmarked for defense or non-defense purposes. Moreover, most of this was channelled to the private sector via tax relief, and hence, was effectively used for private sector consumption and/or investment purposes [Khilji and Zampelli (1991)]. The motivation in the paper was to quantitatively assess the degree of fungibility of U. S. categorical assistance and therefore was concerned solely with the effects of military and economic assistance on two categories of public expenditures, namely, all defense and public non-defense. No distinction was made between private sector expenditures devoted to consumption and investment goods and services.

Clearly, to assess the economic and defense effects of a reduction in U. S. military and non-military assistance to Pakistan, a more relevant exercise would be to see how each type of assistance influences the investment-consumption trade-off in Pakistan. This study, therefore, extends our previous effort by disaggregating private sector expenditures further into private consumption and private investment expenditures. Furthermore it uses an expanded data set covering the period 1960–1988.

The paper is organized as follows. Section 2 briefly reviews the fungibility hypothesis while Section 3 develops an econometric model to explain the allocation of expenditures by Pakistan among defense, public non-defense, private investment, and private consumption goods and services, and the impact of U. S. military and non-military assistance on these decisions. The estimation and results are discussed in Section 4. Section 5 offers a brief summary and conclusions.

2. AN OVERVIEW OF THE FUNGIBILITY MODEL

The Fungibility model hypothesizes that a categorical grant recipient's effective post-grant budget constraint is unknown *a priori* and must therefore be estimated. This requires that a particular form for the effective post-grant constraint be chosen. A simple yet reasonable form is one that allows categorical grants to have both price-changing and income-changing components. Specifically, one might assume that a recipient has the ability to transform a fraction of a categorical grant into pure fungible resources while the remaining fraction reduces the price of purchasing or providing the aided activity. More formally, consider a recipient who is able to convert an (unknown) fraction, ϕ_i of a categorical grant into fungible resources.

Figure 1 illustrates a two dimensional case in which the recipient chooses an allocation between a composite good Y and a subsidized public good Q_i. Assume constant returns and define units so that the total dollar and physical amounts
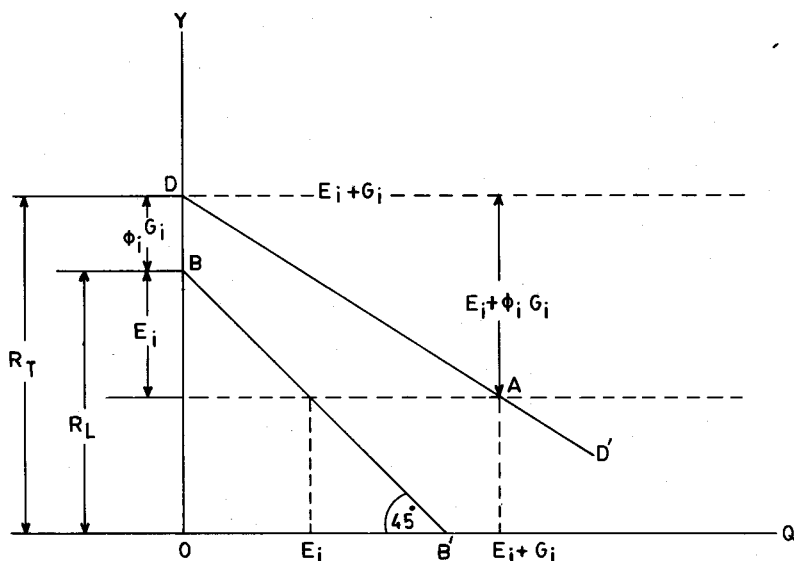
FIGURE 1

of the goods consumed are identical. Terms are defined as follows:

$R_L = E_i + Y =$ The amount of own internal resources where E_i is spent on Q_i and Y is spent on all else;

$G_i =$ The amount of categorical aid for the provision of Q_i;

$\phi_i G_i =$ The amount of G_i converted into fungible resources; and

$R_T = R_L + \phi_i G_i =$ Total fungible resources available for spending on Y and Q.

The pre-grant budget line, *BB'*, depicts the menu of choices in the absence of the categorical grant. The post-grant allocational choice is represented by point A on the effective post-grant constraint, *DD'*. The recipient sacrifices $E_i + \phi_i G_i$ of its total fungible resources to consume an amount of Q_i whose total cost is $E_i + G_i$. This implies an effective price for Q_i of:

$$p_i = \frac{E_i + \phi_i G_i}{E_i + G_i} = 1 + (\phi_i - 1)\frac{G_i}{E_i + G_i} \quad \ldots \quad \ldots \quad (1)$$

Which is equivalent to the slope of DD'. If $\phi_i = 0$, then the grant's effect is to reduce the price of Q by the matching ratio $G_i / (E_i + G_i)$. If $\phi_i = 1$, then the grant's effect is to simply increase the income of the recipient keeping the price of Q_i unchanged at 1. When $0 < \phi_i < 1$, the categorical grant will affect recipient expenditures via its impacts on the price of Q_i and on the recipient's income. Henceforth, we will refer to the ratio $G_i / (E_i + G_i)$ as M_i.[2]

3. AN ECONOMETRIC MODEL OF PAKISTAN'S EXPENDITURE DECISIONS

The development of the econometric model requires the definition of the following major variables and parameters:

Q_d = Per capita amount of "defense" consumed;

Q_{nd} = Per capita amount of public "non-defense" consumed;

Q_I = Per capita amount of private investment goods;

Q_{pvt} = Per capita amount of private consumption goods;

R_p = Real per capita internal resources of Pakistan;

G_d = Real per capita U. S. military aid to Pakistan;

G_{nd} = Real per capita U. S. non-military aid to Pakistan;

G_I = Real per capita U. S. "private investment" aid to Pakistan;

ϕ_d = Fraction of G_d converted into fungible resources;

ϕ_{nd} = Fraction of G_{nd} converted into fungible resources;

ϕ_I = Fraction of G_I converted into fungible resources;

P_d = Effective price of defense goods $= 1 + (\phi_d - 1) M_d$ and where $M_d = G_d /(E_d + G_d)$;

E_d = Pakistan's real per capita expenditure on defense from own internal resources;

P_{nd} = Effective price of non-defense goods $= 1 + (\phi_{nd} - 1) M_{nd}$, where $M_{nd} = G_{nd} /(E_{nd} + G_{nd})$;

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[2]The analysis assumes that the nominal post-grant constraint is strictly linear. For a discussion of the problems which arise when the nominal constraint is "kinked", see Zampelli (1988).

E_{nd} = Pakistan's real per capita expenditure on public non-defense from own internal resources;

P_I = Effective price of private investment goods $= 1 + (\phi_I - 1) M_I$ where $M_I = G_I/(E_I + G_I)$;

E_I = Pakistan's real per capita expenditures on private investment from own internal resources;

P_{put} = Price of private consumption set equal to 1;

γ_d = Minimum subsistence quantity of defense;

γ_{nd} = Minimum subsistence quantity of non-defense;

γ_I = Minimum subsistence quantity of private investment;

γ_{put} = Minimum subsistence quantity of private consumption;

β_d = Pakistan's marginal propensity to spend fungible resources on defense;

β_{nd} = Pakistan's marginal propensity to spend fungible resources on public non-defense;

β_I = Pakistan's marginal propensity to spend fungible resources on private investment;

β_{put} = Pakistan's marginal propensity to spend fungible resources on private consumption;

N_p = Total population of Pakistan; and

α = "Publicness" parameter for defense.

All monetary values are measured in 1980 Pakistan Rupees. Other variables and parameters will be defined as our discussion proceeds.

The econometric model assumes a constrained optimization process in which the recipient government behaves as if it were maximizing the utility of the "representative (or average)" citizen. Average citizen utility is a function of the (per capita) consumption of defense related, public non-defense related, private investment, and private consumer goods and services. Mathematically, the utility function is specified in the Stone-Geary form as:

$$U = (Q_d - \gamma_d)^{\beta_d} \ (Q_{nd} - \gamma_{nd})^{\beta_{nd}} (Q_I - \gamma_I)^{\beta_I} \ (Q_{put} - \gamma_{put})^{\beta_{put}} \ ... \ .... \qquad (2)$$

The β parameters, representing marginal budget shares or equivalently marginal spending propensities, must sum to one. The γ parameters, representing the minimum subsistence quantities, are restricted to be greater than or equal to zero.

We hypothesize that γ_d and γ_{nd}, the subsistence parameters for defense and public non-defense, are chosen in accordance with the threat posed by its neighbouring adversary, India. Algebraically, γ_d and γ_{nd} are replaced by:

$$\gamma_d = \gamma_{od} + \gamma_{ld}{}^* E_{di} \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

$$\gamma_{nd} = \gamma_{ond} + \gamma_{lnd}{}^* E_{di} \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

Where γ_{od} and γ_{ond} are the minimum required amounts of defense and public non-defense which are independent of the Indian threat as proxied by real Indian defense expenditures (E_{di}).

The average citizen's budget constraint requires that per capita fungible resources, from all sources, be equal to per capita expenditures on private and public sector goods and services. Moreover, the budget constraint is formulated to account for the (Potential) "publicness" of defense-related goods and services. Specifically, suppose Q_{di} represents the total amount of defense provided by the Pakistani government and $Q_d{}^*$ denotes the amount of defense provided to the average citizen. A common way to specify the relationship is given by:

$$Q_d = Q_d{}^* / N_p{}^{(\alpha-1)} = (Q_{dl}/N_p)/N_p{}^{(\alpha-1)} \qquad \ldots \quad \ldots \quad \ldots \quad (5)$$

If α equals 0 then defense is a pure public good implying that the per capita amount consumed is equal to the total amount provided, i.e., $Q_d = Q_{dl}$. Conversely, if defense is a pure private good then α equals 1 and the per capita amount consumed is equal to the per capita amount provided, i.e., $Q_d = Q_d{}^* = Q_{dl}/N_l$. If defense is an impure public good then $0 < \alpha < 1$. Therefore, the average citizen's budget constraint can be expressed as a function of the per capita amount of defense consumed which is consistent with the specification of the utility function. Algebraically, the constraint can be written as:

$$R_p + \phi_d G_d + \phi_{nd} G_{nd} + \phi_I G_I = Q_{pvt} + P_d Q_d N^{(\alpha-1)} + P_{nd} Q_{nd} + P_I Q_I \qquad (6)$$

Maximizing (2) subject to (6) and incorporating (3) and (4) yields the well-known

linear expenditure system:[3]

$$
\begin{aligned}
E_d = {} & \beta_d R_p + \beta_d \prod \phi_{nd} G_{nd} + \beta_d \phi_I G_I + (\beta_d \prod - 1)\,\phi_d G_d \\
& + (1-\beta_d)\,[1 + (\phi_d - 1) M_d]\,(\gamma_{od} + \gamma_{ld} E_{di})\,N_p^{(\alpha-1)} \\
& - \beta_d\,[1 + (\phi_{nd} - 1) M_{nd}]\,(\gamma_{ond} + \gamma_{lnd} E_{qi}) \\
& - \beta_d\,[1 + (\phi_I - 1) M_I]\,\gamma_I - \beta_d \gamma_{put} \quad\cdots\quad\cdots\quad\cdots\quad\cdots \quad (7)
\end{aligned}
$$

$$
\begin{aligned}
E_{nd} = {} & \beta_{nd} R_p + \beta_{nd} \prod \phi_d G_d + \beta_{nd} \phi_I G_I + (\beta_{nd} \prod - 1)\phi_{nd} G_{nd} \\
& + (1-\beta_{nd})\,[1 + (\phi_{nd} - 1) M_{nd}]\,(\gamma_{ond} + \gamma_{lnd} E_{di}) \\
& - \beta_{nd}\,[1 + (\phi_d - 1) M_d]\,(\gamma_{od} + \gamma_{dl} E_{di})\,N_p^{(\alpha-1)} \\
& - \beta_{nd}\,[1 + (\phi_I - 1) M_I]\,\gamma_I - \beta_{nd} \gamma_{put} \quad\cdots\quad\cdots\quad\cdots\quad\cdots \quad (8)
\end{aligned}
$$

$$
\begin{aligned}
E_I = {} & \beta_I R_p + \beta_I \theta \phi_{nd} G_{nd} + \beta_I \theta \phi_d G_d + (\beta_I \theta - 1)\,\phi_I G_I \\
& + (1-\beta_I)\,[1 + (\phi_I - 1) M_I]\,\gamma_I^* - \beta_I\,[1 \\
& + (\phi_{nd} - 1) M_{nd}]\,(\gamma_{ond} + \gamma_{lnd} E_{di}) - \beta_I\,[1 \\
& + (\phi_d - 1) M_d]\,(\gamma_{od} + \gamma_{dl} E_{di})\,N_p^{(\alpha-1)} - \beta_I \gamma_{put} \quad\cdots\quad\cdots \quad (9)
\end{aligned}
$$

$$
\begin{aligned}
E_{put} = {} & \beta_{put} R_p + \beta_{put}\,(\phi_d G_d + \phi_{nd} G_{nd} + \phi_I G_I) \\
& - \beta_{put}\,[1 + (\phi_d - 1) M_d]\,(\gamma_{od} + \gamma_{dl} E_{di})\,N_p^{(\alpha-1)} \\
& - \beta_{put}\,[1 + (\phi_{nd} - 1) M_{nd}]\,(\gamma_{ond} + \gamma_{lnd} E_{di}) \\
& - \beta_{put}\,[1 + (\phi_I - 1) M_I]\,\gamma_I + (1-\beta_{put})\,\gamma_{put} \quad\cdots\quad\cdots \quad (10)
\end{aligned}
$$

[3]Even though some of the assumptions of the Linear Expenditure System are restrictive, we have chosen it because the fairly limited sample precludes the efficient estimation of flexible functional forms which would tend to greatly increase the non-linearity and complexity of the system. An interesting study in a similar context by Heller (1975) derives linear demand functions based on a stylized utility function of the public sector.

Since $\beta_{put} = 1 - \beta_d - \beta_{nd} - \beta_p$ Equation (10) is redundant and need not be estimated.

The above equations incorporate two important parameters that ultimately determine the allocation of an additional dollar of external fungible resources among the four expenditure categories. The parameter π has been included to test for the so-called flypaper effect of grants. This effect suggests that an additional dollar's worth of external fungible resources stimulates more public spending than an additional dollar's worth of internal resources.

To see the implications for the current model it will be convenient to define $\pi(\beta_d + \beta_{nd})$ as the fraction of an additional dollars worth of external fungible resources retained in the public sector. If this fraction equals $\beta_d + \beta_{nd}$, i.e. $\pi = 1$ then an additional dollar of external fungible resources will have the same public spending impact as an additional dollar of internal resources. If the fraction equals 1 implying $\pi = 1/(\beta_d + \beta_{nd})$ then the entire additional dollar of external fungible resources is retained in the public sector. This corresponds to a perfect flypaper effect.

A value of $\pi = 0$ implies that, an additional dollar of external fungible resources would yield no public spending impact, i.e., the full dollar would leak into the private sector via some tax relief mechanism. Analogously, θ $(\beta_I + \beta_{put})$ can be defined as the fraction of an additional dollar of external fungible resources that is spent in the private sector.

The model as represented by (7), (8), (9) and (10) assumes that both the supply of U. S. aid and Indian defense expenditures are exogenous to the system. We expand this model to include an equation which makes total U. S. aid $(G = G_d + G_{nd})$ a linear function of the total real internal resources of Pakistan $(TR = R_p * N_p)$ and E_{di}. Algebraically, the equation is specified as:

$$G = b_0 + b_1 {}^* TR_p + b_2 {}^* E_{di} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (11)$$

Additionally, E_{di} is assumed to be a linear function of total real resources of India (TR_i) and total real defense expenditures of Pakistan $(TE_d = E_d * N_p)$ Algebraically:[4]

$$E_{di} = d_0 + d_1 {}^* TR_i + d_2 TE_d \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (12)$$

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[4]Equation (12) would be consistent with the assumption that India also maximizes a Stone-Geary utility function and it observes Cournot reaction to Pakistan's defense expenditures.

4. ESTIMATION AND RESULTS

The model is estimated using the Full Information Maximum Likelihood (FIML) technique. Due to the suspicion of first-order auto-correlation the equations were estimated in the following generalized difference form:

$$E_{it} = F_{it} + \rho \, [E_{i(t-1)} - F_{i(t-1)}] + v_t \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (13)$$

where E_{it} and $E_{i(t-1)}$ represent the values of the ith dependent variable in years t and $(t-1)$, respectively, F_{it} and $F_{i(t-1)}$ represent the corresponding right-hand sides, and ρ represents the auto-correlation parameter which is allowed to vary across the equations of the model. The parameters $\rho_1, \rho_2, \rho_3, \rho_4$ and ρ_5 correspond to the auto-correlation parameters of Equations (7), (8), (9), (11) and (12), respectively.

In our previous paper, to preserve degrees of freedom, compromises were made that allowed us to focus attention on the most important parameters of the model, namely, ϕ_d, ϕ_{nd}, β_d, β_{nd}, b_1, b_2, d_1, and d_2. First, we assumed *a priori* that defense was a pure public good and therefore set the parameter α equal to zero throughout the analysis. Second, a number of preliminary model runs yielded estimates of ρ_1 that were close to zero and statistically insignificant and estimates of ρ_2 that were close to 0.5 and statistically significant at a 1 percent or 5 percent level. Based on these findings, we set the values of ρ_1 and ρ_2 to 0 and 0.5, respectively, throughout our analysis.

After testing different versions of the model with various parameter restrictions, likelihood ratio tests supported our decisions to set the subsistence parameters γ_d and γ_{nd} equal to zero and the flypaper effect parameter π equal to one. Column I of Table 1 reproduces the results we obtained from estimating Equations (7), (8), (11), and (12) over the 1960–1986 time period.

The estimates of ϕ_d and ϕ_{nd} are statistically different from zero but not from one implying that U. S. aid to Pakistan is perfectly fungible. Results for β_d and β_{nd} are robust and imply that an additional Rs 1 will add Rs 0.08 to defense spending and Rs 0.18 to non-defense spending. The U. S. supply equation performed quite well. The estimate of b_1 implies that an increase in Pakistan's own resources of Rs 1 will decrease U. S. aid by Rs 0.007 while an increase in Indian defense expenditures of Rs 1 will raise U. S. aid to Pakistan by about Rs 0.028. Regarding the Indian defense expenditure equation, the highly insignificant estimate of d_1 implies no link between India's real GNP growth and its defense expenditures. The statistically significant estimate of d_2 suggests that India's response to the Pakistani "threat" is dramatic. A Rs 1 increase in real defense

Table 1

Full Information Maximum Likelihood (FIML) Estimation Results
Pakistani Expenditure and Supply Equations

Parameter	Parameter Estimates/ (*t*-statistics)		
	I	II	III
ϕ_d	1.044	0.918	0.873
	(6.03)[aa]	(2.55)[bb]	(6.06)[aa]
ϕ_{nd}	1.499	1.764	2.049
	(2.03)[cc]	(1.36)	(5.40)[aa]
β_d	0.077	0.076	0.075
	(2.35)[b]	(1.44)[c]	(5.50)[a]
β_{nd}	0.175	0.179	0.182
	(1.93)[b]	(1.97)[b]	(6.48)[a]
β_I	–	–	0.074
			(6.48)[a]
γ_{put}	609.8	596.9	589.9
	(0.56)	(0.40)	(1.72)[b]
b_0	21.80	19.58	35.23
	(0.11)	(0.10)	(0.79)
b_1	−0.007	−0.005	−0.004
	(−2.75)[bb]	(−1.70)[cc]	(−15.9)[aa]
b_2	0.028	0.023	0.018
	(2.33)[bb]	(1.54)	(11.9)[aa]
d_0	6777.3	7692.5	7244.8
	(0.62)	(0.50)	(1.57)
d_1	−0.003	−0.003	−0.004
	(−0.59)	(−0.26)	(−1.30)
d_2	3.665	3.511	3.629
	(3.05)[aa]	(1.84)[cc]	(26.9)[aa]
ρ_4	−0.045	−0.023	−0.015
	(−0.38)	(−0.08)	(−0.18)
ρ_5	0.008	0.036	0.041
	(0.16)	(0.32)	(1.27)
R^{2*}_{ed}	0.63	0.69	0.67
R^2_{end}	0.77	0.78	0.75
R^2_I	–	–	0.67
R^2_G	0.64	0.66	0.65
R^2_{edi}	0.85	0.90	0.90
LOG LIKELIHOOD			
Values:	−604.25	−655.58	−784.18

*The R^2 values have been calculated using the sum-of-squared residuals and the total sum-of-squares for each equation. These are presented to give a general approximation to the fit.

[a] Significant at $\alpha = 1\%$; [b]Significant at $\alpha = 5\%$; [c]Significant at $\alpha = 10\%$ (One-tail tests).
[aa]Significant at $\alpha = 1\%$ [bb]Significant at $\alpha = 5\%$; [cc]Significant at $\alpha = 10\%$ (Two-tail tests).

spending by Pakistan evokes an increase of Rs 3.67 in defense spending by India.

Since the present study uses data from 1960 to 1988, the model upon which the results of Column I are based was estimated using the expanded data set. The results are reported in Column II. The only substantive difference is in the estimate of ϕ_{nd}. Specifically, although the point estimates are virtually the same, the null hypothesis that non-military aid is not fungible cannot be rejected using the expanded data set.

Using the expanded data set we estimated a more disaggregated model consisting of Equations (7), (8), (9), (11), (12). In addition to the parameters to be estimated as in the previous model, the disaggregated model also requires the estimation of β_p, γ_p, and ρ_3. In preliminary runs the estimates of ρ_3 were always close to 0.8. To preserve degrees of freedom, the value of ρ_3 was set to 0.8. Likelihood ratio tests supported our decision to set the private investment subsistence parameter γ_I equal to zero.[5]

Column III reports the results of estimating the more disaggregated model which includes the private investment equation Equation (11). Again the substantive difference is in the estimate of ϕ_{nd} which suggests that non-military aid is perfectly fungible, although we find the point estimate to be uncomfortably high. The estimate of β_i is highly significant and suggests a marginal propensity to invest out of internal resources of 0.074. This together with the point estimates of β_d (0.075) and β_{nd} (0.182) imply a marginal propensity to spend for private consumption purposes from internal resources of 0.669. Since the parameter π has been set equal to one (no flypaper effect), the parameter θ must be equal to one since the sum of the marginal propensities must be equal to one.[6] This implies that the marginal propensities to spend out of internal resources and external fungible resources are the same.

Based upon the estimates of the more disaggregated model reported in Column III, a quantitative assessment of the impact of a reduction in U. S. aid on Pakistani expenditures is provided in Table 2. Since the point estimate of ϕ_{nd} (2.049) is implausible, the calculations assume $\phi_{nd} = 1$.

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[5] Let λ_1 be the log-likelihood value of the estimated unrestricted model and λ_2 be the log-likelihood value of an estimated model with parameter restrictions imposed. If the restrictions are true, then the test statistic, $-2(\lambda_2 - \lambda_1)$, will be distributed as a chi-square random variable with r degrees of freedom, where r denotes the number of parameter restrictions imposed. The value for r is equal to the number of parameters in the unrestricted model minus the number of parameters in the restricted model. If the value of the test statistic is greater than the critical chi-square value, then the null hypothesis that the restrictions are true can be rejected.

[6] The setting of π equal to one implying no flypaper effect is consistent with recent empirical work regarding U. S. local government expenditure to grants-in-aid. See Zampelli (1986) and Megdal (1987).

Table 2

The Effects of Reductions in U. S. Aid on Pakistan's Expenditures

I.   **Expenditure Impacts of a $100 Reduction in Military Aid**

Reduction in Fungible Resources $= \phi_d \times \$100 = (.87)(100) = \$87$

Reductions in Expenditures on Defense* $= \beta_d \times \$87 = (.075)(87) = \$6.525$

Reductions in Expenditures on Non-defense* $= \beta_{nd} \times \$87 = (.182)(87) = \$15.66$

Reductions in Expenditures on Private Investment $= \beta_I \times \$87 = (.074)(87) = \$6.438$

Reductions in Expenditures on Private Consumption $= \beta_{pvt} \times \$87 = (.669)(87) = \$58.2$

II. **Expenditure Impacts of a $100 Reduction in Non-military Aid**

Reductions in Fungible Resources $= \phi_{nd} \times \$100 = 1 \times 100 = \$100$

Reductions in Expenditures on Defense $= \beta_d \times \$100 = (.075)(100) = \$7.5$

Reductions in Expenditures on Non-Defense $= \beta_{nd} \times \$100 = (.182)(100) = \$18.2$

Reductions in Expenditures on Private Investment $= \beta_I \times \$100 = (.074)(100) = \$7.4$

Reductions in Expenditures on Private Consumption $= \beta_{pvt} \times \$100 = (.669)(100) = \$66.9$

*This reduction in defense expenditures is due to the decrease in fungible resources. There will be an additional reduction in defense expenditures due to the increase in the subsidized price brought upon by the reduction in the non-fungible portion of military assistance.

The major implication to be drawn from Table 2 is that a reduction in U. S. aid, though reducing public sector expenditures, will have a greater impact in reducing private sector expenditures for consumption and investment purposes.

5. CONCLUSIONS

Using an econometric model formulated on the basis of the fungibility hypothesis, this paper has attempted to explain the response of Pakistan's expenditures for defense, public non-defense, private investment, and private consumption to U. S. military and non-military assistance for the period 1960–1988. Our results suggest the following:

1. U. S. categorical assistance extended to Pakistan whether for defense or non-defense is highly fungible;

2. Pakistan's marginal propensity to spend internal and external fungible resources on public sector goods and services is approximately 0.26

resources on public sector goods and services is approximately 0.26 implying that a reduction of Rs 1 in external fungible resources will reduce public spending by Rs 0.26 with Rs 0.08 from defense and Rs 0.18 from non-defense. Private sector expenditures will be reduced by the remaining Rs 0.74 with private investment declining by Rs 0.07 and private consumption by Rs 0.67;

3.   While it may not hold in the future, the historical pattern of overall U. S. assistance to Pakistan has been partly geared on a needs basis and partly to maintain the arms balance between India and Pakistan. For every Rs 1 increase in Pakistan's own resources, the U. S. has tended to reduce per capita assistance by Rs 0.004 while a Rs 1 increase in Indian defense spending, has elicited a U. S. increase in per capita assistance to Pakistan by Rs 0.018; and

4.   Indian defense expenditures appear to be geared to increase more in line with Pakistan's defense expenditures rather than increases in her own resources. Specifically, our estimates imply that increases in India's GNP have no impact on defense spending while a Rs 1 increase in Pakistan's defense expenditures lead to a dramatic Rs 3.63 increase in India's expenditures on defense. These results are somewhat curious and may indicate a need for refinement of Equation (12). On the other hand, it could be argued that India is reacting to the joint threat posed by Pakistan and its ally, China.

The major policy implication of this paper is important and timely. As noted in our introduction it is probable that future U. S. assistance to Pakistan will be curtailed. Knowing how this assistance has influenced Pakistan's expenditures in the past should enable policy-makers in Pakistan to take the requisite steps that would mitigate the adverse consequences of a reduction in U. S. aid in the future. Given the estimates of the fungibility parameters and the assumption of no flypaper effect it seems that a reduction in U. S. aid will significantly reduce private consumption and investment opportunities thus affecting adversely the country's standard of living and private capital formation.

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"The Effect of U. S. Assistance on Public and
Private Expenditures in Pakistan: 1960–1988"

Let me start with the remarks that the topic of the paper is highly interesting and relevant to the debate which has been going on in Pakistan for quite some time in both the political as well as the academic circles. The recent developments at the global level and the resulting reduced inflows of foreign capital have only increased the urgency to deal with the issue and to do something concrete in this respect. Although there has been considerable public support in favour of reducing dependence on foreign loans and grants and in recent years the government has also been emphasising on a strategy of self-reliance for economic growth, there have been concerns as to what would be the likely impact of curtailment in, or cessation of aid, on the economy. The findings of this paper will be useful for evaluating the various policy options to minimize the possible adverse impact of cessation of U. S. aid.

There are, however, certain points related to the paper on which I would like to comment. The effect of aid on investment and growth has concerned economists for a long time. The possibility that aid might be diverted into consumption has been long recognized as well. In this respect the negative causal relationship between foreign capital inflows and savings has been the main concern. The evidence so far has been inconclusive. In recent years, however, interest has shifted to the trade-off between development and defense. There are studies which have found strong positive relations between the defense burden and civilian product growth rate. One of the main objectives of these studies has been to analyse the nature of interaction between defense and investment. In fact, one of the basic objectives of any econometric exercise is to understand and quantify the interaction among different variables of interest. The result, however, depends on the model or framework used to analyse the issue. Dr Khilji and his colleague in their paper have estimated an expenditure system to determine the fungibility of U. S. aid to Pakistan and has assumed a Stone-Geary utility function. This model has also been used to infer about the nature of the relationship that exists between defense and private investment. Given that prices and income are unknown in this model, the choice of the functional form of the utility function is limited. The problem with the Stone-Geary form, which is completely separable,

is that it imposes strong restrictions on the nature of the relationship that can exist between the goods. To be specific, with a Stone-Geary utility function, the goods can be only gross complements or net substitutes. I wonder to what an extent the results of the paper are sensitive to the choice of the functional form of the utility function.

The model used in the paper assumes that both private as well as public goods, which in this case is the defense of the country, are produced under cons. it returns to scale technology. This assumption, in general, is rarely satisfied in the case of a public good. I must also warn that since the model is based on rational utility maximizing behaviour, its relevance for a developing country like Pakistan where political arrangements are volatile, is far from clear.

Having said that I would turn to some other comments. In the first place I am wondering why the authors did not discuss other important results of the paper which can be directly obtained from their estimates. In particular, I think while it is straightforward to obtain some of the elasticities not reported in the paper, it would have been much more interesting if the authors had discussed the income-changing and price-changing components of the aid flows and derived the effective price of defense or capital formation.

Coming now to the results of the paper. If we look at the values of the parameters reported in Table 1, while ϕ_d is less than unity implying fungibility of military aid, ϕ_{nd} is considerably greater than unity. This is surprising because theoretically it must always be less than unity. Then, in estimating the expenditure impact of reduction in non-military aid the value of ϕ_{nd} is taken to be unity whereas in the table it has different values.

Another surprising result of the paper is the sharp response of India to a Pakistani threat. This I believe is because the authors have not taken into account all the factors that influence Indian defense expenditure. The two most important factors that I can think of, and which have not been included in the model, are the Chinese expenditure on defense and India's ambition to become a naval power in the Indian ocean. Once these factors are taken into account the results are most likely to look more reasonable.

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