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Budgetary Balance and Private Sector Activity in Pakistan: The Net Impact of Defense Expenditures on Investment in Manufacturing

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INTRODUCTION

Toward the end of 1988, Pakistan's deteriorating resource situation caused a financial crisis many remnants of which still exist today. In 1988 the Government's budget deficit reached 8.5% of Gross Domestic Product (GDP), inflation accelerated, the current account deficit doubled to 4.3% of Gross National Product (GNP), the external debt service ratio reached 28% of export earnings, and foreign exchange reserves fell by half to $438 million, equal to less than three weeks of imports (*World Bank*, 1991: ii).

These developments have eroded the ability of the government to affect the country's development process. In fact, the encouragement of private sector activity, particularly investment, is the only viable option open to the authorities. It follows that for policy purposes the most important issue involves restructuring government expenditures and their financing in a manner that would provide the maximum inducement to private sector capital formation, especially in manufacturing. Operationally this means finding an optimal balance between the Government's three most important budgetary items: defense, public consumption and infrastructural development. More importantly because there is abundant evidence[1] that the government's deficits have crowded out a certain amount of private investment, the authorities must achieve this balance within the context of a reduced level of expenditures and/or tax increases.

Defense expenditures would seem to be a logical area for budgetary cuts: current expenditures account for the major part of government budgetary allocations, averaging 65-75 percent in recent years. In fact, defense expenditure and debt servicing together account for 81.4 percent of current expenditure in the 1990/91 budget (*Economist Intelligence Unit*,1990: 39-40).

While not necessarily arguing that reduced defense expenditures would free up sufficient funds to restore the country's deteriorating capital stock[2], the purpose of this paper is to examine whether or not defense expenditures have affected the private sector's willingness and ability to invest in manufacturing. Has the overall impact of defense expenditures on private investment in manufacturing differed significantly from that associated with other categories of government expenditures? If so, in what regard? Are these differences associated with the manner in which defense and expenditures in other areas are funded?

BACKGROUND

As noted, previous studies have indicated that government expenditures in Pakistan have been somewhat of a mixed blessing. On the one hand, these expenditures have the potential to increase private sector profitability either through increases in aggregate demand (the Keynesian effect) and/or cost reductions (the infrastructural effect). On the other hand, public expenditures appear to compete for funds with the private sector, thus reducing ceteris paribus the overall volume of private capital formation.

Apparently these effects vary by expenditure category. For example, infrastructure investment has played a rather passive role in stimulating follow-on private investment[3]. Surprisingly, there is little evidence that government investment in manufacturing crowds out private investment. Instead there is a much greater likelihood that other forms of government investment may be responsible for the private sector's funding difficulties. In particular government investment in public enterprises and general government investment seem to be more responsible for the country's increasing fiscal imbalances.

Little can be said on these issues until the issue of causation is adequately resolved:

1. Often in studies of this type the direction of causation has implicitly been assumed to go from government deficits to expanded domestic borrowing to interest rate increases and ultimately reduced private investment. One could just as easily argue that increased levels of private investment have placed pressure on the government to expand facilities, especially in energy. The government, wishing to aid private investment while at the same time lacking adequate funding for major infrastructural programs, may first grant the private sector various forms of relief such as tax holidays followed by modest increases in public investment. The outcome of this process would be expanded deficits, but not necessarily the crowding out of private investment in the classical sense. The

causation issue must be addressed before any definitive conclusion can be made concerning crowding out.

2. As a related issue, the timing of these impacts needs to be identified. Many of the effects associated with government deficits are likely to have a delayed impact on private investment decisions. Again because the timing of these effects has not been spelled out, the patterns of causation are unclear[4].

3. If we assume that interest rate effects are only one factor associated with the government deficit as it pertains to private investment, the theory of crowding out becomes unclear as to the relevant form of the budgetary deficit. If the interest rate mechanism is not perfect, are private investors more concerned or affected (through perhaps credit rationing) by the actual deficit, some sort of expected deficit, unanticipated changes in the deficit, or even deviations in the deficit from some longer run budgetary trend?

4. The environment in which deficits exist needs to be identified. Obviously, if deficits stem largely from increased government consumption or defense, their negative impact on private investment will be greater than if they had stemmed simply from increased infrastructural investment.

5. The financing of the public sector deficit and government capital formation needs to be examined in detail. Have the deficits been associated with government investment or consumption? How have the deficits been financed as between domestic and foreign borrowing? Do the impacts of domestic versus foreign borrowing vary with regard to their effect on private industrial investors?

THE ISSUE OF CAUSATION

Ultimately any statistical test for causation will be based on a number of arbitrary assumptions. Still, using a number of alternative specifications for the key variables it is possible to make some credible inferences concerning the timing of say government expenditures and public sector deficits: do some types of government expenditure tend to generate a stream of deficits (and associated public borrowing) over time [(soft budgetary constraint) (Kornai, 3-30)] or are selected budgetary allocations constrained by past deficits (hard budgetary constraint). Similarly, which types of expenditures are more likely financed (or constrained) through the domestic capital markets and which are more reliant (or constrained) by foreign borrowing?

The original and most widely used causality test was developed by Granger (1969). According to this test (again using the example of public expendi-

tures and deficits), deficits (DEF) affect growth of public sector expenditures (PE) if this series can be predicted more accurately by past values of deficits than by past (expenditure) growth patterns. To be certain that causality runs from deficits to PE, past values of the public deficit must also be more accurate than past values of public expenditures at predicting increases in the deficit.

GRANGER TEST

More formally, Granger defines causality such that X Granger causes (G-C) Y if Y can be predicted more accurately in the sense of mean square error, with the use of past values of X than without using past X. Based upon the definition of Granger causality, a simple bivariate autoregressive (AR) model for public deficits (DEF) and PE can be specified as follows:

$$(1)\quad PE(t) = c + \sum_{i=1}^{p} a(i)DEF(t-i) + \sum_{j=1}^{q} b(j)\,DEF(t-j) + u(t)$$

$$(2)\quad DEF(t) = c + \sum_{i=1}^{r} d(i)\,DEF(t-1) + \sum_{j=1}^{s} e(j)\,PE(t-j) + v(t)$$

where PE is the growth in public sector expenditures and DEF = the growth in public sector deficits; p, q, r and s are lag lengths for each variable in the equation; and u and v are serially uncorrelated white noise residuals. By assuming that error terms (u, v) are "nice" ordinary least squares (OLS) becomes the appropriate estimation method[5].

Within the framework of unrestricted and restricted models, a joint F- test is appropriate for causal detection. Where:

$$(3)\quad F = \frac{(RSS(x) - RSS(u)/(df(x) - df(u)}{RSS(u)/df(u)}$$

RSS (r) and RSS (u) are the residual sum of squares of restricted and unrestricted models, respectively; and df(r) and df(u) are, respectively, the degrees of freedom in restricted and unrestricted models.

The Granger test detects causal directions in the following manner: first, unidirectional causality from DEF to PE if the F-test rejects the null hypothesis

that past values of DEF in equation (1) are insignificantly different from zero and if the F-test cannot reject the null hypothesis that past values of PE in equation (2) are insignificantly different from zero. That is, DEF causes PE but PE does not cause DEF. Unidirectional causality runs from PE to DEF if the reverse is true. Second, bidirectional causality runs between DEF and PE if both F-test statistics reject the null hypotheses in equations (1) and (2). Finally, no causality exists between DEF and PE if we cannot reject both null hypotheses at the conventional significance level.

The results of Granger causality tests depend critically on the choice of lag length. If the chosen lag length is less than the true lag length, the omission of relevant lags can cause bias. If the chosen lag is greater than the true lag length, the inclusion of irrelevant lags causes estimates to be inefficient. While it is possible to choose lag lengths based on preliminary partial autocorrelation methods, there is no a priori reason to assume lag lengths equal for all types of deficits.

THE HSAIO PROCEDURE

To overcome the difficulties noted above, Hsaio (1981) developed a systematic method for assigning lags. This method combines Granger Causality and Akaike's final prediction error (FPE), the (asymptotic) mean square prediction error, to determine the optimum lag for each variable. In a paper examining the problems encountered in choosing lag lengths, Thornton and Batten (1985) found Hsiao's method to be superior to both arbitrary lag length selection and several other systematic procedures for determining lag length.

The first step in Hsiao's procedure is to perform a series of autoregressive regressions on the dependent variable. In the first regression, the dependent variable has a lag of one. This increases by one in each succeeding regression. Here, we estimate M regressions of the form:

$$(4)\quad G(t) = a + \sum_{i=1}^{m} b(t-1)\, G(t-1) + e(i)$$

where the values of m range from 1 to M. For each regression, we compute the FPE in the following manner

$$(5)\quad FPE(m) = \frac{T + m + 1}{T - m - 1} ESS(m)/T$$

Where: T is the sample size, and FPE(m) and ESS(m) are the final prediction error and the sum of squared errors, respectively. The optimal lag length, m*, is the lag length which produces the lowest FPE. Having determined m* additional regressions expand the equation with the lags on the other variable added sequentially in the same manner used to determine m*. Thus we estimate four regressions of the form:

$$(6)\quad G(t) = a + \sum_{i=1}^{m^*} b\,(t-1)\,G(t-1) + \sum_{i=1}^{n} c\,(t-1)D(t-1) + e(i)$$

with n ranging from one to four. Computing the final prediction error for each regression as:

$$FPE(m^*,n) = \frac{T + m^* + n + 1}{T - m^* - n - 1}\,ESS(m^*,n)/T$$

we choose the optimal lag length for D, n* as the lag length which produces the lowest FPE. Using the final prediction error to determine lag length is equivalent to using a series of F tests with variable levels of significance[6].

The first term measures the estimation error and the second term measures the modelling error. The FPE criterion has a certain optimality property that "balances the risk due to bias when a lower order is selected and the risk due to increases in the variance when a higher order is selected" (Hsaio, 1979, 326). As noted by Judge et. al. (1982), an intuitive reason for using the FPE criterion is that longer lags increase the first term but decrease the RSS of the second term, and thus the two opposing forces are optimally balanced when their product reaches its minimum.

Depending on the value of the final prediction errors, four cases are possible: (a) Government Deficits cause Public Expenditures when the prediction error for public expenditures decreases when the government deficit is included in the expenditure equation. In addition, when public expenditures are added to the deficit equation, the final prediction error should increase; (b) Public Expenditures causes Government Deficits when the prediction error for public expenditures increases when government deficits are added to the regression equation for public expenditures, and is reduced when public expenditures are added to the regression equation for government deficits; (c) Feedback occurs when the final prediction error decreases when government deficits are added to the public expenditures equation, and the final prediction error decreases when public expenditures are added to the government deficit

equation; and (d) No Relationship exists when the final prediction error increases both when government deficits are added to the public expenditures equation and when public expenditures are added to the deficit equation.

OPERATIONAL PROCEDURES

The data used to carry out the causation tests[7] was derived from figures in: World Bank, Pakistan: Current Economic Situation and Prospects--Report No. 10223-PAK (March 16, 1992). World Bank, Pakistan: Current Economic Situation and Prospects--Report No. 9283-PAK (March 22, 1991); World Bank: Pakistan: Progress Under the Sixth Plan (1984). Gross Domestic Product and the GDP price deflator is from various issues of the International Monetary Fund, International Financial Statistics Yearbook. All variables were deflated by the GDP deflator and are in constant 1985 prices. For best statistical results [8], the variables were transformed into their logarithmic values.

To determine the robustness of our findings and whether the results were sensitive to the definition of key variables various measures of the deficit were examined. These included the actual or realized deficit, the expected deficit (the predicted value obtained by regressing each year's deficit on its value for the previous year, the unexpected deficit (the difference between each year's actual deficit and that anticipated based on past patterns) and finally deviations of the deficit from its longer run growth path (the actual deficit minus the exponential trend in the deficit). The same definitions were used in deriving series for public domestic borrowing.

Relationships were considered valid if they were statistically significant at the ninety-five percent level of confidence. That is, if ninety- five percent of the time we could conclude that they had not occurred by pure chance, we considered them statistically significant.

As noted above, there is no theoretical reason to believe that fiscal deficits and government expenditures by category have a set lag relationship -- that is they impact on one another over a fixed time period. To find the optimal adjustment period of impact, lag structures of up to six years were estimated. The lag structure with the highest level of statistical significance was the one chosen which best depicts the relationship under consideration (the optimal lag reported in Tables 1 through 5)[9].

RESULTS

Two sets of causality tests were performed. The first set, (Tables 1 and 2) examines the interaction of the three broad categories of government expenditures: (a) defense, (b) consumption, and (c) general government investment and (d) infrastructure: (i) private sector investment in large scale manufacturing and (ii) private investment in small scale manufacturing enterprises.

The second set of estimates examine the interrelationships between these four types of government expenditures and movements in the fiscal deficit. Since previous studies have suggested that it is not the deficits per se, but rather the method by which they are financed (domestic versus foreign) that determines whether crowding out occurs, the second set of tables also takes the analysis a step further by examining the corresponding link between public sector expenditures and the pattern of public sector domestic/foreign borrowing. Put differently even though public expenditures in certain areas may lead to increased budgetary deficits, crowding out might not occur if the authorities are able to fund this expenditure through foreign borrowing.

The analysis produced a number of interesting patterns which are summarized in Tables 1-5. Those for public expenditures and private investment in manufacturing (Tables 1 and 2) provide an interesting contrast in the manner in which public sector spending has provided a stimulus to private sector capital formation. Specifically (Tables 1 and 2):

1. The impact of defense expenditures (Table 1) on investment in large scale manufacturing appears consistently strong across all measures[10] of this category of expenditures. Also, in all cases the impact lag appears quite short, averaging only a year.

2. In contrast to the case for large scale manufacturing, defense expenditures have no appreciable effect on private investment in small scale manufacturing (Table 2).

3. As a basis of comparison public sector expenditures on consumption do not provide a stimulus to private investment in large scale manufacturing (Table 1). Here, the pattern is largely one whereby expanded private sector activity induces the government to provide additional services. For public services (consumption) this process occurs over a fairly long time frame with an average lag of three years -- expanded private investment in large scale manufacturing industry in over three years induce the government to expand public services.

Table 1:
Pakistan: Interaction of Public Expenditures, Deficits, Borrowing and Private Investment in Large Scale Manufacturing, 1972-1991

	Causation Patterns				Dominant Pattern
	Invest Invest	Invest Expend	Expend Expend	Expend Invest	
Defense Expenditures					
Optimal Lag (years)	3	1	2	2	
Final Prediction Error	(0.11E-1)	(0.65E-2)	(0.26E-2)	(0.26E-2)	
Durbin-Watson Statistic	1.72	1.91	1.62	2.13	Defense->
Ling-Box Q Statistic	8.45	11.40	16.25	9.53	Investment
Adjusted r2	0.982	0.990	0.985	0.984	(+m)
Public Consumption					
Optimal Lag (years)	3	1	3	3	
Final Prediction Error	(0.11E-1)	(0.12E-1)	(0.69E-2)	(0.43E-2)	
Durbin-Watson Statistic	1.72	1.65	1.69	1.98	Investment->
Ling-Box Q Statistic	8.45	9.41	6.82	8.77	Consumption
Adjusted r2	0.982	0.981	0.975	0.985	(+w)
Public Investment (actual)					
Optimal Lag (years)	3	1	1	1	
Final Prediction Error	(0.11E-1)	(0.12E-1)	(0.93E-2)	(0.45E-2)	
Durbin-Watson Statistic	1.72	1.62	1.56	2.16	Private->
Ling-Box Q Statistic	8.45	8.57	5.22	14.02	Public
Adjusted r2	0.982	0.983	0.935	0.959	(+m)
Public Investment (infrastructure)					
Optimal Lag (years)	3	1	1	3	
Final Prediction Error	(0.11E-1)	(0.13E-1)	(0.69E-2)	(0.37E-2)	
Durbin-Watson Statistic	1.72	1.72	1.69	2.25	Private->
Ling-Box Q Statistic	8.45	9.46	4.99	7.95	Public
Adjusted r2	0.982	0.981	0.932	0.958	(+w)

Notes: Summary of results obtained from Granger Causality Tests. A Hsaio Procedure was incorporated to determine the optimal lag. All variables estimated in lograthmic form. The dominant pattern is that with the lowest final prediction error. The signs (+,-) represent the direction of impact. In the case of feedback the two signs represent the lowest final prediction error of relationships B and D. Each of the variables was regressed with 1, 2, 3, and 4 year lags. Strength assessment (s =strong; m = moderate; w = weak) based on the size ofthe standardized regression coefficient and t test of statistical significance.

Table 2:
Pakistan: Interaction of Public Expenditures, Deficits, Borrowing and Private Investment in Small Scale Manufacturing, 1972-1991

	Causation Patterns				Dominant Pattern
	Invest Invest	Invest Expend	Expend Expend	Expend Invest	
Defense Expenditures (actual)					
Optimal Lag (years)	2	1	2	2	
Final Prediction Error	(0.22E-2)	(0.23E-2)	(0.27E-2)	(0.28E-2)	
Durbin-Watson Statistic	2.10	2.10	1.62	2.08	No Rela->
Ling-Box Q Statistic	7.27	4.57	16.25	11.08	tionship
Adjusted r2	0.986	0.985	0.985	0.985	
Public Consumption (actual)					
Optimal Lag (years)	2	3	3	1	
Final Prediction Error	(0.22E-2)	(0.21E-2)	(0.69E-2)	(0.74E-2)	
Durbin-Watson Statistic	2.10	2.07	1.70	1.74	Consumption->
Ling-Box Q Statistic	7.27	5.37	6.81	5.56	Investment
Adjusted r2	0.986	0.988	0.975	0.975	(+w)
Public Investment (actual)					
Optimal Lag (years)	2	1	1	1	
Final Prediction Error	(0.22E-2)	(0.24E-2)	(0.93E-2)	(0.63E-2)	
Durbin-Watson Statistic	2.10	2.18	1.57	2.04	Private->
Ling-Box Q Statistic	7.27	6.42	5.22	8.64	Public
Adjusted r2	0.986	0.985	0.936	0.958	(+m)
Public Investment (infrastructure)					
Optimal Lag (years)	2	3	1	1	
Final Prediction Error	(0.22E-2)	(0.23E-2)	(0.20E-2)	(21E-2)	
Durbin-Watson Statistic	2.10	2.10	1.69	2.04	Private->
Ling-Box Q Statistic	7.27	4.69	4.99	10.57	Public
Adjusted r2	0.986	0.985	0.932	0.958	(+m)

Notes: Summary of results obtained from Granger Causality Tests. A Hsaio Procedure was incorporated to determine the optimal lag. All variables estimated in lograthmic form. The dominant pattern is that with the lowest final prediction error. The signs (+,-) represent the direction of impact. In the case of feedback the two signs represent the lowest final prediction error of relationships B and D. Each of the variables was regressed with 1, 2, 3, and 4 year lags. Strength assessment (s =strong; m = moderate; w = weak) based on the size of the standardized regression coefficient and t test of statistical significance.

4. While one might anticipate that general government investment, especially in the areas of infrastructural expansion would provide a stimulus to private investment in manufacturing, this does not appear to be the case (Table 1). In fact, causation is generally from private investment to public. For actual public investment (including both infrastructural and non-infrastructural components) the lag is rather short -- a year. For longer term infrastructural investment (here proxied as expected investment) the lag tends to be about three years. Interestingly deviations of public investment from its historical exponential trend tend to impact negatively on private investment in manufacturing.

5. Private investment in small scale manufacturing is again affected differently than that in larger scale firms. In this case (Table 2) public consumption expenditures provide a weak stimulus to the private sector. This lag is short, averaging about a year.

6. Private investment in smaller scale industrial ventures interacted with public investment in a manner somewhat similar to that found in larger scale enterprises. However several minor differences do appear to characterize investment by the private sector. First, the lag between private investment and the government provision of infrastructure (anticipated investment) was shorter (one year) in the case of small scale firms. Secondly, while unanticipated (the difference between actual and anticipated) public investment impacted negatively (not shown here) on private investment in smaller scale firms, there were no statistically significant patterns between private investment and deviations from the exponential trend in public investment.

As noted above, in looking for an explanation for these patterns, several previous papers have indicated that public sector crowding out of private investment may be occurring as a result of stepped-up government borrowing in the domestic financial markets. To examine this possibility, an analysis similar to that performed above was used to identify the linkages and causality patterns between the different broad types of public expenditures (defense, consumption, and general government investment) and potential sources of funding (deficits, domestic borrowing, and foreign borrowing).

Again several interesting patterns appeared (Tables 3-5):

1. Of the three types of government expenditures, those allocated to defense appear to have the most complex budgetary linkages. In one sense the military faces a hard budgetary constraint in the sense that increases in past

deficits tend to suppress the expansion in allocations to the military (Table 3). On the other hand increased defense expenditures do force an expansion in future deficits.

2. This same general framework carried over to the borrowing patterns (Tables 4 and 5) associated with military expenditures. For most measures of domestic borrowing, higher growth rates in funding for the domestic markets tends to suppress the expansion in future military expenditures. These suppressing effects are most important in cases were the rate of borrowing (domestic or foreign) expands over its anticipated (or longer term) growth rate. Still, feedback effects are present whereby military expenditures are in turn generally funded in part through both domestic and foreign borrowing.

3. Since a large portion of public consumption consists of allocations to the military, the budgetary patterns of this expenditure category are a bit similar to that characterizing defense, particularly consumption's relationship to the fiscal deficit (Table 3).

4. Several important differences do occur however. The major difference between defense expenditures and public consumption is associated with the manner in which each is actually funded. Increased growth in public consumption definitely contributes to expanded domestic borrowing requirements over time (Table 4). Also the expansion in public consumption appears to be more constrained than defense during periods of expanded foreign borrowing (Table 5).

5. Of the three types of government expenditures examined here, general government investment tends to have the strongest impact on the public sector deficit (Table 3).

6. For all four measures of the deficit[11], increases in general public investment tend to resulted in expanded fiscal imbalance (Table 3). While expanded deficits (actual and deviations from the exponential trend) facilitate a future expansion in public investment, this effect is weak relative to the impact of investment on the deficit.

7. A clear link also exists between expanded public sector investment and increased future domestic borrowing requirements (Table 4). Interestingly enough few links exist between the growth in public investment and the country's pattern of external pubic borrowing (Table 5).

Table 3:

Pakistan: Interaction of Public Expenditures, and the Fiscal Deficit, 1972-1991

	Causation Patterns				Dominant Pattern
	Expend Expend	Expend Deficit	Deficit Deficit	Deficit Expend	
Defense (actual)					
Optimal Lag (years)	2	1	3	3	
Final Prediction Error	(0.27E-2)	(0.27E-2)	(0.19)	(0.12)	
Durbin-Watson Statistic	1.62	1.76	1.97	2.35	Feedback
Ling-Box Q Statistic	16.25	17.84	4.04	8.75	(-w,+w)
Adjusted r2	0.985	0.986	0.584	0.756	
Public Consumption					
Optimal Lag (years)	3	1	3	4	
Final Prediction Error	(0.69E-2)	(0.63E-2)	(0.19)	(0.13)	
Durbin-Watson Statistic	1.70	1.76	1.97	1.76	Feedback
Ling-Box Q Statistic	6.82	3.51	4.04	4.37	(-w,+w)
Adjusted r2	0.975	0.978	0.584	0.764	
General Public Investment					
Optimal Lag (years)	1	1	3	4	
Final Prediction Error	(0.93E-2)	(0.91E-2)	(0.19)	(0.86E-1)	
Durbin-Watson Statistic	1.57	1.75	1.97	2.70	Feedback
Ling-Box Q Statistic	5.22	4.41	4.04	24.68	(+w,+s)
Adjusted r2	0.936	0.940	0.584	0.856	
General Public Infrastructure					
Optimal Lag (years)	1	1	2	4	
Final Prediction Error	(0.93E-2)	(0.10E-1)	(0.19)	(0.64E-1)	
Durbin-Watson Statistic	1.57	1.84	1.97	2.23	Infrastruct->
Ling-Box Q Statistic	5.22	6.32	4.04	15.10	Deficit
Adjusted r2	0.936	0.910	0.584	0.791	(+m)

Notes: Summary of results obtained from Granger Causality Tests. A Hsaio Procedure was incorporated to determine the optimal lag. All variables estimated in lograthmic form. The dominant pattern is that with the lowest final prediction error. The signs (+,-) represent the direction of impact. In the case of feedback the two signs represent the lowest final prediction error of relationships B and D. Each of the variables was regressed with 1, 2, 3, and 4 year lags. Strength assessment (s =strong; m = moderate; w = weak) based on the size of the standardized regression coefficient and t test of statistical significance.

Table 4:

Pakistan: Interaction of Public Expenditures, and Public Sector Borrowing in Domestic Markets, 1972-1991

	Causation Patterns				Dominant Pattern
	Expend Expend	Expend Borrow	Borrow Borrow	Borrow Expend	
Defense					
Optimal Lag (years)	2	3	3	3	
Final Prediction Error	(0.27E-2)	(0.27E-2)	(0.26)	(0.12)	
Durbin-Watson Statistic	1.62	2.43	2.16	2.28	Feedback
Ling-Box Q Statistic	16.25	7.92	4.80	6.86	(-w,+w)
Adjusted r2	0.985	0.987	0.284	0.444	
Public Consumption					
Optimal Lag (years)	3	1	3	4	
Final Prediction Error	(0.69E-2)	(0.77E-2)	(0.26)	(0.17)	
Durbin-Watson Statistic	1.70	1.69	2.17	2.56	Consump.>
Ling-Box Q Statistic	6.82	6.49	4.80	10.29	Borrowing
Adjusted r2	0.975	0.973	0.284	0.618	(+w)
General Public Investment					
Optimal Lag (years)	1	1	3	3	
Final Prediction Error	(0.93E-2)	(0.10E-1)	(0.26)	(0.18)	
Durbin-Watson Statistic	1.57	1.58	2.17	1.86	Investment->
Ling-Box Q Statistic	5.22	4.14	4.80	8.52	Borrowing
Adjusted r2	0.936	0.932	0.284	0.516	(+m)
General Public Infrastructure					
Optimal Lag (years)	1	1	3	1	
Final Prediction Error	(0.93E-2)	(0.10E-1)	(0.26)	(0.56E-1)	
Durbin-Watson Statistic	1.57	1.81	2.17	2.05	Investment->
Ling-Box Q Statistic	5.22	5.88	4.80	3.46	Borrowing
Adjusted r2	0.936	0.909	0.284	0.322	(+w)

Notes: Summary of results obtained from Granger Causality Tests. A Hsaio Procedure was incorporated to determine the optimal lag. All variables estimated in lograthmic form. The dominant pattern is that with the lowest final prediction error. The signs (+,-) represent the direction of impact. In the case of feedback the two signs represent the lowest final prediction error of relationships B and D. Each of the variables was regressed with 1, 2, 3, and 4 year lags. Strength assessment (s =strong; m = moderate; w = weak) based on the size of the standardized regression coefficient and t test of statistical significance.

Table 5:

Pakistan: Interaction of Public Expenditures,
and Public Sector Borrowing in Foreign Markets, 1972-1991

	Causation Patterns				Dominant Pattern
	Expend Expend	Expend Borrow	Borrow Borrow	Borrow Expend	
Foreign Borrowing (actual)					
Optimal Lag (years)	2	4	3	3	
Final Prediction Error	(0.27E-2)	(0.22E-2)	(0.17)	(0.12)	
Durbin-Watson Statistic	1.62	1.80	2.36	3.17	Feedback
Ling-Box Q Statistic	16.25	18.20	13.03	32.07	(+w,+w)
Adjusted r2	0.985	0.989	0.571	0.742	
Public Consumption					
Optimal Lag (years)	3	4	3	4	
Final Prediction Error	(0.69E-2)	(0.31E-2)	(0.17)	(0.15)	
Durbin-Watson Statistic	1.70	1.82	2.36	2.32	Feedback
Ling-Box Q Statistic	6.82	12.28	13.04	10.14	(-m,+w)
Adjusted r2	0.975	0.989	0.571	0.688	
General Public Investment					
Optimal Lag (years)	1	3	3	1	
Final Prediction Error	(0.93E-2)	(0.95E-2)	(0.17)	(0.19)	No Rela-
Durbin-Watson Statistic	1.57	2.19	2.36	2.37	tionship
Ling-Box Q Statistic	5.22	9.05	13.04	13.90	
Adjusted r2	0.936	0.922	0.571	0.540	
General Public Infrastructure					
Optimal Lag (years)	1	2	4	1	
Final Prediction Error	(0.93E-2)	(0.85E-2)	(0.36E-1)	(0.42E-1)	
Durbin-Watson Statistic	1.57	2.34	1.77	21.78	Borrowing->
Ling-Box Q Statistic	5.22	10.20	8.29	8.48	Investment
Adjusted r2	0.936	0.914	0.574	0.527	(-w)

Notes: Summary of results obtained from Granger Causality Tests. A Hsaio Procedure was incorporated to determine the optimal lag. All variables estimated in lograthmic form. The dominant pattern is that with the lowest final prediction error. The signs (+,-) represent the direction of impact. In the case of feedback the two signs represent the lowest final prediction error of relationships B and D. Each of the variables was regressed with 1, 2, 3, and 4 year lags. Strength assessment (s =strong; m = moderate; w = weak) based on the size of the standardized regression coefficient and t test of statistical significance.

IMPLICATIONS

While the results presented above do not provide a definitive proof of the existence of the crowding out mechanism in Pakistan, they are quite consistent with what one might find if the phenomenon were present. Public investment and infrastructural development appears to have the least stimulating (and in some cases negative) effect on private sector investment. This is somewhat ironic given that a major purpose of these allocations is to provide a stimulus to follow on private investment. Clearly this effect stems from the large demands placed on the domestic capital market by this type of expenditure.

At the other extreme is defense. Again a somewhat ironic pattern exists whereby expanded military expenditures provide a generally strong stimulus to private investment in large scale private manufacturing. While the analyses does not let us identify the cause of this stimulus (general Keynesian demand expansion and/or direct linkages to the country's military procurement program), the fact remains that the government has shown restraint in funding defense expenditures once domestic borrowings begin to accelerate.

General public consumption falls somewhere in between defense and investment in affecting the private sector's willingness (or ability) to commit capital to manufacturing. While the government does fund increased consumption through expanded domestic borrowing the magnitudes involved do not appear to be nearly as great as in the case of investment. Thus government consumption is still able to provide a net positive stimulus to small scale private investors (who presumably are not as reliant on the domestic capital markets as is the case for their larger scale counterparts).

A MACRO-ECONOMIC FRAMEWORK

The possible presence of crowding out resulting from increases in government investment and infrastructural development is important for policy design and as such warrants further analysis. For this purpose a small macroeconomic model[12] based on the causality findings was developed (Table 6).

Table 6:

Pakistan: Defense and the Macroeconomy, Simulation Model, 1973-1991

(constant 1985 prices)

STRUCTURAL EQUATIONS

(1) Gross Domestic Produce (GDP)

$GDP = -127.80 + 11.94\,EMP + 5.04\,MILX_{(-1)} + 3.22\,IPT$
(-3.81) (5.99)*** (8.20)*** (5.18)***
$r^2(adj) = 0.998$; DW = 2.19; F = 2716.3

(2) Defense Expenditures (MILX)

$MILX = -4.90 + 0.12\,GDP_{(-1)} - 0.21\,IGT_{(-1)} - 0.14\,GDEF_{(-1)} - 0.20\,GDEF_{(-2)}$
(-4.21) (14.94)*** (-3.00)*** (-2.21)** (-3.33)***
$r^2(adj) = 0.987$; DW = 1.91; F = 329.97

(3) Non-Defense Expenditures (NILX)

$NILX = -16.27 + 0.56\,NILX_{(-1)} + 2.91\,IGGTP$
(-2.07) (3.08)*** (2.71)**
$r^2(adj) = 0.947$; Durbins H = - 0.51; F = 151.83

(4) Private Investment in Large Scale Manufacturing (IPML)

$IPML = -4.55 + 0.77\,IPML_{(-1)} - 0.08\,BORD_{(-1)} + 0.19\,MILX_{(-1)}$
(-3.71) (6.31)*** (-2.81)** (2.81)**

$+ 0.16\,BORF_{(-1)} + 0.19\,GNSP$
(3.15)*** (2.01)**
r2(adj) = 0.991; Durbins H = -1.24; F = 368.45

(5) Private Investment in Small Scale Manufacturing (IPMS)

$IPMS = 0.01 + 0.87\,IPMS_{(-1)} - 0.008\,BORD_{(-1)} + 0.007\,NILX$
(0.27) (8.34)*** (-3.25)*** (3.86)***
r2(adj) = 0.995; Durbins H = -0.51; F = 885.13

(6) Private Investment in Non-Manufacturing Activities (IPNMT)

$IPNMT = 2.46 + 0.07\,GDP_{(-1)} - 0.34\,MILX - 0.087\,GNS$
(3.11) (7.13)*** (-3.05)*** (3.20)***
r2(adj) = 0.987; DW = 1.75; F = 414.98

(7) Gross National Savings (GNS)

$GNS = -32.69 + 0.29\,GDP_{(-1)} - 1.02\,GDEF - 0.62\,GDEF_{(-1)}$
(-5.06) (10.22)*** (-2.69)** (-1.97)*
r2(adj) = 0.929; DW = 2.21; F = 75.33

(8) Government Revenues (GR)

$GR = -20.77 + 0.21\,GDP_{(-1)} + 0.27\,DGDP_{(-1)}$
r2(adj) = 0.991; DW = 1.85; F = 906.68

Table 6: (contd)

Pakistan: Defense and the Macroeconomy, Simulation Model, 1973-1991

(constant 1985 prices)

STRUCTURAL EQUATIONS

(9) Total Government Investment (IGT)

$IGT = 10.58 + 0.54\ IGT_{(-1)} + 0.13\ GRT$
(4.14) (3.77)*** (2.47)**
$r^2(adj) = 0.934$; Durbins H = -1.37; F = 122.18

(10) General Government Investment IGGT)

$IGGT = 2.85 + 0.74\ IGGT_{(-1)} + 0.21\ IPMT$
(2.53) (5.57)*** (1.92)*
$r^2(adj) = 0.951$; Durbins H = 0.353; F = 166.21

(11) Public Domestic Borrowing (BORD)

$BORD = 12.99 + 0.73\ GDEF - 0.91\ BORF$
(4.01) (5.10)*** (-2.92)**
$r^2(adj) = 0.610$; DW = 2.37; F = 14.31

(12) Public Foreign Borrowing (BORF)

$BORF = 7.57 + 0.32\ BORF_{(-1)} + 0.47\ GDEF_{(-1)} - 0.17\ GNSP_{(-1)}$
(3.22) (2.07)** (4.59)*** (-3.74)***
$r^2(adj) = 0.740$; Durbins H = -1.48; F = 17.15

IDENTITIES

(13) Government Expenditures (GE)

$GE = MILX + NILX$

(14) Government Deficit (GDEF)

(8) $GDEF = GE - GR$

(15) Change in GDP (DGDP)

$DGDP = GDP - GDP_{(-1)}$

(16) Private Investment in Manufacturing (IPMT)

$IPMT = IPML + IPMS$

(17) Total Private Investment (IPT)

$IPT = IPMT + IPNMT$

EXOGENOUS

(18) Employment (EMP)

Notes: Two stage least squares estimations. See: SORITEC Integrated Econometric and Statistical Analysis Language, Version 6.6 Reference Manual, (Springfield, VA: Sorites Group, Inc., 1993) for a description of the procedure. r2(adj) = adjusted coefficient of determination; F = F statistic; DW = Durbin Watson Statistic, Durbins H = Durbin's H statistic; (-1) = variable lagged one year.

In constructing the model, our main concern was to capture the main areas that defense and other government expenditures might conceivably affect private investment. Specifically, the model attempts to capture the impact of public expenditures by type on the deficit, the impact of the deficit on the composition of public borrowing (domestic versus foreign) and domestic savings. Ultimately these links modify the private sector's decision to expand or contract capital formation in manufacturing.

With regard to the more important individual equations (Table 1):

1. Growth is affected mainly by employment, lagged military expenditures and private investment[13]. Interestingly, non-defense expenditures were not statistically significant in affecting GDP. The same was also true for government investment.

2. Defense expenditures were found to be a function of lagged GDP. In addition allocations to the military were found to compete with other forms of public expenditures and were reduced with increased funding of government investment. As noted in the causality analysis, an expansion in the public deficit also depresses the rate of increase in follow on allocations to the military.

3. Private investment in manufacturing follows a standard Koyc[14] distributed lag pattern. Funds allocated to this sector are reduced with increased levels of public sector borrowing in domestic markets (BORD). Some of the pressure on capital markets is reduced with increased foreign borrowing (BORF). As in the causality tests, military expenditures provides a stimulus to investment in large scale manufacturing (while non-defense expenditures provides a stimulus to investment in smaller scale plants). As noted by Khan and Iqbal (1991) private investment is strongly affected by the country's pattern of savings.

4. Gross National Savings[15] expand with the overall growth of the economy. However these funds are pre-empted (or crowded out) by the fiscal deficit.

Based on estimates over different time intervals the coefficients were found to be stable. Based on the Durbin Watson Statistic there does not appear to be a serious problem of autocorrelation.

HISTORICAL SIMULATIONS

To test the general accuracy of the model, a historical simulation was performed i.e. using the actual values for each variable, how well would the model have predicted each of the major variables over the period 1974 to 1991. The results (Table 7) were encouraging, particularly for the all-important GDP, and total private investment. The largest error for GDP was only 3.76 percent in the year of political crisis (1977).

Because of their smaller, absolute values, however, the errors were often high for private investment in manufacturing. Still, during the last several years the predicted figures for private capital allocations to this sector were close to the actual figures.

Roughly the same picture emerges when general government investment was treated as exogenous i.e., when actual rather than estimated values were used in the model' solution (Table 8).

The next step was to get a rough idea of the quantitative magnitudes of impact produced by changes in government investment. In the first set of simulations, government investment was increased (Table 9) by 2.5% and 10% over its historical values (with the other behavioral equations left endogenous). As a basis of comparison, the Base figures are those derived (in Table 8) from the actual (realized) levels of government investment.

The results (Table 9) of this simulation provide interesting insights to the dynamics of the Pakistani economy. In particular, increased levels of government investment tend to reduce GDP. The suppression in GDP occurs through the associated reduction in defense expenditures (given the insensitivity of private investment to changes in the levels of public capital formation).

Up to now the simulations have assumed that the pattern of public external borrowing is largely passive, that is determined by the endogenous equation 12 in Table 6. If instead, it is assumed that the government is constrained (to some preassigned level) in its borrowing in foreign capital markets the results of the simulations change dramatically (Table 10).

Again as a basis of comparison, three separate values are given for each of the key macroeconomic aggregates: (a) the endogenous values are those obtained by letting public foreign borrowing increase as in Table 9; (b) actual refers to the results obtained when public foreign borrowing was constrained to its realized values over the 1974-1991 period; and (c) actual plus 10% are the values obtained on the assumption that the government could not increase foreign borrowing at will i.e., the government could increase its foreign borrowing at most up to 10% over its actual borrowing levels for any one year.

Table 7:

Macroeconomic Simulation I, Endogenous Model, 1974-1991

(billions of 1985 rupees)

	Gross Domestic Product			Total Private Investment		
Year	Actual	Est	% Dif	Actual	Est	% Dif
1974	246.0	245.6	0.19	15.7	17.1	7.75
1975	256.8	259.8	1.17	17.5	17.9	2.30
1976	268.8	270.4	0.59	19.3	18.4	5.80
1977	278.9	290.2	3.91	20.9	19.1	9.48
1978	301.4	305.6	1.36	21.7	21.0	3.63
1979	315.9	324.6	2.69	22.4	22.4	0.00
1980	343.4	341.4	0.59	26.4	24.1	9.61
1981	367.0	363.7	0.92	28.5	26.1	9.42
1982	391.0	383.6	1.95	28.1	28.4	0.87
1983	417.9	408.2	2.38	30.7	30.6	0.23
1984	438.7	432.5	1.43	32.8	33.3	1.31
1985	472.2	460.4	2.56	35.8	36.1	0.68
1986	498.1	481.4	3.47	38.7	39.2	1.26
1987	530.1	523.3	1.29	41.1	41.9	2.04
1988	570.9	549.2	3.95	43.8	46.5	5.99
1989	611.9	588.5	3.97	51.0	49.8	2.44
1990	630.9	624.4	1.04	56.0	54.2	3.34
1991	672.0	670.4	0.24	60.1	59.1	1.79

	Private Non-Manuf Invest			Private Manufacturing Invest		
Year	Actual	Est	% Dif	Actual	Est	% Dif
1974	12.8	13.3	4.18	2.97	3.74	20.48
1975	14.0	14.6	3.67	3.41	3.29	3.85
1976	15.5	15.1	2.35	3.86	3.15	22.36
1977	16.9	15.8	6.61	4.06	3.29	23.25
1978	17.9	17.3	3.40	3.84	3.67	4.70
1979	18.6	18.2	2.24	3.84	4.15	7.60
1980	21.8	19.1	14.63	4.56	5.03	9.41
1981	22.5	20.0	12.47	6.00	6.03	0.54
1982	21.5	21.2	1.74	6.61	7.23	8.51
1983	22.9	22.1	3.44	7.81	8.50	8.12
1984	23.9	23.3	2.64	8.94	9.99	10.49
1985	25.8	24.5	5.31	10.02	11.57	13.38
1986	26.8	25.9	3.67	11.88	13.32	10.82
1987	28.5	26.8	6.18	12.57	15.09	16.65
1988	29.8	29.2	1.86	13.98	17.31	19.24
1989	32.5	30.4	6.90	18.51	19.40	4.56
1990	34.3	32.1	6.66	21.71	22.05	1.50
1991	36.4	34.4	5.89	23.73	24.07	3.92

Notes: Model simulation based on equations in Table 6. All variables except employment are endogenous.

Table 8:
Macroeconomic Simulation II:
General Government Investment Set at Historical Values, Foreign Public Borrowing Endogenous, 1974-1991

(billions of 1985 rupees)

	Gross Domestic Product			Total Private Investment		
Year	Actual	Est	% Dif	Actual	Est	% Dif
1974	246.0	245.5	0.23	15.7	17.0	7.58
1975	256.8	260.0	1.25	17.5	17.9	2.30
1976	268.8	269.9	0.38	19.3	18.2	5.88
1977	278.9	290.0	3.76	20.9	19.0	10.42
1978	301.4	306.8	1.77	21.7	21.5	1.04
1979	315.9	322.5	2.06	22.4	22.7	0.94
1980	343.4	342.4	0.27	26.4	23.6	11.79
1981	367.0	369.4	0.64	28.5	25.2	13.15
1982	391.0	393.1	0.54	28.1	27.1	4.01
1983	417.9	423.0	1.21	30.7	30.0	2.44
1984	438.7	445.9	1.63	32.8	33.6	2.32
1985	472.2	469.6	0.55	35.8	36.0	0.58
1986	498.1	491.5	1.34	38.7	38.6	0.15
1987	530.1	534.2	0.78	41.1	41.8	1.76
1988	570.9	557.0	2.51	43.8	46.9	6.73
1989	611.9	593.0	3.19	51.0	50.5	0.97
1990	630.9	625.6	0.85	56.0	54.9	1.95
1991	672.0	670.3	0.25	60.1	59.1	1.65
	Private Non-Manuf Invest			Private Manufacturing Invest		
Year	Actual	Est	% Dif	Actual	Est	% Dif
1974	12.8	13.3	4.02	2.97	3.73	20.29
1975	14.0	14.6	3.94	3.41	3.32	3.01
1976	15.5	15.1	2.34	3.86	3.13	22.99
1977	16.9	15.7	7.61	4.06	3.28	23.89
1978	17.9	17.6	1.39	3.84	3.87	0.56
1979	18.6	18.5	0.50	3.84	4.15	7.34
1980	21.8	18.7	16.83	4.56	4.92	7.36
1981	22.5	19.5	15.17	6.00	5.65	6.17
1982	21.5	20.5	4.83	6.61	6.52	1.43
1983	22.9	22.0	3.83	7.81	7.92	1.42
1984	23.9	24.1	0.87	8.94	9.51	6.01
1985	25.8	25.0	3.27	10.02	11.04	9.28
1986	26.8	25.8	4.04	11.88	12.86	7.65
1987	28.5	27.1	5.26	12.57	14.73	14.65
1988	29.8	29.8	0.20	13.98	17.08	18.15
1989	32.5	31.1	4.48	18.51	19.42	4.66
1990	34.3	32.8	4.65	21.71	22.17	2.04
1991	36.4	34.4	5.66	23.73	24.70	3.92

Notes: Model simulation based on equations in Table 6.

Table 9:
Macroeconomic Simulation III: General Government Investment 2.5% and 10% over Historical Values, Foreign Public Borrowing Endogenous

(billions of 1985 rupees)

	Gross Domestic Product			Total Private Investment		
Year	2.5%	Base	10.0%	2.5%	Base	10.0%
1974	245.3	245.5	244.9	17.0	17.0	16.9
1975	260.0	260.0	259.8	17.9	17.9	17.9
1976	269.4	269.9	268.0	18.3	18.2	18.6
1977	288.5	290.0	284.7	19.1	19.0	19.4
1978	304.9	306.8	299.0	21.6	21.5	22.0
1979	319.8	322.5	311.6	22.8	22.7	23.3
1980	338.9	342.4	328.1	23.8	23.6	24.3
1981	365.1	369.4	352.2	25.4	25.2	25.8
1982	388.2	393.1	373.6	27.2	27.1	27.7
1983	417.5	423.0	401.0	30.1	30.0	30.7
1984	439.7	445.9	420.9	33.8	33.6	34.5
1985	462.6	469.6	441.6	36.2	36.0	36.8
1986	483.9	491.5	461.1	38.8	38.6	39.4
1987	526.0	534.2	501.2	42.0	41.8	42.7
1988	548.0	557.0	521.1	47.2	46.9	47.8
1989	683.3	593.0	554.2	50.8	50.5	51.5
1990	615.1	625.6	583.7	55.2	54.9	56.0
1991	659.0	670.3	625.3	59.4	59.1	60.2

	Private Non-Manuf Invest			Private Manufacturing Invest		
Year	2.5%	Base	10.0%	2.5%	Base	10.0%
1974	13.3	13.3	13.2	3.72	3.73	3.68
1975	14.6	14.6	14.5	3.33	3.32	3.35
1976	15.2	15.1	15.3	3.17	3.13	3.28
1977	15.7	15.7	15.9	3.34	3.28	3.53
1978	17.7	17.6	17.7	3.98	3.87	4.30
1979	18.5	18.5	18.6	4.29	4.15	4.72
1980	18.7	18.7	18.7	5.10	4.92	5.62
1981	19.5	19.5	19.4	5.85	5.65	6.45
1982	20.5	20.5	20.3	6.74	6.52	7.41
1983	22.0	22.0	21.8	8.18	7.92	8.94
1984	24.0	24.1	23.8	9.80	9.51	10.63
1985	24.9	25.0	24.6	11.34	11.04	12.26
1986	25.6	25.8	25.2	13.19	12.86	14.18
1987	26.9	27.1	26.5	15.09	14.73	16.16
1988	29.7	29.8	29.2	17.46	17.08	18.61
1989	30.9	31.1	30.4	19.83	19.42	21.08
1990	32.6	32.8	32.0	22.61	22.17	23.94
1991	34.2	34.4	33.6	25.17	24.70	26.58

Notes: Model simulation based on equations in Table 6. Base = estimated values in Table 8.

Table 10:
Macroeconomic Simulation IV:
General Government Investment 2.5% over Historical Values, With Varying Patterns of Foreign Public Borrowing

(billions of 1985 rupees)

	Gross Domestic Product			Total Private Investment		
Year Borrow.:	Endogen	Actual	Act+10%	Endogenous	Actual	Act+10%
1974	245.3	245.5	245.9	17.0	17.0	17.2
1975	260.0	259.3	260.6	17.9	17.7	18.1
1976	269.4	272.4	277.2	18.3	19.3	20.0
1977	288.5	294.7	299.2	19.1	21.1	22.2
1978	304.9	311.2	317.6	21.6	23.1	24.4
1979	319.8	325.9	334.6	22.8	23.3	25.0
1980	338.9	346.6	358.2	23.8	24.4	26.4
1981	365.1	373.1	387.4	25.4	26.3	28.7
1982	388.2	399.6	414.3	27.2	28.2	31.0
1983	417.5	424.4	445.8	30.1	30.5	33.8
1984	439.7	442.1	468.7	33.8	32.8	36.6
1985	462.6	459.7	489.9	36.2	33.7	38.2
1986	483.9	472.7	508.3	38.8	34.5	39.6
1987	526.0	503.8	545.6	42.0	35.8	41.8
1988	548.0	511.0	560.0	47.2	38.4	45.4
1989	583.3	530.2	587.8	50.8	39.7	47.9
1990	615.1	545.7	613.6	55.2	42.4	52.2
1991	659.0	570.7	650.5	59.4	44.6	56.1

	Private Non-Manuf Invest			Private Manuf Invest		
Year Borrow.:	Endogen	Actual	Act+10%	Endogenous	Actual	Act+10%
1974	13.2	13.2	13.2	3.72	3.71	3.90
1975	14.6	14.6	14.6	3.32	3.11	3.49
1976	15.2	15.1	15.2	3.17	4.17	4.85
1977	15.7	15.9	16.1	3.34	5.20	6.17
1978	17.7	18.0	18.2	3.98	5.09	5.25
1979	18.5	18.7	18.9	4.29	4.67	6.04
1980	18.7	18.9	19.2	5.10	5.53	7.17
1981	19.5	19.0	20.3	5.85	6.39	8.32
1982	20.5	20.8	21.4	6.74	7.44	9.69
1983	22.0	22.2	22.9	8.18	8.22	10.81
1984	24.0	24.3	25.1	9.80	8.56	11.53
1985	24.9	25.0	26.0	11.35	8.79	12.22
1986	25.6	25.4	26.6	13.19	9.08	13.00
1987	26.9	26.4	27.8	15.09	9.43	14.00
1988	29.7	28.8	30.4	17.46	9.68	15.02
1989	30.9	29.4	31.3	19.83	10.29	16.59
1990	32.6	30.4	32.7	22.61	11.96	19.45
1991	34.2	31.5	34.2	25.17	13.05	21.88

Notes: Model simulation based on equations in Table 6.

On the basis of these assumptions it can be easily seen that even with modest increases (2.5%) in government investment, the economy would come under severe strains (Table 10). In particular:

1. With no increase in public external borrowing in 1991, GDP would decline from 659 billion rupees to 570.7.

2. The economy's extreme dependence on external borrowing to offset the public sector's crowding out of private investment appears to have developed around 1984/85 (as evidenced by the widening gap between the values obtained in actual and endogenous simulations).

3. This extreme dependence is evidenced by the fact that in recent years a 2.5 percent increase in government investment would have to be matched by an increase in public foreign borrowing of over 10 percent simply to preserve levels of investment and GDP that would have occurred in the absence of these increases in government investment.

CONCLUSIONS

While a complete explanation of the reasons the government has chosen to fund certain expenditures in certain markets is beyond the scope of this study, it is clear that if the Pakistani authorities wish to play a more productive role in the country's development, they will have to devote just as much attention to the financial impacts of public investment has they have to the direct economic impacts.

NOTES

1. See for example (Kemal, 1989); (Burney and Yasmeen 1989) and (Khan and Iqbal (1991)

2. As Richards and Waterbury note: "We may estimate, counterfactually, the returns on alternative uses of the monies devoted to defense, but practically nowhere in the world is there any assurance that reduced defense budgets would result in increased outlay on say, social welfare or infrastructure. Defense outlays are laden with the symbols and sentiments of national pride and survival. People seem prepared to accept disproportionate public investment in defense. They and their leaders find less justification in using equivalent resources to reduce adult illiteracy or line irrigation ditches. (Richards and Waterbury, 1990: 360-61).

3. See Looney (1992 a), Looney (1992 a) and Robert E. Looney "Infrastructural constraints on Energy Development: The Case of Pakistan" The Journal of Energy and Development. XVI/2, (Spring 1991), 267-286.

4. Gupta does make an attempt to identify the relevant lag structure, but these are arrived at in a somewhat arbitrary manner.

5. If the disturbances of the model were serially correlated, the OLS estimates would be inefficient, although still unbiased, and would distort the causal relations. The existence of serial correlation was checked by using a maximum likelihood correlation for the first-order autocorrelation of the residuals [AR(1)]. The comparison of both OLS and AR(1) results indicated that no significant changes appeared in causal directions. Therefore, we can conclude "roughly" that serial correlation was not serious in this model.

6. Since the F statistic is redundant in this instance they are not reported here. They are, however, available from the authors upon request.

7. Causation tests were performed using a program written in RATS386 Version 4.0. Cf. Thomas A. Doan, RATS User's Manual Version 4 (Evanston, Illinois: Estima, 1992).

8. The reasons underlying involve the assumption of stationary conditions. See Hsiao (1981), and Joerding (1986).

9. As a practical matter, the results were insensitive to the manner in which a variable was defined – actual, expected, and unexpected usually provided a consistent picture. Because of this only the actual impacts are summarized in the tables below. However because of its importance government investment in the form of infrastructure (here proxied as expected, or on-going government expenditure are also included in the set of main findings. The findings for the other variable definitions are available from the author upon request.

10. Again those for anticipated (expected) and unanticipated (unexpected) are not presented in detail. They are however available from the author upon request.

11. Again only the results for the actual (realized) deficit are presented here.

12. I am indebted to a referee for noting that the causality tests in and of themselves are insufficient for assessing the problem of crowding out.

13. Ideally one would have liked to use a neo-classical formulation of the type developed by Mintz and Huang and adopted successfully by Ward et al to the Indian situation. Unfortunately in the case of Pakistan several of the key variables (in particular non-defense expenditures and government investment) were not statistically significant. See Mintz and Huang (1990) and Ward et al. (1992)

14. See Pindyck and Rubinfeld (1976) for a description of this model and its theoretical rationale.

15. It should be noted that Gross National Savings is used here. Due to the large component of worker remittances Gross Domestic Savings fluctuates erratically. These remittances are no doubt purely exogenous and as such tend to mask the relationship between government expenditures, the deficit and the change in savings.

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ÖZET

1988 yılının sonlarına doğru Pakistan'da ortaya çıkan ekonomik kriz halen önemini sürdürmektedir. Artan bütçe açıkları, kronik enflasyon ve giderek bozulan dış ödemeler dengesi pozisyonu ülkenin büyüme potansiyelini olumsuz yönde etkilemektedir. Kamu kesimi dengelerinin yeniden kurulması özel kesim yatırımlarının ve dolayısıyla büyümenin canlandırılması açısından kilit önem taşımaktdır.

Kamu kesimin yeniden yapılanması ise büyük ölçüde devlet harcamalarının azaltılması ve vergi gelirlerinin arttırılmasına bağlıdır. Son yıllarda bütçe % 65-75 ödeneklerinin düzeyinde bir bölümün savunma harcamalarına ayrıldığı göz önüne alındığında, savunma harcamalarında ciddi bir kısıntıya gidilmesinin kamu kesimi dengesi ve büyüme üzerinde gerçekleştireceği olumlu etkiler açıkça ortaya çıkmaktadır.