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Constraints to the Economic Growth of Pakistan: A Three-gap Approach

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1. INTRODUCTION

The development of the two-gap model [Chenery and Bruno (1962); Chenery and Strout (1966); Mckinnon (1964); and Weisskopf (1972)] was an important contribution to the literature of economic development. The two-gap model deals with the interactions between the savings constraint and the foreign exchange constraint in the determination of economic growth in an economy. The savings constraint refers to the situation when the growth of an economy is limited by the availability of domestic savings for investment, and the foreign exchange constraint refers to the growth of an economy being limited by the availability of foreign exchange for importing capital goods. More recently, there has been increasing interest in the three-gap model, introducing fiscal constraint as a third gap limiting the growth prospects of highly indebted developing economies [Bacha (1990); Solimano (1990) and Taylor (1993, 1994)]. The fiscal constraint is intended to reflect the impact of the availability of resources to finance the public investment required to support a given level of potential output. These constraints are selected for analysis because of their direct impact on economic growth of Pakistan. The paper is structured as follows: Section 2 presents the three-gap model; in Section 3, the economy-wide potential output and capacity utilisation of Pakistan are estimated; in Section 4, the empirical results are discussed; the conclusions are summarised in Section 5.

2. THE THREE-GAP MODEL

In this study, the three-gap model developed by Solimano (1990) is used to determine the main macroeconomic constraints to the economic growth of Pakistan.

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The salient features of the Solimano model are presented here.[1] Starting with the conventional national accounting identity:

$$(Y_p - C_p) + (T - C_g) + (M - X) = I \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

Y_p is private income, C_p is private consumption, T and C_g are current revenues and current consumption of the government, respectively. M and X represent total imports and exports of goods and services, respectively. I is gross investment. Since the disaggregation of net foreign transfers (factor and non-factor services) R between private and public sectors is not available, it is assumed that a share λ of the debt is owed by the public sector ($0<\lambda<1$) and ($1-\lambda$) by the private sector. Incorporating net foreign transfers, Equation (1) can be rewritten as:

$$[Y_p - C_p + (1-\lambda)R] + (T - C_g + \lambda R) + (MT - XT - R) = I \quad \ldots \quad \ldots \quad (2)$$

Where MT and XT are merchandise imports and exports, respectively. The three terms on the left represent, respectively, private savings (S_p), public savings (S_g), and foreign savings (S_f). Thus Equation (2) becomes:

$$S_p + S_g + S_f = \mathrm{I} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

Using these identities of Equations (1)–(3), the foreign exchange, savings, and fiscal constraints can be established. The procedure for determining these constraints is the following.

(a) Foreign Exchange-constrained Growth

Foreign savings in dollars ($S_f{}^{\$}$)—the current account deficit—are equal to the sum of imports of capital goods ($M_k^{\$}$), imports of intermediate goods ($M_i{}^{\$}$), and imports of consumption goods ($M_c^{\$}$), minus total exports of merchandise goods ($XT^{\$}$), minus net transfers from abroad ($R^{\$}$). All the variables are normalised by the level of potential output. Potential output is subsequently used to normalise the level of variables in the three-gap analysis. The foreign savings in dollars are expressed as:

$$S_f^{\$}/Y^p = M_k^{\$}/Y^p + M_i^{\$}/Y^p + M_c^{\$}/Y^p - XT^{\$}/Y^p - R^{\$}/Y^p \quad \ldots \quad \ldots \quad (4)$$

Solimano specifies the import and export functions as follows:

$$M_k^{\$}/Y^p = \alpha_0 + \alpha_1 Y^p{}_g + \alpha_2 RER \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

$$M_i^{\$}/Y^p = \beta_0 + \beta_1 CU + \beta_2 RER \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

$$M_c^{\$}/Y^p = \gamma_0 + \gamma_1 CU + \gamma_2 RER \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

$$XT^{\$}/Y^p = \delta_0 + \delta_1 YW_g + \delta_2 RER \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

Imports of capital goods are made a function of the rate of growth of the potential GDP

[1]For the complete model, see Solimano (1990).

defined as $Y^p{}_g = \Delta Y^p/Y^p$, and the real exchange rate defined as $RER = ER.P^{us}/P$, where ER is the nominal exchange rate, P^{us} represents foreign inflation, and P is domestic inflation. Imports of intermediate and consumption goods are made a function of the real exchange rate and the level of capacity utilisation (CU). Total exports of goods are assumed to be a positive function of the real exchange rate and the growth in world demand (YW_g) defined as the over time growth rate in the world GDP index. Inserting Equations (5), (6), (7), and (8) into Equation (4) gives the foreign exchange constraint in an economy. The expression is as follows:

$$S_f^{\$}/Y^p = \pi_0 + \pi_1 RER + \pi_2 CU + \pi_3 Y^p{}_g - \pi_4 YW_g - R^{\$}/Y^p \quad \ldots \quad \ldots \quad (9)$$

where:

$$\pi_0 = \alpha_0 + \beta_0 + \gamma_0 - \delta_0$$
$$\pi_1 = \alpha_2 + \beta_2 + \gamma_2 - \delta_2$$
$$\pi_2 = \beta_1 + \gamma_1$$
$$\pi_3 = \alpha_1$$
$$\pi_4 = \delta_1$$

Equation (9) represents the constraint imposed by the balance of payments on the level of economic activity and the rate of growth of the GDP when the availability of foreign exchange is a binding restriction in the system. In order to focus on the constraints to growth, Equation (9) can be solved for the rate of growth of potential output as:

$$Y^p{}_{gf} = 1/\pi_3 \{S_f^{\$}/Y^p - \pi_0 - \pi_1 RER - \pi_2 CU + \pi_4 YW_g + R^{\$}/Y^p\} \quad (10)$$

$Y^p{}_{gf}$ is the maximum rate of growth of potential GDP that a foreign exchange-constrained economy could afford in order to satisfy the restriction imposed by the balance of payments. Equation (10) reveals that an increase in transfers from abroad may accelerate the growth of an economy because of the higher availability of foreign exchange to finance the imports of capital goods. A real devaluation of domestic currency (i.e., $\Delta RER > 0$) may increase output since it provides extra foreign exchange through an increase in net export earnings. Solimano argues that an increase in capacity utilisation (as a consequence of following expansionary demand policies) may encourage imports of consumption goods for a given level of net foreign financing and exports, which amounts to a cut in imports of capital goods and, consequently, a decline in economic growth.

(b) Savings-constrained Growth

The savings constraint includes foreign savings in domestic currency. Solimano proposes the following output-investment relationship:

$$Y^p{}_g = g_0 + k\,(I/Y^p) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (11)$$

Total investment as a share of potential GDP (I/Y^p) is related to the rate of potential GDP growth ($Y^p{}_g$). The k is the incremental potential output-capital ratio and g_0 represents a base-level growth due to other factors (labour-productivity growth, technological change, and supply shocks). The following savings functions for the private, public, and foreign sectors normalised by potential GDP are specified as follows:

$$S_p/Y^p = \zeta_0 + \zeta_1 YD/Y^p] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (12)$$

$$S_g/Y^p = \xi_0 + \xi_1 CU \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (13)$$

$$S_f/Y^p = \mu_0 + \mu_1 RER + \mu_2 CU + \mu_3 Y^p{}_g + \mu_4 YW_g \quad \ldots \quad \ldots \quad \ldots \quad (14)$$

Private national savings (S_p) are made a function of disposable income relative to potential GDP defined as $YD/Y^p = [(1-t)CU + (1-\lambda)R/Y^p]$, where t is the average tax rate. The coefficient of disposable income is expected to be positive. Public savings (S_g) are expected to rise with increasing capacity utilisation because of increases in tax revenues and operational profits of public enterprises. In the foreign savings function, if the exports and imports respond as expected, the coefficient μ_1 is assumed to be negative, anticipating that a real devaluation will reduce the current deficit in domestic currency. Furthermore, the deficit will increase with capacity utilisation (CU) and decrease with an increase in foreign demand. Combining Equations (11), (12), (13), and (14) and inserting them into the savings-investment balance, Equation (3) gives the savings constraint on the growth of potential output as follows:

$$Y^p{}_{gs} = (k/1 - k\mu_3)\{\omega_0 + \omega_1 RER + \omega_2 CU + \omega_3 YW_g\} \quad \ldots \quad \ldots \quad (15)$$

where

$$\omega_0 = g_0/k + \zeta_0 + \xi_0 + \mu_0$$
$$\omega_1 = \mu_1$$
$$\omega_2 = \xi_1 + \mu_2 + \zeta_1$$
$$\omega_3 = \mu_4$$

$Y^p{}_{gs}$ is the maximum rate of growth of potential GDP consistent with the savings constraint. A stability condition is that $k\mu_3 < 1$. A real devaluation may reduce potential output if a reduction in foreign savings following the real devaluation is not compensated for by an increase in national savings.

(c) Fiscal-constrained Growth

The fiscal constraint is intended to reflect the impact of the availability of resources to finance the public investment required to support a given level of potential output. Another dimension of fiscal deficit lies in its effects on macroeconomic stability, particularly its effects on inflation and the balance of payments. The fiscal constraint can be derived from public sector borrowing requirements (BR_g) normalised by the

level of potential output as follows:

$$BR_g/Y^p = I_g/Y^p - S_g/Y^p \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (16)$$

Total investment decomposed into public investment (I_g) and private investment (I_p) normalised by the level of potential GDP can be written as:

$$I/Y^p = I_p/Y^p + I_g/Y^p \quad \ldots \quad \ldots \quad \ldots \quad \ldots\ldots \quad (17)$$

Solimano specifies the private investment function as follows:

$$I_p/Y^p = \eta_0 + \eta_1 I_g/Y^p + \eta_2 CU \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (18)$$

In the private investment function, the sign of the coefficient (η_1) depends on whether public investment crowds-in private investment (i.e., government investment in infrastructure complements private investment) or crowds-out private investment (i.e., increased fiscal deficits drive up interest rates and reduce private investment). The parameter (η_2) represents an accelerator coefficient and is expected to be positive, assuming that an increase in the rate of capacity utilisation stimulates private investment activities in Pakistan. Inserting Equation (18) into Equation (17) gives:

$$I/Y^p = \eta_0 + (1+\eta_1) I_g/Y^p + \eta_2 CU \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (19)$$

Inserting Equation (19) into Equation (11) and solving for I_g/Y^p yields:

$$I_g/Y^p = 1/k\,(1+\eta_1)\{Y^p{}_g - g_0 - k\,(\eta_0 + \eta_2 CU)\} \quad \ldots \quad \ldots \quad \ldots \quad (20)$$

Replacing Equation (20) in Equation (16) and solving for $Y^p{}_g$ yields:

$$Y^p{}_{gg} = k\,(1+\eta_1)\,\{BR_g/Y^p + \xi_0 + (g_0/k + \eta_0)/1+\eta_1 + (\xi_1 + \eta_2/1+\eta_1) CU\} \quad \ldots \quad (21)$$

Where $Y^p{}_{gg}$ is the maximum rate of potential GDP growth consistent with the fiscal constraint defined in terms of a certain public sector borrowing requirement (BR/Y^p) target. In this context, an increase in (BR_g/Y^p), which enhances public investment, may raise the rate of potential GDP growth and an increase in capacity utilisation may accelerate potential output since an increase in net revenues and consequently public savings may provide more resources to finance higher public investment and support more economic growth.

3. ESTIMATES OF POTENTIAL OUTPUT, NATURAL UNEMPLOYMENT, AND CAPACITY UTILISATION

The concepts of potential output, natural unemployment, and capacity utilisation are widely used for empirical economic analysis. The measure of capacity utilisation of Pakistan's economy developed in this section will be employed in the empirical analysis of the three-gap model in the next section. Since these concepts are widely used for

economic analysis, their accurate quantification is important.[2] To my knowledge, not a single study has been done on estimating the potential output, natural unemployment, and capacity utilisation in Pakistan's economy. The general reasons are substantive methodological differences, data limitations, and the complexity of their measurement. The purpose of this section is to specify, estimate, and interpret economy-wide measures of potential output, natural unemployment, and capacity utilisation in Pakistan over the period 1970–93.

(a) Measure of Potential Output

Although methodological differences persist, a broad consensus has formed around the appropriateness of combining the Okun (1962) method and the Phillips (1958) curve for measuring potential output and capacity utilisation in an economy. This is the approach adopted in this study for the quantification of these concepts. Potential output is defined here as the maximum output level that can be reasonably produced with installed production capacity. Algebraically, the Okun's method is as follows:

$$Y^p = Y[1 + g(U - U^n)] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (22)$$

Where g is the growth rate in potential output (known as Okun's coefficient), U is the actual open unemployment rate defined as the difference between total labour force (LF) and employed labour force (ELF) as the fraction of total labour force $\{U = [(LF - ELF)/LF]\}$, and U^n is the natural rate of open unemployment. For the measurement of potential output, two further estimates are required: the estimate of Okun's coefficient (g) and the estimate of natural rate of unemployment (U^n). These estimates are calculated on the basis of the following econometric methods.

Okun's Coefficient

Okun's law says that there is a constant elasticity relationship between the ratio of actual output (Y) and potential output (Y^p), on the one hand, and the employment rate (ER=100–U) as a fraction of its potential level (ER^p), on the other hand. Algebraically, this expression is:

$$ER/ER^p = (Y/Y^p)^{\alpha} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (23)$$

It is also assumed that there is a constant growth rate (g) of potential output starting from some level Y^p_0 such that at any time t:

$$Y^p = Y^p_0 \cdot e^{agt} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (24)$$

[2]Many alternative definitions and methods have been used to quantify these concepts, particularly in the case of developed countries; [e.g., Okun (1962); Artus (1977); Harris and Taylor (1985); Berndt and Hesse (1986); Hulten (1986); Adams, Fenton and Larsen (1987); Adams and Coe (1990); Torres and Martin (1990) and OECD (1991)].

By substituting Equation (24) for Y^p in Equation (23) and rearranging:

$$ER_t = (Y^{\alpha}_t \,.\, ER^p)/(Y^p{}_0 \,.\, e^{\alpha g t}) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (25)$$

Logarithmically, Equation (25) is:

$$logER^3 = log\beta_0 + \alpha logY - \alpha gT + e^4 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (26)$$

where $\beta_0 = ER^p/Y^p{}_0$

The employment rate (ER) is related to time trend (T) and actual real gross domestic product (Y). The coefficient (α) gives the output elasticity of employment rate, and the coefficient of time trend is the product of (α) and the potential growth rate (g), which yields an estimate of the growth of potential output. The specified regression Equation (26) is estimated by the ordinary least squares (*OLS*) technique, using time-series data for the period 1970–90 for Pakistan's economy. The following estimated equation fits the data well, according to the usual statistical criteria.

$$LogER^5 = 0.2222 + 0.0541 logY - 0.0029T + 0.8103\ logER^6{}_{t-1}$$
$$(0.51) \quad (3.69) \quad (3.59) \quad (8.13)$$
$$R^2 = 0.93 \quad F = 81.08 \quad D.h. = -0.01$$

The estimated elasticity coefficient of output with respect to employment is 0.05, suggesting that one percentage point increase in output results in 0.05 percent increase in Pakistan's employment rate. As the coefficient of time trend is the product of output elasticity of the employment rate and the potential output growth rate, it yields an estimate of potential output growth rate. The estimated coefficient yields a plausible growth rate in potential output in Pakistan (g = 5.37 percent).

Natural Rate of Open Unemployment

This study uses the widely used Phillips curve method to estimate the natural rate of unemployment in Pakistan. The specified function in logarithmic form is:[7]

$$\Delta logWR = \Delta logP^e + \beta_1(U - U^n) + \beta_2 \Delta logLP + (1-\beta_2)\,\Delta logLP^{tr} + e \quad \ldots \quad (27)$$

Equation (27) is a Phillips curve relating to growth of nominal wage rate (ΔWR) to inflation expectation (ΔP^p, taken as one year lag of actual inflation), the gap between

[3]For convenience, the time subscript 't' associated with variables is dropped.

[4]A stochastic error term is also included for non-included variables.

[5]t-ratios are in parenthesis under their respective coefficients.

[6]In the estimated function, an extra lagged dependent variable is also included as an explanatory variable; this was not done in the original Okun's method.

[7]For more detail on this specification, see Adams and Coe (1990)

the actual open unemployment and the natural rate of open unemployment ($U-U^n$), and the growth of actual labour productivity (ΔLP) and the trend labour productivity (ΔLP^{tr}). The natural growth of unemployment and trend growth can be subsumed in a constant term β_0, which is not included above, the expression being:

$$\beta_0 = -\beta_1 U^n + (1-\beta_2)\Delta logLP^{tr}$$

In this case, the Equation (27) becomes a standard Phillips curve such as:

$$\Delta log\ WR = \Delta logP^e + \beta_0 + \beta_1 U + \beta_2 \Delta logLP + e \quad \ldots \quad \ldots \quad (28)$$

From the estimated coefficients of Equation (28), the implicit natural unemployment rate can be calculated as:

$$U^n = [-\beta_0 + (1-\beta_2)\Delta logLP^{tr}]/\beta_1 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (29)$$

The specified function of the Phillips curve by Equation (28) is estimated using the OLS estimation technique, taking time-series data for the period 1970–93. The estimates seem quite plausible, having the expected signs, and are free of econometric problems.

$$\Delta log\ WR = -0.0447\Delta logP^e + 0.0423 - 1.3005U + 2.0487\Delta logLP$$
$$(2.00) \qquad (1.74) \quad (2.64) \quad (1.98)$$
$$R^2 = 0.48 \qquad F = 4.85 \qquad D.W. = 1.82$$

It is interesting to note that the coefficient of open unemployment rate (β_1) appears statistically significant with a negative sign, supporting the existence of a Phillips curve for Pakistan over the period 1970–93. This finding is consistent with Hassan (1988), who found a short-run Phillips curve for Pakistan for the period 1972–82. As *a priori* expectation, the coefficient of labour productivity (β_2) is significantly positive, implying that the higher the productivity of labour, the more nominal the wages will be. Using Equation (29), the estimate of the natural rate of open unemployment in Pakistan over the period 1970–93 is $U^n = 3.21$ percent.

Potential Output

The above estimates of the natural unemployment rate and the growth rate of potential output help to generate an economy-wide series of potential output in Pakistan in the following way:

$$Y^p = Y[1 + 0.0537(U - 3.21)]$$

Capacity Utilisation

Capacity utilisation rates (CU) over the period 1970–93 are computed as the ratio of actual GDP to potential GDP as:

$$CU = Y/Y^p$$

The estimates show that Pakistan's economy was working at full capacity until 1977, after which it started declining and reached 87 percent in 1992-93. Since the estimates of potential output and capacity utilisation are based on the open unemployment rate, these estimates may not provide a correct indicator for the potential output and capacity utilisation in the case of Pakistan, and they should be treated carefully.

4. EMPIRICAL RESULTS

(a) Key Parameter Values of the Three-gap Model for Pakistan

For the estimation of reduced-form equations of the model—the foreign exchange constraint Equation (10), the savings constraint Equation (15), and the fiscal constraint Equation (21)—the various functions specified in the previous section are estimated using the ordinary least squares estimation technique for the period 1977–92. The results of the key parameters are reported in Appendix Table 1A. The signs of the coefficients of estimated functions are mostly according to *a priori* expectations. The results corresponding to import and export functions seem to be interesting. The coefficient of the real exchange rate is positive in import functions of consumption goods Equation (7) and capital goods Equation (5), while being negative in the case of imports of intermediate goods Equation (6). These results suggest that the real exchange rate does not negatively affect the imported consumption goods (usually luxurious goods) and capital goods as Pakistan is a capital-deficient economy. As *a priori* expectation, total exports Equation (8) of goods are a positive function of the real exchange rate. Furthermore, the coefficient of capacity utilisation and world demand are found to be positively related to Pakistan's imports and exports, suggesting that increasing capacity utilisation and world demand stimulate economic activities in Pakistan. The incremental capital-output ratio, calculated as new investment as a fraction of potential output, is 1.86 reported in Equation (11). The coefficients of capacity utilisation in private savings function Equation (12) and public savings function Equation (13) possess positive signs, implying that a 1 percent increase in the rate of capacity utilisation increases private savings by 0.15 percent and public savings by 0.22 percent. The estimates of the foreign savings function Equation (14) show that a real devaluation of 10 percent reduces the current account deficit by 0.2 percent. On the other hand, a 10 percent increase in capacity utilisation increases the current account deficit by 0.7 percent. The coefficient of investment in the foreign savings function shows that a 1 percent increase in investment increases the current account deficit by 0.4 percent. A negative relationship is found between private investment and public investment Equation (18). The estimated coefficient ($\eta_I = -0.5$) shows that a 1 percent increase in public investment crowds-out private investment by 0.5 percent in Pakistan. On the other hand, a 10 percent increase in capacity utilisation stimulates private investment by 0.9 percent.

(b) Reduced-form Results

The parameterisation of reduced-form equations for the foreign exchange- , savings- and fiscal-constrained growth is reported in Table 1. The results of the foreign exchange-constrained Equation (10) show that a real devaluation allows acceleration of the rate of growth of potential GDP since it provides extra foreign exchange through increased export earnings. The positive coefficient of the growth of foreign demand suggests that the potential output growth increases with a rise in foreign demand since it accelerates economic activities and export earnings in Pakistan. Conversely, an increase in the level of capacity utilisation reduces the potential output. The plausible reason seems to be that an increase in capacity utilisation through expansionary demand policies encourages the imports of consumption goods (luxury goods) and reduces the imports of capital goods, and as a consequence the growth rate in potential output declines when Pakistan's economy is facing a foreign exchange constraint.

Table 1

Results of Reduced-form Equations of the Three-gap Model for Pakistan

	Foreign Exchange-constrained Growth
Equation (10)	$Y^p_{gf} = 0.095 + 0.016\ RER - 0.109\ CU + 0.008\ YW_g$
	Savings-constrained Growth
Equation (15)	$Y^p_{gs} = -0.135 - 0.011\ RER + 0.410\ CU - 0.124\ YW_g$
	Fiscal-constrained Growth
Equation (21)	$Y^p_{gg} = 0.018 + 0.104\ CU$

The results of the savings-constrained Equation (15) are also as expected. The coefficient of real exchange rate carries a negative sign, implying that a real devaluation of the exchange rate reduces Pakistan's potential output growth when the savings gap is binding. This result is consistent with the foreign savings function Equation (14) that a real devaluation reduces foreign savings in domestic currency. It seems that a reduction in foreign savings is not compensated for by an increase in national savings. The same argument holds in the case of foreign demand since it has a negative effect on foreign savings and, consequently, on the growth rate of potential output. Conversely, increasing capacity utilisation raises private and public sector savings, and consequently potential output growth, when the saving constraint is binding. Turning to the fiscal constraint Equation (21), it is apparent that increases in capacity utilisation accelerate the rate of growth of potential GDP in Pakistan. Since the fiscal constraint is defined in terms of the public sector borrowing requirement, the increasing rate of capacity utilisation raises public savings, relaxing the fiscal constraint on public investment; and as a consequences the rate of potential output growth is increased.

5. CONCLUSIONS

A three-gap model is used to examine selected macroeconomic constraints (foreign exchange, fiscal, and savings) to Pakistan's economic growth over the 1977–92 period. The model proceeds as follows. In the first stage, economy-wide potential output and capacity utilisation, which are required for the working of the model, are estimated. Using the Okun method and the Phillips curve, the estimates of potential and capacity utilisation, show that since 1978 Pakistan's economy has been operating below capacity. In the second stage, the various specified functions of the model are estimated to provide the key parameter values of the three-gap model for Pakistan. The results of these functions show that a higher capacity utilisation increases both private and public savings; real devaluation reduces the current account deficit; public investment crowds-out private investment; and growth in foreign demand stimulates economic activities in Pakistan. In the third stage, the reduced-form equations for the foreign exchange, savings, and fiscal constraints are parameterised. The results of the foreign exchange constraint equation show that a real devaluation and the growth in foreign demand allow an accelerated rate of growth of potential GDP; conversely, increased capacity utilisation reduces potential output when foreign exchange is a binding constraint. In contrast, the results of the savings constraint equation show that real devaluation and increases in foreign demand reduce Pakistan's potential output growth, while increasing capacity utilisation accelerates the rate of growth of potential GDP. Finally, the fiscal constraint equation shows that the growth of potential output increases with higher capacity utilisation.

Appendix

Appendix Table 1A

Key Parameter Values of the Three-gap Model for Pakistan

Eq. No.	Functions	Parameters	Values
(5)	Import function of capital goods	α_0	0.0007
		α_1	0.2570
		α_2	0.0005
(6)	Import function of intermediate goods	β_0	–0.011
		β_1	0.020
		β_2	–0.004
(7)	Import function of consumption goods	γ_0	–0.006
		γ_1	0.008
		γ_2	0.0002
(8)	Total export function	δ_0	0.006
		δ_1	0.002
		δ_2	0.001
(11)	Growth-investment relationship	g_0	0.011
		k	0.538
		$1/k$	1.860
(12)	Private savings function	ζ_0	–0.018
		ζ_1	0.148
(13)	Public savings function	ξ_0	–0.160
		ξ_1	0.216
(14)	Foreign savings function	μ_0	–0.092
		μ_1	–0.019
		μ_2	0.074
		μ_3	0.405
		μ_4	–0.222
(18)	Private investment function	η_0	0.055
		η_1	–0.500
		η_2	0.086

Source: All the data were taken from *Pakistan Economic Survey* (PES) (Various Issues), except the world GDP index, nominal exchange rate, and US consumer price index, which were taken from *International Financial Statistics*, IMF (Various Issues). The data on the wage rates in the agricultural sector were taken from Naqvi *et al.* (1983, 1993), which in turn were obtained from *FAO Yearbook*, Rome.

REFERENCES

Adams, C., P. R. Fenton, and F. Larsen (1987) Potential Output in Major Industrial Countries. *Staff Studies for the World Economic Outlook* 1–38. Washington, D. C.: Research Department of the International Monetary Fund.

Adams, C., and D. T. Coe (1990) A Systems Approach to Estimating the Natural Rate of Unemployment and Potential Output for the United Sates. *Staff Papers* 37:2 232–293. Washington, D. C.: International Monetary Fund.

Artus, J. R. (1977) Measures of Potential Output in Manufacturing for Eight Industrial Countries, 1955–78. *Staff Papers* 24: March 1–35. Washington, D. C.: International Monetary Fund.

Bacha, E. L. (1990) A Three-gap Model of Foreign Transfers and the GDP Growth Rate in Developing Countries. *Journal of Development Economics* 32: 279–296.

Berndt, E. R., and D. M. Hesse (1986) Measuring and Assessing Capacity Utilisation in the Manufacturing Sectors of Nine OECD Countries. *European Economic Review* 30: 961–989.

Chenery, H. B., and M. Bruno (1962) Development Alternatives in an Open Economy: The Case of Israel. *Economic Journal* 72:79-103.

Chenery, H. B., and A. M. Strout (1966) Foreign Assistance and Economic Development. *American Economic Review* 56: 679–733.

Harris, R., and J. Taylor (1985) The Measurement of Capacity Utilisation. *Applied Economics* 17: 849–866.

Hassan, A. (1988) Is There a Phillips Curve in Pakistan? *The Pakistan Development Review* 27:4 839–851.

Hulten, C. R. (1986) Productivity Change, Capacity Utilisation, and the Sources of Efficiency Growth. *Journal of Econometrics* 33: 31–50.

McKinnon, R. (1964) Foreign Exchange Constraints in Economic Development and Efficient Aid Allocation. *Economic Journal* 74: 388–409.

Naqvi, S. N. H., A. H. Khan, N. M. Khilji, and A. M. Ahmed (1983) *The P.I.D.E. Macroeconometric Model of Pakistan's Economy*. Islamabad: Pakistan Institute of Development Economics.

Naqvi, S. N. H., A. H. Khan, and A. M. Ahmed (1993) *The Macro-economic Framework for the Eighth Five-Year Plan*. Islamabad: Pakistan Institute of Development Economics.

Okun, A. (1962) Potential GNP, Its Measurement and Significance. *Proceedings of the Business and Economics and Statistics Section*. 98–104. Washington, D. C.: American Statistical Association.

OECD (1991) Organisation of Economic Cooperation and Development. *Economic Outlook* 40. Paris: OECD.

Phillips, A. W. (1958) The Relation Between Unemployment and the Rate of Change of

Money Wages in the United Kingdom, 1861–1957. *Economica* November.

Solimano, A. (1990) Macroeconomic Constraints for Medium-term Growth and Distribution: A Model for Chile. *Working Papers*, Country Economics Department, The World Bank (WPS 400).

Taylor, L. (1993) (eds.) *The Rocky Road To Reform*. Cambridge: MIT Press.

Taylor, L. (1994) Gap Models. *Journal of Development Economics* 45:17–34.

Torres, R., and J. P. Martin (1990) Measuring Potential Output in the Seven Major OECD Countries. *OECD Economic Studies* 14: Spring 127–149.

Weisskopf, T. E. (1972) The Impact of Foreign Capital Inflow on Domestic Savings in Underdeveloped Countries. *Journal of International Economics* 2: 25–38.

Comments

I feel the paper has contributed to the existing literature on economic growth of Pakistan, extending the two-gap model that deals with the interactions between the saving and the foreign exchange constraints in the determination of economic growth of an economy. Pakistan, like other LDCs, has internal (e.g., economic, social, political and structural) and external constraints (e.g., debt burden, higher foreign interest rate, and unfavourable terms of trade) that are responsible for the unsustainable economic growth. To capture some of these internal and external constraints, the author included the fiscal constraint along with the saving and the foreign exchange constraints to pinpoint the possible reasons that make the economic growth of Pakistan unsustainable.

Using the Okun method and Phillips curve, the author estimates potential output and capacity utilisation for the various specified constraints of the model, to provide the key parameter values of the three-gap model. The estimates show that since 1978 Pakistan's economy is operating below capacity utilisation. The study also shows that the natural rate of unemployment for Pakistan is 3.21 percent over the period 1970–93, and 5.37 percent growth rate in potential output. Basing on these figures, the results show that higher capacity utilisation is the source of increase in both private and public savings as well as in the growth of potential output.

My other observations on the paper are as follows. First, author has combined the Okun method and the Phillips curve for measuring capacity utilisation and potential output. In fact, to measure potential output we also need a measure of the total amount of capital available in the economy. Moreover, in macroeconomic literature, NAIRU (Naturally Adjusted Inflation Rate Unemployment), which is an extension of Okun's law, is considered a more appropriate measure of potential growth than Okun's law itself. After going through a number of complexities of the model, the author finds that the natural unemployment rate in Pakistan is 3.21 percent during the period of 1970–93. Second, if we take the average of unemployment rate of the same period, we would find the same values for the unemployment rate. So the actual unemployment rate in Pakistan can be considered as the natural unemployment rate. Moreover, he has given only one estimate of the natural unemployment for the whole period. More specifically, **if the potential growth and capacity utilisation had been estimated for more than one** small period, the study might be more effective and beneficial. Finally, I noticed that the saving-constrained growth equation's Equation (15) derivation was not correct; it should be re-estimated. All in all, the paper is a constructive effort in the right direction, and is to be complimented.

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