Structural Constraints in Developing Economies: A three-gap analysis

Dissertation Submitted to Jawaharlal Nehru University
in Partial Fulfillment of the Requirements for the
Award of the Degree of

MASTER OF PHILOSOPHY

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July, 2001

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DECLERATION

I hereby certify that the dissertation entitled " Structural Constraints in Developing Economies: A Three-Gap Analysis", submitted by Tara Shankar Shaw in partial fulfillment for the award of Degree of **Master of Philosophy** (M. Phil) of Jawaharlal Nehru University is his original work and has not been previously submitted to any other university for the award of the degree.

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To
Ma, Bapi
And
Didis

Acknowledgement

During the last one year, while I was working on my dissertation I had many anxious moments regarding conceiving the convoluted aspects of my research. In all these moments I have always found my supervisor Prof. Manmohan Lal Agarwal and stayed beside as the source of inspiration and provided me with insights and directions to my work. Sir gave me ample independence to nurture my thoughts so as to substantiate my research.

I am thankful to Dipankarda (Dipankar Sengupta, Ford Foundation Fellow, ITD), for helping me to enhance my research work by providing me with valuable information with regard to articles and books that are relevant to my research. Additionally I take the opportunity to thank Prof. Nimfa Mendoza from University of Philippines who has taken the pain to send to me few articles relating to my dissertation work.

Moreover, I am indebted to my dear friend Ranajoy, who has lent a hand in tabulating data and proof reading my manuscript. Without his help it might not have been feasible for me to complete the dissertation in its entirety and comprehensiveness. Abhijit Sengupta provided me with data and helped me in many ways. Simply thanking him will fall short of.

I am grateful to the SERFA, Delhi, for granting me the access to use its resources during the course of my work.. Besides this, I take the pleasure to thank all of my friends in JNU (innumerable to count and will be irresponsibility if I miss one), who have helped me at different points of time. Finally leaving myself responsible for the errors alone.

(Para Shankar Shaw)

Contents

Sources of the data used in the Dissertation

Data	*Source*
Export and Goods and Services	International Financial Statistics Yearbook (1999)
Government Consumption	-do-
Gross Fixed Capital Formation	-do-
Private Consumption	-do-
Import of Goods and Services	-do-
GDP deflator (*base year 1995*)	-do-
Wholesale Price Index (*base year 1995*)	-do-
Consumer Price Index (*base year 1995*)	-do-
Population	-do-
Government's Total Revenue	Government Finance Statistics Yearbook of (1999, 1995, 1990, 1985, 1980, 1975)
Government's Current Revenue	-do-
Tax Revenue	-do-
Non Tax Revenue	-do-
Total Government's Expenditure and Lend Repayment	-do-
Current Expenditure of the Government	-do-
Capital Expenditure of the Government	-do-
Government's Deficit or Surplus	-do-
Agriculture, value added (% of GDP)	World Development Indicator CD 2000
Industry, value added (% of GDP)	-do-
Services, etc., value added (% of GDP)	-do-
Aid (% of GNP)	-do-

CHAPTER – I

Chapter 1.

Literature survey of gap models with special emphasis on three gap model

Introduction:

The economic growth of an economy depends on an economy reallocating its resources from low growth sectors to its high growth sector and on capital accumulation. Various development economists have spelled out the importance of investment. Prof. Rostow (1960) defines the process of "take off" into sustained growth in terms of a critical ratio of investment to national product. Prof. Arthur Lewis (1955) has described the process of development as one of transforming a country from being a 5% saver and investor to a 12 % saver and investor. Prof Johnson (1969) singles out capital accumulation in its widest sense as a distinguishing characteristic of development and has described structural transformation of the economy as a generalized process of capital accumulation. According to him "The condition of being developed consists of accumulated capital and having established efficient social and economic mechanisms for maintaining and increasing the stock of capital per head in various form. Similarly the condition of being underdeveloped is characterized by the possession of relatively small stocks of the various kinds of capital". A country can invest more through higher saving. But the question arises how to convert this saving into investment. This question becomes more pertinent for developing economies, where there are structural bottlenecks in the economy. As a result the economic policies prescribed by mainstream economists may not hold good for these economies. Moreover, many assumptions of the neo classical theory do not tally with the specific economic condition of the developing countries. In particular the existence of a market determined set of unique prices that ensure competitive equilibrium is questionable. Fully optimal resource allocation is then not possible. As a result there will be a discrepancy between the actual growth and the feasible growth. If one suspects the non-existence of a competitive equilibrium in the developing countries, one should study the

possible sources of the disequilibrium. The structural economists do this. The incorporation of the gap models in this field of literature has made the policy conclusion much easier. So it is important to study the literature of the Gap models.

In this chapter we will outline the development of the economic literature pertaining to the gap models. Rosenstein Rodan who introduced the saving gap initiated the first work on the gap model. Thereafter Chenery introduced the foreign exchange gap and the model became famous as the two gap model. The two gap model was central to the analysis of foreign aid's macro impact in developing economies. In this type of model aid acts as an increment to investment, relieving either the foreign exchange or the savings constraint, and therefore leading to higher growth. Thereafter in the decade of seventies the importance of the two gap model in analyzing policy design for the developing economies was reduced. In the meantime, Edward L. Bacha introduced "fiscal gap" as a third gap to analyze the problem facing many Latin American countries. Lance Taylor used extensively the three gap model to analyze the bottlenecks in developing economies within the paradigm of structural analysis.

The literature on the gap models can be traced to the work of Rosenstein Rodan (1961) in his article "International Aid for the Underdeveloped Countries". He presumed that output was strictly determined by the local productive capacity according as to the Harrod Domar Model. The simplest form of Harrod Domar model can be written as

$$\frac{1}{Y}\frac{\partial K}{\partial t} = \frac{K}{Y}\frac{\partial Y}{\partial t}$$

where K is the capital stock and Y is the output. According to this model investment is an endogenous variable and the amount of investment required to maintain a government's target rate of growth can be calculated. The investment is financed through domestic saving, or, if the domestic saving is low, then the discrepancy between investment and saving can be filled by private capital inflow or by public capital inflow (which is commonly known as aid). So, according to Rodan, when domestic savings are inadequate then foreign aid can fill the gap and

help the transition to self-sustaining growth. The transition is achieved if the marginal propensity to save exceeds the average propensity to save so that the latter rises with income. Eventually domestic saving will be sufficient to finance the desired growth rate without aid.

However, Rosenstein Rodan's argument did not take into account the specific foreign exchange requirements for capital formation in the developing country. For a developing country the initial step towards industrialization involves substitution of imports of final goods by domestic production. The difficulty is that production depends upon imported intermediate inputs, so that no sector can function without hard currency. The multiple requirement of external capital – to finance both intermediate inputs and investment was conceptualized by Chenery and Bruno (1962) in their two-gap model for their study of Israeli economic growth. Later Chenery and Strout formalized the model and introduced three gaps: a limited capacity to invest and so the need for technical assistance. The second constraint is, as in Rosenstein Rodan's model, the saving gap. Finally the foreign exchange gap is equal to the excess of import requirements over export earnings. Imports were specified by a linear function of output and growth of exports was exogeneous. These assumptions make this a *structural model.* While *ex post* the savings and trade gaps are identical there is no reason to believe that this will be the case *ex a*nte. In an ex ante sense one of the constraints would be more binding than other and would put a lower limit on growth given any capital inflow. With this theoretical background the case of aid inflow was justified on the ground that aid would enable a country to get rid of the binding constraint and thus lead to a one to one increase of investment and thus the growth rate of output. The above logic was criticised by Keith Griffin (1970) and Griffin and Enos (1970), who argued that aid inflow would lead to a one to one increase in investment only if the marginal propensity to save was one. Their main argument can be described by a simple inter-temporal budget constraint that is shown below

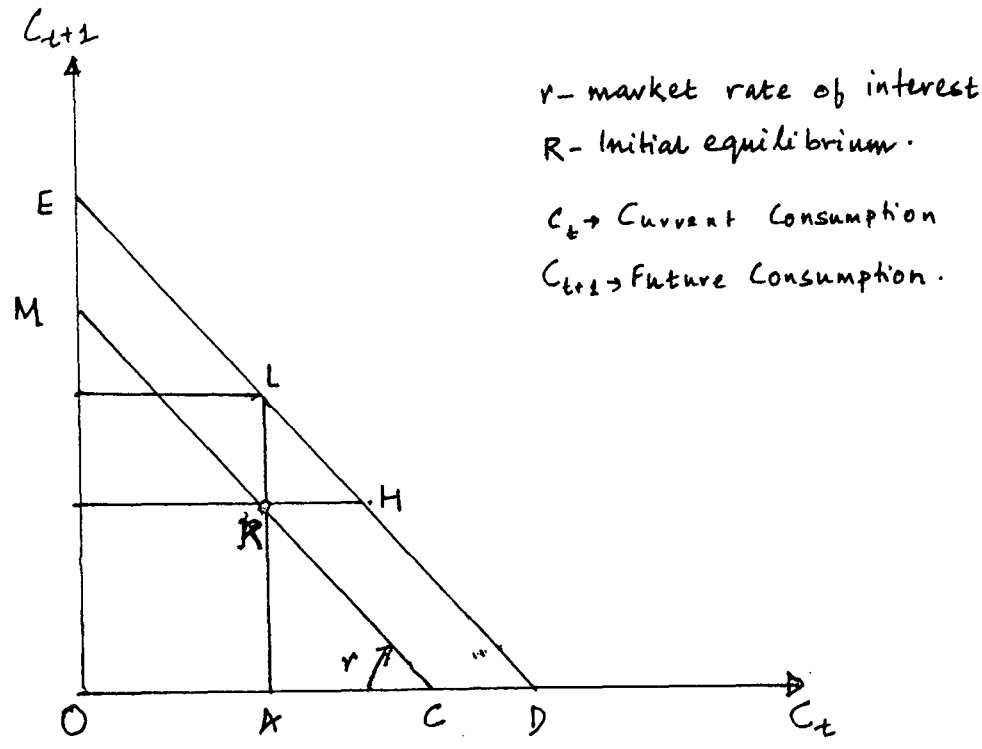

Fig. 1

The horizontal axis measures current consumption and the vertical axis measures future consumption. The rate at which the current consumption is forgone for future consumption is given by the market rate of interest, which determines the slope of the budget constraint. Initially without any inflow of foreign aid the line CM gives the initial inter-temporal budget constraint. The point A gives the current consumption and so AC gives the current saving. Now suppose there is an inflow of aid of amount CD. The two gap analysis assumes that the new equilibrium is at L as the entire quantum of aid increases investment. Here current consumption remains at A and future consumption increases. However if the marginal propensity of consumption is between 0 and 1 then the current consumption will also increase, the new equilibrium can lie anywhere between L and H with higher present consumption. The total saving increases unambiguously but by less than the value of the foreign aid. Thus, in

essence the inflow of foreign capital has displaced domestic capital. This is the Griffin paradox.

The basic argument of the two gap model is that one gap is binding and the inflow of foreign capital should close this gap. In a linear programming context the model solution includes one binding and one slack inequality or a "gap between the gaps". Such a result contradicted the *ex post* equality between the saving-investment and foreign balances. This led to a lot of head scratching among economists to solve this disequilibrium. To this day, for example when the World Bank economists solve the Revised Minimum Standard Model (RMSM) they assume that trade gap is binding. Bacha (1984) was among the first to point out that the two gaps are equivalent to the internal and external balance of open economy macroeconomics with a developing country twist. He described that an adjustment mechanism through forced saving and inflation tax can remove the discrepancy. This adjustment mechanism made the capital output ratio an endogenous macro variable instead of a technically determined parameter.

In the later part of seventies the theoretical literature relating to aid shifted its focus to micro effects. There was a shift in the development paradigm, and the gap model lost its relevance. The gap model got a new lease of life when Bacha (1990) pointed out that fiscal limitations could open a gap between feasible and the desired growth target. It was observed that there are strong complementarities between public sector capital formation and private investment. During the debt and terms of trade shock in the decade of the eighties developing economies severely curtailed public sector investment because public revenue from the export tax declined while foreign debt was nationalized. As a result the growth rate was restricted by fiscal consideration. The fiscal limitation added a new gap in the gap literature and these new models were known as three-gap models. Taylor (1993) Ros (1992) successfully applied the three-gap model in the structural literature.

The main theme of the structural literature is that the existing institutions and the available technology strongly constrain changes in an economy at a given point of time. In particular these constraints rule out a rapid and equitable development path. Moreover, over the past twenty year a neostructaralist school has appeared which mostly deals with short run stabilization problems. This school emphasizes that developing economies respond to the standard neo classical stabilization policies in unexpected ways. For example devaluation may lead to output contraction, inflation has its own inertial dynamics, tight money may lead to a price increase due to higher interest costs. These features are well documented by the three-gap model. We now discuss the three-gap model as developed by Taylor.

Three Gap Model

The three gap model is intended to find the path of maximum investment and thus of the growth rate of capital in a fix price growth model subjected to a number of equality and inequality constrain. The equality constraints are the balance between income and absorption, the balance of payment identity, the government budget constraint and the equality between the flow demand for and the flow supply of money. The inequality constraints are that the actual real output cannot be higher than the real potential output, actual export cannot be higher than export demand.

The Model:

The basic macro economic balance equation is stated in the following way. X, the real output, is the sum of GDP (or real value added) and real intermediate goods imports in the *base year price*. This non-standard definition pertains to the fact that most of the developing countries rely extensively on imported intermediate goods in their production process. Thus,

$X = C + \theta I + G + E - M$

An important aspect of the developing economies is their lack of economic independence so that import substitution process extends to capital goods production. Poor economies,

especially one with limited market, do not acquire the technology to produce the equipment that accounts for half of the total investment demand. So, it has been assumed that 'θ' proportion of investment needs is domestically produced and the proportion '$1-\theta$' is imported from abroad.

Consumption behavior is given by the relationship:

$C = X - aX - S_p - W$

Where 'a' is the import required to produce one unit of real output, i.e. 'a' is the import/output ratio. S_p is private saving. Private individuals direct '$1-\lambda$' portion of there saving for domestic asset formation and the proportion 'λ' flows abroad. Capital flight is usually reflected in the trade account by over invoicing of imports or under invoicing of exports. 'W' represents the sum of the Governments' net tax revenue plus the profit of the public sector less the transfer. Thus 'W' is the net revenue the Government receives from the private sector.

The balance of payment condition shows that the excess of import over export is equal to the net foreign transfer

$M + (1 - \theta)I + aX + (1 - \lambda)S_p - E = T - J$

Where M represents the imports of goods that are not used as intermediate inputs or as capital goods. 'T' represent the capital inflow into the country in a given time period, of which ξ is acquired by the public sector and $1-\xi$ by the private sector. For simpler exposition let us assume that the proportions ξ and $1-\xi$ are constant throughout. Then J which is the total foreign interest payments on the past accumulated foreign debts, is divided among the public and the private sector in the proportion of 'ξ' and '$1-\xi$'. Therefore the net capital inflow or the net transfer of new money from abroad in the country is $T-J^1$.

Substituting the behavioral equation for the consumption of the private sector and the balance of payment condition in the GDP equation we get the investment saving balance.

$I = [W - G - \xi J] + [\lambda S_p - (1 - \xi)J] + T$

Or

$I = [W - G] + [\lambda S_p] + (T - J)$

The terms within the bracket are the flows of savings from public, private and foreign sector, which finances national investment and thus capital formation. These channels for the flow of funds for investment underlie the three gaps of the model, which become impediments to the growth process at various stages.

Let Q be potential output, defined as the highest possible level of output that can be produced with the existing capacities without running into any bottlenecks and g denotes its growth rate.

$g(t) = [Q(t+1) - Q(t)] / Q(t)$

According to the Harrod Domar formulation potential output can grow due to capital accumulation. Let there be a one to one relationship between g and capital accumulation; then

$g = g_o + \dot{K}(t)/K(t)$ -----A Harrod Domar specification

So g is tied to capital accumulation through the basic structural equation

$g = g_o + d\, i$ (1)

Where 'g_o' is the growth rate of the base period's potential output and 'd' is the incremental potential output/capital ratio. All the lower case letters are the values of the variables normalized by the potential output. Let 'u' be defined as the level of capacity utilization, i.e. $u = X/Q < 1$. This implies that because of inefficiencies in a developing economy output always lies below the production frontier. i_g and i_p are defined as the public and private investment normalized by the potential output respectively. By using a linear behavioral relationship for simplicity we can write private investment as

$i_p = i_o + \alpha\, i_g + \beta\, u$ (2)

The term βu is the instantaneous accelerator an output investment linkage that is common in the developing country literature. The sign of 'α' implies whether public investment 'crowds in' or 'crowds out' private investment. A positive α signifies that public investment attracts more private investment. This expresses the idea that latecomers in the development process are characterized by the central role of government investment in the development process. This follows from the fact that private investors in developing economies (which has a nascent capital market) look to the government for basic infrastructure and other facilities having a public good characteristic. A negative α reflects the idea of 'crowding out' of the private investment either from the financial market or from the foreign exchange market. Since total investment is the sum of public and private investment, the investment function becomes

$$i = i_o + (1 + \alpha)i_g + \beta u \qquad (3)$$

Domestic savings constrained growth rate

Our next step is to set out the savings function, which is fundamental for writing the equation for the gap. Real public savings can be written as

$$S_g = (W - G) + \xi (T\text{-}J) \qquad (4i)$$

W is explained above and G is government expenditure so W – G is the national public revenue net of current expenditure denoted by Z and the last right-hand term is the proportion of the net foreign transfer retained by the government. The key assumption is that Z is an increasing function of capacity use, i.e. because taxes and other receipts rise more rapidly than real spending when economic activity goes up.

$$W - G = Z = z_o Q + z_1 X \qquad (4ii)$$

Substituting 4ii in 4i and normalizing by Q we get

$$s_g = z_o + z_1 u + \xi(t - j) \qquad (4)$$

Beside government savings it is interesting to consider the Public Sector Borrowing Requirement (PSBR). PSBR is defined as

PSBR = Government current spending + Public investment – local revenue – net transfer of government from abroad (includes the interest payment for the accumulated past loans).

Let π be the share of PSBR in the total output produced, X, then we have PSBR/Q = (PSBR/X)(X/Q) = πu

So $\pi u = i_g - (z_o + z_1 u) - \xi(t - j)$ (5)

Relative to capacity private savings can be expressed in the linear form as

$s_p = \sigma_o + \sigma_1 u - \sigma_2 (1-\xi)(t - j)$ (6)

σ_1 is the marginal savings rate. A positive value of σ_2 means that net capital inflow in the account of the private sector substitutes domestic savings. To describe the saving gap we hypothesize that in absence of inflation λ proportion of private savings is directed to augment domestic bank deposits and $(1-\lambda)$ flows out.

So the domestically constrained investment is

$i = s_g + \lambda s_p + \sigma P$

The σP term in the above expression embodies the structuralist interpretation of forced saving resulting from the inflation tax. In the absence of any liquid assets in the hand of the agents, a higher inflation rate requires larger money stock for transaction and that can be built up only by saving more. Aggregate demand is reduced as the aggregate savings function shifts upward. This tax like affect of inflation is termed the inflation tax. A fall in private consumption can result because of other reasons also. For example if the inflation is initiated by increasing the money supply then private consumption is forced below the desired level by preemption of the output by government and domestic investors. Moreover, we assume that higher private savings resulting from the inflation tax won't result in capital flight. Substituting s_g from equation 4 and s_p from equation 6 we get

$$i = z_o + z_1 u + \xi(t-j) + \sigma_o + \sigma_1 u - \sigma_2(1-\xi)(t-j) + \sigma P \quad (7i)$$

and substituting the above expression for 'i' in equation 1 we get the saving constrained growth rate g_s Where

$$g_s = g_o + d\,[z_o + \lambda\sigma_o + \{\xi - \lambda\sigma_2(1-\xi)\}(t-j)] + d(z_1 + \lambda\sigma_1)u + d\sigma P \quad (7)$$

Foreign Exchange constrained growth rate.

The balance of payment condition shows that the excess of imports over exports is equal to the net foreign transfer, which is equal to foreign savings

$S_f = M + (1-\theta)I + aX + (1-\lambda)S_p - E = T - J$ where $aX = a_oQ + a_1X$ and the export function is given by $E = \varepsilon_oQ + \varepsilon_1X$

Normalizing throughout by Q and equating with i one gets the foreign exchange constrained investment level and substituting that investment level in equation 1 we can get the foreign exchange constrained growth rate g_f

$$g_f = g_o - d[(a_1 + \varepsilon_1 + (1-\lambda)\sigma_1)/(1-\theta)]\,u + (d/1-\theta)[\{1+(1-\lambda)(1-\xi)\}(t-j) - a_o + \varepsilon_o - (1-\lambda)\sigma_o] \quad (8)$$

It can be seen that the above expression shows a negative relationship between g_f and u. This is because the developing economies requires imported capital goods for investment and also imported intermediate goods for current production. As a consequence increasing the capacity utilization uses up scarce foreign exchange reserve and crowds out capital formation and thus reduces growth of potential output.

Fiscal constrained growth rate.

Rewriting equation 5 gives the fiscal constrained investment level as

$$i_g - (\pi + z_1)u = z_o + \xi(t-j)$$

Here the PSBR target π is set in terms of output. Greater capacity utilization permits an increase in government capital formation and growth. Higher net foreign transfer caters for greater public investment.

So the investment function is given by

$i = i_o + (1+\alpha)[(\pi+z_1)u + z_o + \xi(t-j)] + \beta u$

The growth in terms of the fiscal gap becomes

$$g_g = g_o + di_o + d\,[(1+\alpha)(\pi + z_1) + \beta]u + c[z_o - (1-\xi)(t-j)] \qquad (9)$$

It can be noted here that the parameters, α and β, of the investment function appear only in the growth rate of the above equation.

Diagrammatically

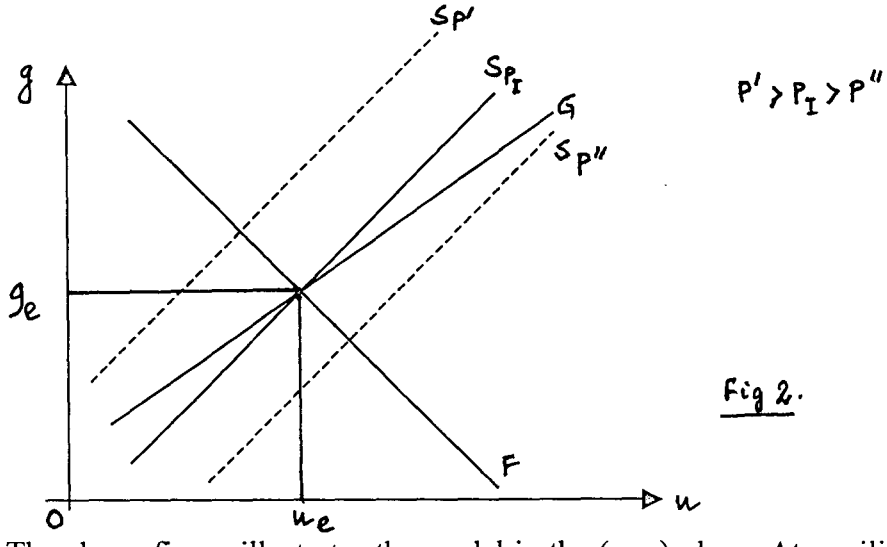

Fig 2.

The above figure illustrates the model in the (u, g) plane. At equilibrium all the three-growth constrained curves must cross at a single point, which gives us a unique growth rate, g_e.

Investment can be assumed to respond less strongly than saving to the changes of the capacity utilization which is the standard stability condition.

So, $(z_1 + \lambda\sigma_1)|_s > (1+\alpha)(1+\pi)+\beta|_i$

The adjustment towards the equilibrium is made by the recursive structure of the equations. Suppose that the growth rate g adjusts according to the fiscal sector of the economy whose behavior is captured by the fiscal gap given by the line G, i.e. equation (9). Capacity utilization 'u' varies according to the availability of the intermediate inputs, which is imported from abroad. So 'u' varies according to according to the availability of the foreign exchange. The foreign exchange gap line F given by the equation (8) captures this behavior. To attain overall macro balance saving, given by the equation (7), comes into line with fiscal and

investment demand through a variation in the inflation rate. The inflation tax is the vehicle through which adjustment is made. If P is allowed to vary parametrically then we get a family of 'S' curves depending upon various inflation rates. Since a higher inflation increases the saving because of inflation tax the curve shifts further to the North-West corresponds to a higher rate of inflation. In the figure above the inflation rate corresponding to P_1 brings domestic saving rate in line with fiscal and investment demand. Therefore, in order to understand the underlying dynamics of the adjustment process one has to know how the inflation rate is getting determined.

There are two theories of inflation. One is the theory of the monetarists, which postulates that inflation follows from the demand and supply of money where the growth rate of capacity and the money supply is determined elsewhere in the system. The other theory is the structuralist view where the inflation rate adjusts according to the cost. The two different aspects of the inflation theory can be viewed in a simple fashion. Let us consider that production of output X requires two variable inputs, viz. labor and intermediate goods. Where a and b are the constant input output coefficient of labor and capital goods respectively. Thereby the average variable cost C is given by the equation

$C = wa+eP^*b$ (P^* is the foreign price level)

where w is the wage rate and e exchange rate. It is presumed that production takes place under industrial or in oligopolistic condition. So the price is set according to a constant mark-up over the cost. So

$P = (1+\pi)C$

The rate of inflation is given by the equation

$p = \pi/(1-\pi) + (1-\phi)w + \phi\, e$ (the alphabets in the italics are the rate of change) where $\phi = eP^*a/B$, i.e. the share of imported intermediate goods in the prime cost. According to the monetarists '*p*' changes due to the variation in the output growth or due to the changes in

money supply and w, e and π adjusts accordingly. The contrasting structuralist view is that class conflict and propagation mechanism makes 'p' the adjusting variable to the changes in w and e.

The three-growth restrictions and the two inflation theories interact in a number of different schemes of macro economic causality to produce different results. The result and the policy response depend upon the model closure that we assume. Here I will discuss two types of model closure.

a. The output is demand determined where inflation is realized according to the structural view and there is joint solution of the equation S, F and G. 'g','u' and 't' are determined endogenously.
b. The output is determined by the availability of foreign exchange with inflationary adjustment to the excess demand according to the monetarist view. There is joint solution for G and F with pre determined 't' and S adjusts accordingly.

Devaluation

Let us consider a foreign exchange constrained economy under the model closure 'b'. Government undertakes a devaluation. If the devaluation results in an increase of exports immediately then the F curve shifts out to F^1. A new equilibrium is reached at B at a higher u and g where the F^1 curve intersects the G curve. As a result aggregate supply increases reducing the excess demand. Therefore the inflation rate declines and the savings follows suit. The S curve shifts outward to S^1 at the new equilibrium at level B resulting in a deflationary and expansionary sort of adjustment to devaluation.

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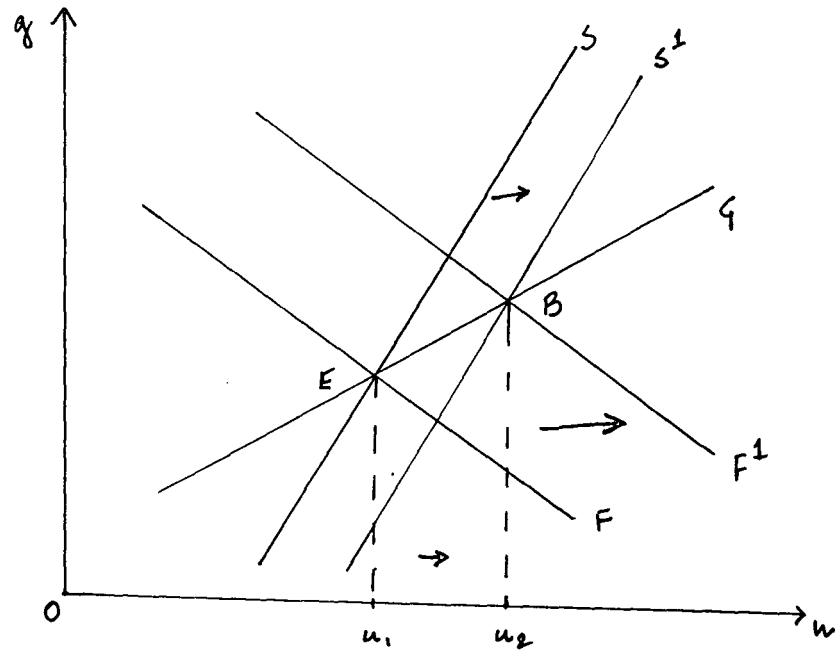
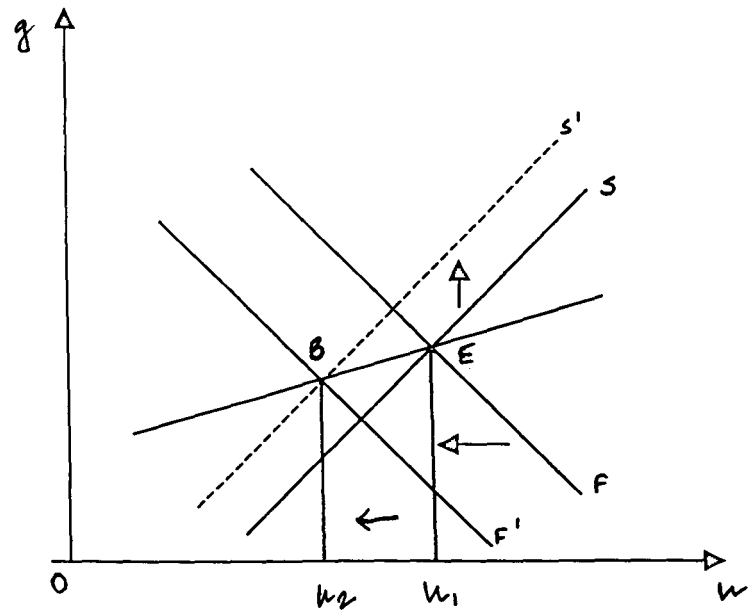


E - Initial Equilibrium Position
B - Final Equilibrium Position.

Fig 3

Let us consider a second case under the model closure 'a'. Under this case devaluation does not directly affect demand. So, devaluation leads to a higher cost of imported intermediate goods. This results in a price increase from the supply side. The resulting inflation leads to higher saving via inflation tax by cutting down real spending leading to an excess of potential saving over investment. Output falls in the first step. If exports fail to react then the trade deficit increases resulting in the downward shift of the F curve to ratify the new equilibrium position at B



E - initial Equilibrium Position
B - Final Equilibrium Position

Fig. 4

Heterodox shock

Let us consider the case of heterodox shock. Heterodox shock is a stabilization process that is intended to reduce cost based inflation. It involves a price freeze and a deindexation of contracts. As an immediate effect inflation falls resulting in a fall in savings. So the S curve shifts outward to S^1 and a new demand determined equilibrium (u,g) is determined at a higher level at A^1. The new demand determined equilibrium at A is infeasible since supply will be limited by foreign exchange. So to attain A one requires an increased export volume or higher capital inflows. But foreign exchange generation by higher export may not be in the cards. Domestic producers are not likely to expend effort to expand foreign sales when domestic demand is booming. At the same time capital flight will become more tempting as savings increase. This results in downward shift of the F curve worsening the equilibrium position. At the same time, the black market exchange rate is likely to go up, increasing cost pressure and perhaps triggering a devaluation and faster inflation.

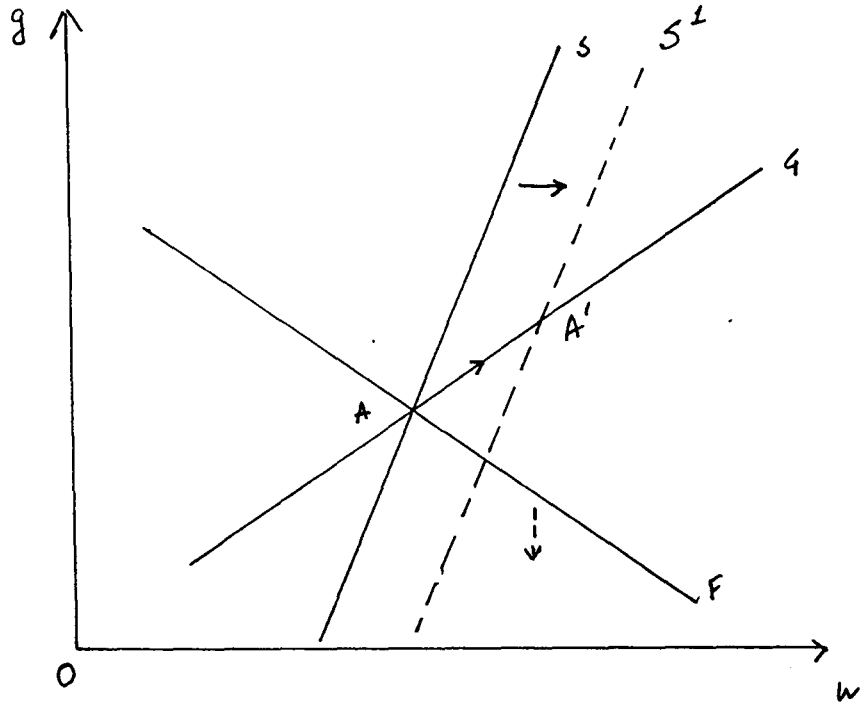


Fig. 5

Thus the moral of the above story is that the standard stabilization policies do not hold for all types of economies. The stabilization policies of an economy should be based upon the institutional constraints faced by an economy. These policies are well captured by the three-gap models.

In the following chapters we are going to test the three-gap for twenty-six developing economies from Economic and Social Survey of Asia and Pacific (ESCAP) and Africa. In the first section of chapter two we are going a brief over view of the economies on which we are going to test the three-gap model. In the second section of the chapter we will try to find out whether there is any structural difference among the countries considered for the ESCAP region and for the Africa. In the third chapter we will discuss the test of three-gap model by using Weisskopf's test. In the fourth chapter we are going to test the three-gap by using an alternative model. The fifth chapter, which happens to be the last chapter of the dissertation, will be the conclusion and scope for further research.

CHAPTER – II

Chapter 2.

Macroeconomic Performance of the Developing Countries of ESCAP Region and Africa

This chapter gives a macroeconomic overview of some developing countries of ESCAP region and Africa for the decades of the seventies, eighties and the first half of the nineties and explains the external and internal factors that contributed to macro performance. An overall assessment is initially presented, followed by a continent wise study. In the second part of the chapter we study whether there is any substantial difference between the developing countries of ESCAP region and Africa.

Section I

ESCAP Economies

The economic performance of the ESCAP countries was quite different for the South Asian countries and the East and South East Asian countries. The South Asian economies were predominantly agricultural and thereby dependent on the vagaries of the nature, while the East and South East Asian countries were market oriented and had successfully harnessed their internal resources to boost their external sector and thus their growth rate. The consequence is quite discernible form the growth rate table (Table 1.1). The average growth rate of the South Asian countries is around 5%, whereas the South and South east Asian countries were able to maintain an average growth rate of well above 5%.

South Asian Economies

It is discernible from the table below that among the South Asian countries, the countries of the Indian sub continent had a quite diverse growth experience. Pakistan had

an accelerating growth rate till the first half of the decade of the eighties. Thereafter the growth rate declined. In Sri Lanka the growth rate accelerated till the second half of the decade of seventies, after which it declined and later on it increased again in the period 1991-95. To the contrary India had a declining growth rate in the decade of the seventies, after which it increased during the decade of the eighties. Myanmar had a modest growth rate hovering around 5% point and the growth rate of Nepal was low but it was accelerating throughout the period under consideration.

The important thing to envisage is that even though the contribution of the agricultural sector declined for both Pakistan and India in the decade of the seventies, the increasing contribution from the service sector for Pakistan helped to keep the growth rate buoyant. In case of Sri Lanka there was no major decline in the value addition from the agricultural sector and the contribution from the industrial sector was buoyant which helped to keep its growth rate higher than India's. The increase in the growth rate of India after the decade of the seventies was due to the steady increase in the value addition of the industrial and the service sectors. In case of Pakistan there was no major structural shift after the decade of the seventies and in Sri Lanka the value addition from the industrial sector declined, which again caught up during the initial years of the nineties. Moving in tandem with the growth rate was the investment variable. It can be seen from the table in the appendix (Table 1.1A) that investment as a proportion of GDP remained less than 20% for India for the years corresponding to the period of low growth rate in the decade of the seventies. In the decade of the eighties and thereafter, investment as a proportion of GDP was more than 20% and it was increasing. In case of Pakistan investment as a proportion of GDP was less than 20% throughout the period under

consideration. Moreover, it declined in the first half of the decade of the eighties. Thereafter the moderate increase in investment as a proportion of GDP in the second half of the decade was not enough to increase the growth rate. Compared to the other countries in the Indian subcontinent Sri Lanka had a higher investment ratio. Moreover, the ratio had been increasing till the second half of the decade of the eighties but declined thereafter. If one gives a cursory look at the external sector table (Table 1.3A) then one can notice that vis-à-vis Pakistan and Sri Lanka, India has been less open to the external sector. Export of goods and services as a proportion of GDP have been less than 10% throughout the time period, whereas for Sri Lanka it contributed more than 20% of the GDP and was increasing. In Pakistan's case the contribution from the export sector was more than 10%.

The accelerating growth rate of Nepal was possible due to the increasing contribution of the industrial and the service sectors throughout the time period. Moreover, investment as a proportion of GDP had shown an increasing trend throughout the time period under consideration. In the case of Myanmar the value addition from the industrial sector had been declining throughout, but the increasing contribution from the agricultural sector helped to keep its growth rate buoyant. Investment as a proportion of GDP had been increasing till the first half of the eighties, thereafter declining in the second half of the eighties and again catching up in the nineties. The export sector, which was mostly dominated by agricultural products, contributed too little to the overall GDP.

East and South East Asian Countries

Compared to the South Asian countries, the East Asian countries witnessed higher growth rates. Barring Philippines all these economies had a growth rate of more than 5%.

The leader among them was the Korean economy, which had an average growth rate of more than 6%. For Korea the growth rate declined till the second half of the seventies, thereafter gaining momentum. Similar is the case with Malaysia, except that here the growth fell till the first half of the eighties, after which it increased. In case of Singapore, even though the growth rate was high, it declined till the eighties but in the first half of the nineties it shot up to more than 8%. In case of Philippines and Thailand the movement of the growth rate was not uniform. Barring Philippines and Singapore, in all other countries the value addition by the industrial and the service sectors had been increasing throughout the period. In case of Singapore the service sector experienced a phenomenal growth. The driving force in these economies has been the investment and export sectors. The increase in investment during the decades of the seventies and the eighties in these economies was the result of the increase in construction demand, which came from both internal and overseas sources (mostly from the Middle East countries). The boost in the export sector had been due to the deliberate policy of diversifying their manufacturing sector towards electronic goods, toys, footwear and clothing apparel. Another factor was the opening up of the Japanese economy to them. As a result, the export sector experienced a phenomenal growth. For example in case of Malaysia exports as a percentage of GDP was around 42.17% in 1965-70, and increased to around 82.5% in 1991-95. For Thailand it was 18.54% in 1966-70, and increased to around 38.84% by the first half of the nineties. In the Korean case export as a percentage of GDP increased till the decade of eighties but declined in the first half of the nineties.

Oil Exporting Countries

The oil exporting countries of Asia, namely Iran and Indonesia, had very high growth rates during the period 1966-75. This resulted mainly from the export of oil from which they appropriated large revenues. The increase in the growth rate in the first half of the decade of the seventies was due to the increase of the crude petroleum prices by the Organization of Petroleum Exporting Countries (OPEC) in 1973 by four times its previous level. This helped to swing the terms of trade in favour of the petroleum exporting countries. The oil exporting countries of Asia, namely Iran and Indonesia, had a different sort of experience in the second half of the seventies. Both these economies suffered a decline in their volume of exports in the initial years, which dampened their rate of expansion. Indonesia could revive itself due to the expansion of exports of other commodities such as rubber and timber and due to the rising investment. In case of Iran the situation became much more difficult due to the revolutionary changes, civil disturbances and war with Iraq, all of which worsened Iran's economic condition. This resulted in the decrease of crude oil extraction by Iran and the oil supply declined resulting in a sharp increase in the oil prices for the second time in a row. The second oil shock was not beneficial for Iran and this resulted in the decline in its growth rate. On the contrary, Indonesia benefited from the increase in the oil prices and it was able to maintain its growth rate of around 5%. Thereafter the oil prices reduced and Indonesia's growth rate decreased, whereas Iran recovered from its internal problems. In the meantime, unlike Iran, Indonesia diversified its export basket to include manufactures and this enabled it to keep its exports buoyant. This resulted in the steady decline of

exports as a proportion of GDP of Iran in the preceding period, whereas the share of exports in the GDP for Indonesia remained constant at around 23%.

Fiji is a small Pacific island open economy whose export basket chiefly consists of agricultural commodities. As a result, its growth rate declined after 1976-80 with the international terms of trade moving against the agricultural products. Even though its share of exports in GDP was more than 45% throughout, the revenue from exports fell due to the downward movement of the agricultural terms of trade. Moreover, the fall in the share of investment in GDP after the first half of the eighties also resulted in the decline in its growth rate.

Table 1.1

	1966-70	1971-75	1976-80	1981-85	1986-90	1991-95
South Asia countries						
India	6.11	5.32*	3.21*	5.09	6.78	6.32
Myanmar	5.92*	5.21	5.04	5.69*	5.84	5.09#
Nepal	1.95*	2.24*	2.76*	3.91*	4.59	4.14
Pakistan	2.21*	4.55	6.12	9.40*	5.77	4.23
Sri Lanka	2.62	3.13	6.19	4.89	2.96	5.56
Pacific Island country						
Fiji	7.27*	5.08*	3.87	1.33*	4.12*	4.94
Oil exporting countries						
Indonesia	8.01	6.90	5.60	4.77*	6.56	7.14*
Iran	10.81	9.28	-3.67*	6.64	-1.62*	2.63
East and South-East Asia countries						
Korea	10.18	9.01	6.47	8.82	9.04	6.75
Malaysia	4.72*	7.68	7.56	4.99	8.09	8.35
Philippines	4.94	5.76	5.20	-1.17*	5.20	2.89
Singapore	12.50	8.40	8.46	6.22	6.76	8.09
Thailand	-	5.83	7.34	5.24	11.11	8.23

Note: The growth rates were calculated by fitting a semi-log trend on a five yearly basis. In the cases where the coefficient was not insignificant, the semi-log growth rate was substituted by the five yearly average of the annual growth rates. These figures are marked by "*"

African countries

The African countries do not show any consistent pattern in their growth rates (Ref. Table 1.2). In most of the African economies growth has been erratic; beside in Botswana and Morocco the growth rate has fallen persistently. Related to the movement of the growth rate is the movement of the investment to GDP ratio that has started to decline after the initial increase. In case of Botswana, investment (Ref Table 1.2A) started to dip from the second half of the eighties and in case of Morocco the fall was from the initial years of the eighties. The share of exports (Ref Table 1.4A) to GDP also started declining from the decade of the eighties. Countries like Burundi, Kenya, Nigeria, Sierra Leone and Swaziland, which started with a high rate of growth in the sixties, could not maintain that level and by the following decade their growth rates started fluctuating at a very low level. The investment to GDP ratio increased till the second half of the seventies and plummeted thereafter. Among these countries Kenya and Swaziland had high export to GDP ratios, which also showed no consistent movement. Ghana had a very high growth rate in the decade of the seventies. During this decade the investment to GDP ratio was low. Even though investment increased during the eighties, the growth rate failed to respond. The other African countries like Ethiopia, Tanzania, Tunisia and Zimbabwe had very low growth rates. In these economies the share of investment in GDP is high but that failed to have any significant effect on the growth rate.

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Table 1.2

Growth rates of the African countries

	1966-70	1971-75	1976-80	1981-85	1986-90	1991-95
Botswana	8.9	18.09	11.6	10.54	7.00*	3.00
Burundi	6.02	0.72	4.15	4.59	3.63	-4.23
Ethiopia	4.27	2.17	2.4	0.80*	3.91*	0.39*
Ghana	-4.30	20.00	8.01	1.14	4.73	4.21
Kenya	14.03	3.06*	6.92*	2.74	4.72	2.0
Morocco	7.6	5.34	4.2	4.17	3.95	1.03*
Nigeria	6.42*	5.48*	4.44*	-2.51*	5.31	2.29*
Sierra Leone	-	11.6	15.9	-8.97*	1.90*	5.75*
Swaziland	8.88*	14.71	0.75*	3.12	8.95	2.84
Tanzania	3.92	4.21	1.98	0.86*	3.35*	-
Tunisia	3.38	7.76	6.6	4.05	3.45	3.56
Zambia	0.20*	6.31	12.52	-2.28*	3.93	-0.36*
Zimbabwe	-1.11*	4.25*	1.95	5.1	5.33	1.35*

Note: The growth rates were calculated by fitting a semi-log trend on a five yearly basis. In the cases where the coefficient was not insignificant, the semi-log growth rate was substituted by the five yearly average of the annual growth rates. These figures are marked by "*"

Structural Change

Structural change is clearly an essential element in the process of development. The most accessible measure of structural change is to compare the shares of different sectors over a sufficiently long time period. Historical evidence of the developed economies suggests that there has been a long-term shift in the pattern of output and employment that has involved a decrease in the relative importance of agriculture and an expansion of the share of the industrial and service sectors. Structural evolution of the present developing economies need not necessarily follow the same path. This is mainly because of the existence of an international market economy in which a great number of today's developing economies are enmeshed to varying degrees. The dominance of the developed world in technology, production and international trade implies that a limited

range of choice is available to developing countries. The technology which evolved in the developed economies deserves special emphasis for it reflects a set of conditions pertinent to those economies, which obviously differ from the market conditions and resource endowments of the present developing economies.

ESCAP Countries.

The table below (Table 1.3 for the actual figure Ref. Table 1.5A in the appendix) shows the changes in the share of value added of agriculture, industry and service in the Asian countries over a time span of twenty years. The signs are described below the tables. Among the South Asian economies, apart from Myanmar and Sri Lanka all the countries had experienced a substantial fall in the share of value added in agriculture. On the contrary, none but Nepal experienced a substantial increase in the share of value addition by industry. The fall in the share of the agricultural sector was not altogether compensated by the rise in the share of the industrial sector, which had been an important phenomenon of the structural transformation of the developed economies. Among the East and South-East Asian countries, beside Philippines and Singapore, the decline in the share of value addition of agriculture in GDP was simultaneously matched by the substantial increase in the value addition of the industrial sector. In case of Singapore the situation is different. Singapore being an entrepot economy, there was not much scope for structural transformation. In the group of oil exporting economies, Indonesia showed substantial structural transformation with a considerable fall in the share of value addition of the agricultural sector matched by a substantial increase in the share of value addition of the industrial sector. Iran had a different experience of the transformation, with a fall in the share of the industrial sector in GDP and an increase in the share of the agricultural

sector. Fiji did not show much signs of structural transformation in these twenty years. The share of value addition of the agricultural sector in GDP has fallen marginally whereas the share of the industrial sector has increased marginally. The service sector has shown a moderate increase owing to the growth of the tourism industry.

Table 1.3

Countries	Agriculture	Industry	Service
South Asia countries			
India	F-S	I-Mo	I-Mo
Myanmar	I-S	F-Ma	F-S
Nepal	F-S	I-S	I-S
Pakistan	F-S	I-Ma	I-Ma
Sri Lanka	F-Ma	I-Ma	I-Ma
Pacific Island country			
Fiji	F-Ma	F-Ma	I-Mo
Oil exporting countries			
Indonesia	F-S	I-S	I-Ma
Iran, Islamic Rep.	I-S	F-S	I-Mo
East and South-East Asia			
Korea	F-S	I-S	I-Mo
Malaysia	F-S	I-S	F-S
Philippines	I-Mo	I-Ma	I-Ma
Singapore	F-Ma	I-Ma	I-Ma
Thailand	F-S	I-S	I-Ma

Note:
I-S (or F-S)- Increase Substantially (or Fall Substantially)- When the increase (or fall) is more than 10% between the periods 1971-75 and 1991-95
I-Mo (or F-Mo)- Increase Moderately (or Fall Moderately)- When the increase (or fall) is between 5-10 % between the periods 1971-75 and 1991-95
I-Ma (or F-Ma)- Increase Marginally (or Fall Marginally)- When the increase (or fall) is less than 5 % between the periods 1971-75 and 1991-95
For actual figures Ref to the Table 1.5A in the Appendix

African Economies

Apart from Botswana, Burundi, Ghana and Sierra Leone, none of the other African countries showed substantial structural transformation (Ref Table 1.4 for actual figure Ref. Table 1.6A in the appendix). In case of Botswana the fall in the share of the

value addition of agriculture was compensated by the increase of the share of the industrial sector value addition. In case of Burundi there was a moderate increase in the share of the value addition of the industry and the service sectors. Ghana is the diametrically opposite case of Botswana, with the fall in the value addition of the agricultural sector being compensated by the rise in the value addition of the service sector. In Ethiopia and Zambia value addition of agriculture has increased. Nigeria, on the other hand, witnessed a substantial increase in the value addition of the industrial sector but in this case the value addition of the service sector has decreased substantially rather than the value addition of the agricultural sector. Thus, from the table below we can conclude that there hasn't been much structural transformation in the African countries.

Table 1.4

Countries	Agriculture	Industry	Service
Botswana	F-S	I-S	I-Mo
Burundi	F-S	I-Mo	I-Mo
Ethiopia#	I-Ma	F-Ma	F-Ma
Ghana	F-S	No change	I-S
Kenya	F-Ma	F-Ma	I-Mo
Morocco	F-Ma	I-Ma	I-Ma
Nigeria	F-Mo	I-S	F-S
Sierra Leone	I-Mo	I-Ma	F-Mo
Swaziland	F-S	I-S	I-Mo
Tunisia	F-Mo	I-Mo	No change
Zambia	I-Mo	F-Mo	I-Ma
Zimbabwe	F-Ma	I-Ma	I-Ma

Note:
I-S (or F-S)- Increase Substantially (or Fall Substantially)- When the increase (or fall) is more than 10% between the periods 1971-75 and 1991-95
I-Mo (or F-Mo)- Increase Moderately (or Fall Moderately)- When the increase (or fall) is between 5-10 % between the periods 1971-75 and 1991-95
I-Ma (or F-Ma)- Increase Marginally (or Fall Marginally)- When the increase (or fall) is less than 5 % between the periods 1971-75 and 1991-95
For actual figures Ref to the Table 1.6A in the Appendix

Public sector:

In the last paragraphs of this section we studied the growth pattern and the structural transformation of the developing economies of the ESCAP and African countries. During the decade of the seventies the developing economies encountered a number of destabilizing shocks as a result of global inflation, energy shortage and recession. Accompanying these disruptions was the perception that growth was not instrumental in achieving the development objective. Thereafter, the governments of these economies started taking an active role in the management of their economies. In most cases the trend was reflected in the rising share of the public sector in the GDP and the rising portion of per capita income that was being transferred to the public sector to pay the expanding array of public sector expenditure. The fiscal dimension of the development process centered on the revenue expenditure activities of the government, which is traditionally referred to as fiscal policy. In the developed economies fiscal policies are mostly applied for stabilization purpose. In the developing economies these policies have evolved along different lines. Firstly, the development imperative for these economies requires the application of revenue and expenditure policies keeping in view the long-term objectives. In this context, stabilization is only one of the objectives pursued by the fiscal policy maker. Secondly, the institutional constraint, inadequate internal integration and external vulnerability of these economies warrant a great deal of selectivity in the application of fiscal measures. So the application of fiscal policy measures in these economies departed significantly from the conventional perspective that was assumed for the developed economies.

The economic role played by the public sector in mobilizing and utilizing resources may be broadly considered to have two unrelated dimensions. The first concerns the mobilization of resources to finance the public sector's current and capital expenditure. The second pertains to the impact of public sector resource mobilization and utilization process on investment, saving, income and wealth distribution and other key economic variables. In our study we will mostly concentrate on the first aspect of fiscal policy. The primary purpose of resource mobilization by government is obviously to finance public sector expenditure. Thus the changes in resource mobilization pattern over time and among countries will closely follow the path of changes in the expenditure pattern.

Public sector of the ESCAP countries

None of the developing ESCAP countries surveyed experienced any pattern of increase in expenditure as a share of GDP throughout the period covered (Ref table 1.7A, 1.8A, and 1.9A). Among the South Asian countries, apart from Pakistan and Sri Lanka, none had a share of expenditure to GDP of more than 20%. Virtually all these economies registered a movement around a discernible trend. In case of Pakistan and Sri Lanka the share was around 23% and 28% respectively. Among the South East and East Asian countries, Malaysia and Singapore had a more than 25% share of expenditure as a proportion of GDP, while it was less than 20% for the other countries surveyed. Among the oil exporting countries the share of public expenditure to GDP was more than 30% in the seventies, which tapered off thereafter and fell to around 22% in 1991-95. Fiji also had a high share of public expenditure in the GDP of more than 20% during the period under study. Break up of expenditure into current and capital expenditure is not available

for Nepal. From the data available for the other countries no definite conclusion can be drawn about their movement. It is quite evident from the above data that in most of the economies current expenditure constituted a high proportion of the total expenditure. One thing that is discernible from the expenditure data is that the oil exporting countries have had persistently higher capital expenditure.

National performance regarding the mobilization of resources can be assessed by relating resource mobilization to national income and comparing these ratios over time and among countries. Any analysis based on such estimates is limited by the fact that it does not account for various qualitative roles that may be assigned to the government. In examining the resource mobilization performance in terms of resource mobilization to national income ratios, we have restricted ourselves to the ratios of total receipt to GDP and those of its major components to GDP. Nearly all the ESCAP countries covered showed an increase in the ratio of the total revenue to GDP within the time period under consideration (Ref to the Tables 1.13A, 1.14A and 1.15A). Only Myanmar and Iran are the exceptions, where the share of the total revenue to GDP declined between the periods 1971-75 and 1991-95. Apart from Myanmar and Sri Lanka, all other South Asian countries showed a marginal increase of the ratio of tax revenue to GDP during the period. In case of the East and South East Asian countries the governments were successful in resource mobilization. Barring Singapore all other countries showed an increase in the collection of taxes as a percentage of GDP. In the case of Korea, Philippines and Thailand the increase was more than 3%. All the South Asian countries showed an increase in the share of non-tax revenue in the GDP. It is quite astonishing that in case of Myanmar the share of total revenue and tax revenue has decreased in the

time period under consideration. Among the South Asian countries Pakistan shows the largest increase in non-tax revenue. Among the East and South East Asian countries, Singapore has the highest proportion of non-tax revenue to GDP, which has increased over time. In case of Philippines the share of non-tax revenue to GDP has fallen. Among the oil exporting countries Iran has the highest non-tax revenue.

Public sector of the African countries

In case of the African countries (Ref to the Tables 1.10A, 1.11A and 1.12A) current expenditure accounts for a higher proportion of total government expenditure. The share of total expenditure in GDP in the case of Ethiopia, Kenya, Morocco, Swaziland and Tunisia has increased till the first half of the eighties, after which it has fallen. This is the case with the current expenditure also. Botswana and Zimbabwe have, on an average, a high expenditure to GDP ratio but they do not show any trend. The (Ref to the Tables 1.16A, 1.17A and 1.18A) revenue stream follows the same trend. In the case of Botswana, Ethiopia, Kenya and Tunisia the total government revenue as a percentage of GDP increased till the first half of the eighties, after which it fell. Tax revenue accounted for a higher proportion of the total expenditure in these countries. It also follows the same trend. In case of Sierra Leone and Zambia the ratio of government revenue to GDP has been falling throughout. Ghana and Morocco has a constant expenditure to GDP ratio of 13% and 25% respectively throughout the period under consideration.

Revenue Productivity

The revenue performance of the fiscal system in developing nations can be compared with the growth of these countries' current and capital expenditures. Such

evaluation is based on the estimate of revenue productivity. As tax revenue constitutes by far the most important source of receipts in most countries, the present discussion confines itself to revenue productivity with respect to tax revenue only. In our study we have measured the productivity of tax revenue by the buoyancy method. Buoyancy is defined as the percentage change in the tax revenue related to percentage change in income. Tax revenue may change due to an autonomous change in income or due to discretionary changes in the tax rate or due to some other factor beside income changes which affect tax revenue. The tax buoyancy measure does not distinguish between the autonomous and discretionary changes. On the expenditure side the buoyancy is measured for total, capital and current government expenditure. A *buoyancy gap* is defined as the difference between expenditure buoyancy and revenue buoyancy. A *positive buoyancy gap* implies that in the economy the tax system is insufficient to keep up with the expenditure requirements. Government expenditure in the study has been disaggregated into current and capital expenditure. This would enable us to test the widespread perception that the current expenditure in much of the developing countries has grown rapidly and needs to be constrained if development targets are to be achieved.

The entire period of 1971-1997 is divided into sub-periods on a decadal basis. It is quite perceptible from the buoyancy table (Table 1.5) that in South Asia the buoyancy of the tax revenue and expenditure has been falling in the eighties and the nineties. The exceptions were Sri Lanka and Myanmar, where the buoyancy has increased in the eighties and fallen thereafter. In all the cases the buoyancy gap of the total expenditure has been either zero or negative in the nineties. This implies that the government has reduced its share in each unit increment of income and moreover, it has been able to

tailor its expenditure according to its revenue stream. The movement in the buoyancy gap of the current expenditure is similar to that of the total expenditure. Therefore the hypothesis that the current expenditure of the governments of the developing economies of the South Asia is unprecedentedly high does not hold. Though it is true that the government of these economies were able to keep their expenditure within limits, in order to have a complete picture one should differentiate between the buoyancy of development expenditure and non-development expenditure.

Among the South East and East Asian countries, the tax buoyancy is more than unity in most of the cases, implying that a growing proportion of incremental income has been transferred to the government in form of tax revenue as income has risen. The expenditure of the government is well within the limit that is reflected by the negative buoyancy gap of the total expenditure in most of the cases. Beside Singapore for the entire time period and Malaysia and Philippines in the decade of the eighties, the movement of the buoyancy gap of the current expenditure is similar to that of the total expenditure. The buoyancy of the tax revenue for Fiji is higher than unity and the buoyancy gap of total expenditure and current expenditure is positive in the decade of the seventies and the nineties.

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Table 1.5: Buoyancy Table of Asia

	Year	Tax	Expenditure	Current	Capital
India	1974-80	1.13	1.43	1.51	1.11
	1981-90	1.11	1.10	1.29	1.17
	1991-96	0.82	0.82	0.83	0.73
Myanmar	1973-80	1.13	0.82	0.71	1.48
	1981-90	0.55	1.1	1.09	1.08
	1991-97	0.85	0.83	0.59	1.34
Nepal	1973-80	1.33	1.45	-	-
	1981-90	0.98	1.05	-	-
	1991-98	1.33	0.97	-	-
Pakistan	1973-80	1.14	1.09	1.06	1.05
	1981-90	1.03	1.16	1.29	1.07
	1991-98	1.03	0.86	0.98	0.53
Sri Lanka	1971-80	1.07	1.27	1.09	1.67
	1981-90	1.14	0.97	1.21	0.43
	1991-98	0.88	0.81	1.01	0.73
Indonesia	1972-80	1.23	1.1	1.07	1.39
	1981-90	0.8	0.78	0.89	0.81
	1991-98	0.99	1.04	1.26	0.59
Iran	1971-80	0.92	1.13	1.17	1.07
	1981-90	0.84	0.56	0.6	0.35N3
	1991-98	1.12	1.16	1.11	1.27
Fiji	1972-80	1.06	1.13	1.15	1.1
	1981-90	1.13	0.95	0.97	0.45N1
	1991-96	1.00	1.39	1.18	0.75N2
Korea	1971-80	1.12	1.09	1.07	0.84
	1981-90	0.99	0.83	0.9	0.9
	1991-97	1.33	1.31	1.02	1.96
Malaysia	1972-80	1.25	1.05	0.91	1.47
	1981-90	0.65	0.32 N3	0.91	-0.18N4
	1991-97	0.92	0.52	0.44	0.74
Philippines	1972-80	1.31	1.04	0.9	1.33
	1981-90	1.17	1.15	1.46	0.68
	1991-97	1.21	0.95	1.13	-0.16N5
Singapore	1972-80	1.14	1.10	1.15	1.73
	1981-90	1.00	0.60	1.02	1.39
	1991-98	0.09N6	1.34	0.64	1.17
Thailand	1972-80	1.12	1.11	1.11	1.11
	1981-90	1.2	0.62	0.69	0.29
	1991-98	0.86	1.29	0.91	2.02

The p-values

N1: 0.332 N4: 0.810

N2: 0.590 N5: 0.503

N3: 0.138 N6:0.953

Note : The buoyancy is calculated by using the formula logx = a + b logy where x is either the tax or total government expenditure or current expenditure or capital expenditure and y is the GDP

African Economies

In most of the countries of Africa (Ref Table 1.6) the tax buoyancy was greater than unity, implying a higher government share in each unit of the incremental income. In all the cases the buoyancy was less in the decade of the eighties compared to the decades of the seventies and the nineties. Zimbabwe is the only country that had positive buoyancy gap in all the sub-periods under consideration. In fact there was positive buoyancy gap for the current expenditure in the decades of the seventies and the nineties in Zimbabwe. Ethiopia and Tunisia had positive buoyancy gap for all types of expenditure in the decades of the seventies and the eighties. Ghana, Morocco, Sierra Leone and Tanzania had positive buoyancy gap in the decade of seventies. Beside these, all other African economies had negative buoyancy gap.

Table 1.6: Buoyancy Table of Africa

		Tax	Expenditure	Current	Capital
Botswana	1971-80	1.09	1.08	1.06	1.15
	1981-90	1.08	0.97	1.02	0.81
	1991-96	0.09N1	0.72	1.09	-0.27N2
Burundi	1973-80	1.30	1.07	-	-
	1991-97	0.45	0.43	1.09	-0.57N3
Ethiopia	1972-80	1.91	2.11	2.10	2.15
	1981-90	1.01	1.35	1.49	0.49N4
	1991-95	1.35	1.22	0.77	8.70N5
Ghana	1972-80	0.67	0.85	0.86	0.74
	1981-90	1.36	1.10	1.07	1.28
	1991-93	1.22	2.06	2.22	1.30N7
Kenya	1972-80	1.32	1.28	1.17	1.86
	1981-90	0.86	0.89	0.89	0.90
	1991-96	1.19	1.12	1.20	0.61N8
Morocco	1972-80	1.22	1.38	1.17	1.86
	1981-90	1.06	0.71	0.79	0.53N11
	1991-95	0.94N9	1.68	1.80	1.22N10
Nigeria	1972-78	1.40	1.67	-	-
	1984-88	0.48N11	1.62	-	-

		Tax	Expenditure	Current	Capital
Sierra Leone	1972-80	1.00	1.15	1.65	0.09N12
	1981-90	0.67	0.66	0.69	0.47
	1991-94	1.77	1.60	1.42	2.32
Tanzania	1972-80	1.11	1.28	1.17	1.51
	1981-85	0.95	0.64	-	-
Tunisia	1972-80	1.22	1.33	1.21	1.69
	1981-90	0.57	0.61	0.73	0.29N13
	1991-95	1.11	0.93	0.99	0.72
Zambia	1972-80	1.07	0.99	1.19	-0.05N14
	1981-90	0.93	0.90	0.85	1.12
	1991-97	1.00	0.73	0.82	0.56
Zimbabwe	1976-80	0.82	1.13	1.52	0.07N15
	1981-90	0.87	0.87	0.84	1.17
	1991-97	1.16	1.19	1.25	0.52N16

The p-values

N1: 0.525 N6: 0.285 N11: 0.094 N16: 0.067
N2: 0.642 N7: 0.232 N12: 0.872
N3: 0.257 N8: 0.104 N13: 0.070
N4: 0.724 N9: 0.092 N14: 0.796
N5: 0.264 N10: 0.100 N15: 0.656

Note : The buoyancy is calculated by using the formula logx = a + b logy where x is either the tax or total government expenditure or current expenditure or capital expenditure and y is the GDP

Section II.

Comparison among Developing ESCAP Countries and African Countries

An obvious question that arises while studying the development process in different underdeveloped economies is whether the countries belonging to different continents exhibit significant differences in the parameters affecting their growth; and if the parameters have changed over time. This will enable us to see whether we can discriminate among the nations on the basis of continents and if so, which are the factors that will enable us to discriminate among them. This problem is analysed using the simple test of mean difference. I have considered the developing ESCAP and African countries to study the differences in their growth patterns. Non-availability of the

continuous data series has been a serious impediment for a complete study, and the study is restricted to thirteen developing countries[1] from each of the two regions. The entire period1971 to 1995 is divided into five five-year sub-periods --- 1971-75, 1976-80, 1981-85, 1986-90 and 1991-95, in order to help in understanding the evaluation of structural constraints over the years.

Methodology:

First, averages for all the variables are calculated for the sub-periods. Thereafter, the two groups of countries are considered for testing the difference in the means of the variables. It is assumed that the distribution of a variable x in each of the two populations is normal. The mean and standard deviation of x for one population are μ_1 and σ_1, while for the other they are μ_2 and σ_2 respectively. Suppose x_{1i} (i= 1 (1) n_1) be a random sample from the first population and x_{2j} (j= 1 (1) n_2) be a random sample from the other. The first sample is supposed to be independent of the second. Then

$$x_1 = \Sigma x_{1i} / n_1$$

$$s_1 = \sqrt{\sum_{i=1}^{n_1} (x_{1i} - x_1)^2 / (n_1 - 1)}$$

are the mean and the standard deviation of the first sample, and

$$x_2 = \Sigma x_{2j} / n_2$$

---

[1] The countries which have been considered in the study are:
ESCAP countries: Fiji, India, Indonesia, Iran, S. Korea , Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Singapore and Thailand
African countries: Botswana, Burundi, Ethiopia, Ghana, Kenya, Morocco, Nigeria, Sierra Leone, Swaziland, Tanzania, Tunisia, Zambia and Zimbabwe.

and $s_2 = \sqrt{\sum_{2j}^{n_2}(x_{2j} - x_2)^2/(n_2 - 1)}$

are the corresponding statistics for the second sample.

Case 1:

Here we consider the case where the mean and the standard deviation are unknown but we assume that the standard deviations are equal. Now if is assumed to be common standard deviation, then

$$t = \frac{(x_1 - x_2) - \xi_0}{s\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

is a standard normal variable. Since the pooled sample variance is a sum of two chi-squares with degrees of freedom n_1-1 and n_2-1 respectively, it itself is a chi-square with degrees of freedom ($n_1 + n_2 - 2$). Hence the test statistic for the null hypothesis H_0: $\mu_1 = \mu_2$ follows a t-distribution of the form

$$t = \frac{(x_1 - x_2) - \xi_0}{s\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

(where ξ_0 is μ_1-μ_2) with degrees of freedom ($n_1 + n_2 - 2$). This is called fisher's t-test.

Case 2:

Under this case we do not assume that the variables have equal standard deviation. Here the approach hinges on the approximation of a linear combination of

independent chi-squares with positive coefficients by a multiple of a chi-square with appropriate degree of freedom in such a way that both the mean and the variance remain unchanged. Hence if we use the function

$u = \dfrac{(x_1 - x_2) - \xi_0}{\sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}}$ where s_1 and s_2 are sample standard deviation of the groups.

and write it approximately as $\dfrac{\tau}{\sqrt{c\chi^2/\upsilon}}$

where

$$\tau = \{(x_1 - x_2) - (\mu_1 - \mu_2)\} \Bigg/ \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

and $c\chi^2 / \nu$ approximates

$$\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right) \Bigg/ \left(\frac{\sigma_2^2}{n_1} + \frac{\sigma_1^2}{n_2}\right) =$$

$$\left[\frac{\sigma_1^2}{n_1(n_1-1)} \times \frac{(n_1-1)s_1^2}{\sigma_1^2} + \frac{\sigma_2^2}{n_2(n_2-1)} \times \frac{(n_2-1)s_2^2}{\sigma_2^2}\right] \div \left(\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}\right)$$

$$=\left(c_1\chi_1^2+c_2\chi_2^2\right)\Bigg/\left(\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}\right)$$

where χ_1^2 and χ_2^2 have $(n_1 - 1)$ and $(n_2 - 1)$ degrees of freedom then we have on taking expectations

$$c=\{c_1(n_1-1)+c_2(n_2-1)\Bigg/\left(\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}\right) \quad =1$$

and on variances

$$\frac{2c^2}{\upsilon}=[2c_1(n_1-1)+2c_2(n_2-1)\Bigg/\left(\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}\right)^2$$

$$\text{or } \upsilon=\left(\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}\right)^2\Bigg/\left(\frac{\sigma_1^4}{n_1^2(n_1-1)}+\frac{\sigma_2^4}{n_2(n_2-1)}\right)$$

Consequently, the function u is taken to be approximately distributed as a t-statistic with degrees of freedom

$$\text{df} \quad =\left(\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}\right)^2\Bigg/\left(\frac{s_1^4}{n_1^2(n_1-1)}+\frac{s_2^4}{n_2(n_2-1)}\right)$$ where s_i's are the sample standard deviations

Smith and Satterthwaite recommend the use of this procedure in testing for the difference of H_o: $\mu_1 = \mu_2$. Welch, Dixon and Massey have shown that it would be more correct to use the degrees of freedom of approximating t-statistic the formula

$$df = \left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2} \right)^2 \Bigg/ \left(\frac{s_1^4}{n_1^2(n_1 - 1)} + \frac{s_2^4}{n_2(n_2 - 1)} \right) - 2$$

In a later piece of work Welch looked for a function $h(s^2_1, s_2^2, n_1, n_2, \alpha)$ such that $P[u > h(s^2_1, s_2^2, n_1, n_2, \alpha)] = \alpha$, Welch has found a series expansion for h in terms of

$c = \frac{s_1^2}{n_1} \Big/ \left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2} \right)$, $\upsilon_1 = n_1 - 1$, $\upsilon_2 = n_2 - 1$ and τ_α the upper α-point of standard normal distribution. Welch's later approach is the one followed here for the cases where the variances.

Results: The p-values of the above test results are shown in the next table (Table 1.7) and the actual mean and standard deviation is given in the appendix Table 1.19). The hypothesis is being tested for 10% level of significance. The important result that follows from the test is that the growth of GDP has remained the same in both the regions. But in the ESCAP economies the growth is capital driven and in the African region the growth is labour driven. This results in higher growth rate of per capita income in the ESCAP economies vis-à-vis the African economies. The foreign sector and the government sector of the African and the ESCAP economies do not show any significant difference. But there is greater heterogeneity in the performance of the government sector among the African economies. The variables that are incorporated in the test help to analyze three different aspects firstly, the aspect of the general performance of the economies, secondly

the aspect of the foreign sector of the economies and thirdly the public finance aspect. In order to study the general performance of the economies the variables that are incorporated are growth rate of GDP, growth rate of per capita GDP, growth rate of population, investment as a proportion of GDP, consumption as a proportion of GDP. In order to study the external sector we have included variables like export as a proportion of GDP, net factor income from abroad as a proportion of GDP, aid as a proportion of GNP. To analyze the public finance aspect we have considered variables like government deficit as a proportion of GDP, tax revenue as a proportion of GDP, capital expenditure of government as a proportion of GDP. Initially the test for the equality of the variance of the variables was carried out. If the null hypothesis of equality of the variances was accepted, then we used the first case for testing the equality of the mean. Alternatively, if the null hypothesis was rejected, we used the second case.

Before discussing the test results it is better to point out that since it was not possible to include all the countries of ESCAP and Africa we can't make any general conclusion about the regions. In the last few decades the economic performance of the African economies is bad. But we cannot make such a conclusion from our test due to the sampling bias. Even though from the test we gain some important insight.

The general performance variables show that apart from the quinquennium of 1981-85, the growth rate in the ESCAP region was the same as in the African countries. But the growth rate of per capita income is higher among the ESCAP countries from the second half of the seventies. The growth rate of population is higher in the African

economies. Investment as a proportion of GDP is higher among the ESCAP economies whereas consumption as a proportion of GDP is same for both the economies.

These results can be explained in the following way. Let us consider a simple Solow type of model where growth is the result of technical progress, increase of labour and increase in capital usage. Assuming that technological progress is similar for the group of the ESCAP economies and the African economies then the growth rate of a region can be explained by the growth of the labour force and capital usage. The test result shows that even though the growth rates are the same for both the regions per capita growth rate is higher among the ESCAP region countries. This may be due to the higher labor force growth in the African economies. Considering that the population growth can be used as a proxy for the growth of labour force then it can be concluded that for the group of African countries the growth of labour has been a driving force behind the growth of GDP. In case of ESCAP region economies investment as a proportion of GDP is higher vis-à-vis the African economies so it can be concluded that growth of ESCAP economies is more oriented towards higher capital usage whereas the growth in the African economies is the result of increasing labour force. One disturbing result from the test is that even if from the decade of eighties investment as a proportion of GDP is higher in the among the ESCAP vis-à-vis the African economies but there is no difference in the consumption as a proportion of GDP between these region of economies. It may be that the higher investment in the ESCAP region is financed by a higher inflow of foreign direct investment.

On the trade front the ESCAP region economies and the African economies do not show any difference. Exports as a proportion of GDP is the same among both the regions except during the sub-period of 1971-75 where the African economies had a higher export proportion. The African economies have higher net transfer from abroad in the second half of the decade of seventies and the first half of the decade of eighties. But it is important to note that there is much heterogeneity in the group of the African economies in their inflow of foreign transfer. The result shows that the African economies have persistently received higher aid than the ESCAP countries throughout the time period under the consideration. It is important to note that the higher aid inflow have failed to have any positive effect in the growth rate of the African economies. It might be possible that when a donor gives aid for a project that the recipient government have undertaken it anyway but it was financed for expenditure other than the intended project. Thus, aid in this sense may be "fungible," for the African countries. Recent empirical studies by Shantayanan Devarajan, Andrew Sunil Rajkumar, Vinaya Swaroop (1999) supports this hypothesis.

The group of the ESCAP economies and the African economies do not show any difference in the management of public finances. Both deficit as a proportion of GDP and tax as a proportion of GDP are the same in the economies of ESCAP and Africa. But within Africa there is considerable heterogeneity regarding tax collection. It is worth noting that Governments in the African economies have taken an active role in increasing public investment since capital expenditure of the government as a proportion of GDP is higher among the African economies. But the private sector has failed to respond. It is

likely that the shortage of foreign exchange has resulted in low capital goods investment and this has kept the investment low in the African economies.

General Performance													
p-value of t-test for difference of group means							p-value of F-test for difference of group variances						
		1971-75	1976-80	1981-85	1986-90	1991-95			1971-75	1976-80	1981-85	1986-90	1991-95
Null Hypo.	G.r. ESCAP = G.r. Africa						Null Hypo.	G.r. ESCAP = G.r. Africa					
Alt. Hypo.	1. G.r. ESCAP < G.r. Africa	0.3469	0.6734	0.9796	0.5940	0.5035	Alt. Hypo.	1. G.r. ESCAP < G.r. Africa	0.8456	0.8871	0.2750	0.9108	0.1499
	2. G.r. ESCAP != G.r. Africa	0.6939	0.6531	0.0409	0.8121	0.9930		2. G.r. ESCAP != G.r. Africa	0.3089	0.2258	0.5500	0.1794	0.2998
	3. G.r. ESCAP > G.r. Africa	0.6531	0.3266	0.0204	0.4060	0.4965		3. G.r. ESCAP > G.r. Africa	0.1544	0.1129	0.7250	0.0897	0.8501
Result		Null Acc.	Null Acc.	Alt 3	Null Acc.	Null Acc.	Result		Null Acc.	Null Acc.	Null Acc.	Null Acc.	Null Acc.
Null Hypo.	Gr. PCY ESCAP=Gr. PCY Africa						Null Hypo.	Gr. PCY ESCAP=Gr. PCY Africa					
Alt. Hypo.	1. Gr. PCY ESCAP<Gr. PCY Africa	0.4952	0.9719	0.9816	0.9416	0.9994	Alt. Hypo.	1. Gr. PCY ESCAP<Gr. PCY Africa	0.3054	0.6683	0.7076	0.7210	0.5129
	2. Gr. PCY ESCAPI=Gr. PCY Africa	0.9905	0.0565	0.0369	0.1167	0.0011		2. Gr. PCY ESCAPI=Gr. PCY Africa	0.6109	0.6633	0.5849	0.5581	0.4871
	3. Gr. PCY ESCAP>Gr. PCY Africa	0.5048	0.0283	0.0184	0.0584	0.0006		3. Gr. PCY ESCAP>Gr. PCY Africa	0.6945	0.3317	0.2924	0.2790	0.4871
Result		Null Acc.	Alt.3	Alt.3	Alt.3	Alt.3	Result		Null Acc.	Null Acc.	Null Acc.	Null Acc.	Null Acc.
Null Hypo.	Gr. Popu ESCAP=Gr. Popu Africa						Null Hypo.	Gr. Popu ESCAP=Gr. Popu Africa					
Alt. Hypo.	1. Gr. Popu ESCAP<Gr. Popu Africa	0.1421	0.0220	0.4004	0.0443	0.0684	Alt. Hypo.	1. Gr. Popu ESCAP<Gr. Popu Africa	0.0000	0.0001	0.8224	0.0009	0.0004
	2. Gr. Popu ESCAPI=Gr. Popu Africa	0.2842	0.0440	0.8009	0.0886	0.1362		2. Gr. Popu ESCAPI=Gr. Popu Africa	0.0000	0.0002	0.3552	0.0018	0.0008
	3. Gr. Popu ESCAP>Gr. Popu Africa	0.8579	0.9870	0.5996	0.9557	0.8213		3. Gr. Popu ESCAP>Gr. Popu Africa	1.0000	0.9999	0.1776	0.9991	0.9996
Result		Null Acc.	Alt 1	Null Acc.	Alt 1	Alt 1	Result		Alt 1	Alt 1	Null Acc.	Alt 1	Alt 1
Null Hypo.	Inv. ESCAP=Inv.Africa						Null Hypo.	Inv. ESCAP=Inv.Africa					
Alt. Hypo.	1. Inv. ESCAP<Inv.Africa	0.4611	0.7928	0.9747	0.9646	0.9449	Alt. Hypo.	Inv. ESCAP<Inv.Africa	0.1227	0.1155	0.5253	0.7476	0.4525
	2. Inv. ESCAPI=Inv.Africa	0.9221	0.4144	0.0506	0.0708	0.1101		Inv. ESCAPI=Inv.Africa	0.2454	0.2309	0.9494	0.6740	0.9050
	3. Inv. ESCAP>Inv.Africa	0.5389	0.2072	0.0253	0.0354	0.0551		Inv. ESCAP>Inv.Africa	0.8773	0.8845	0.4747	0.2524	0.5475
Result		Null Acc.	Null Acc.	Alt 3	Alt 3	Alt 3	Result		Null Acc.	Null Acc.	Null Acc.	Null Acc.	Null Acc.
Null Hypo.	Cons. ESCAP=Cons.Africa						Null Hypo.	Cons. ESCAP=Cons.Africa					
Alt. Hypo.	1. Cons. ESCAP<Cons.Africa	0.6824	0.0519	0.0024	0.3743	0.1428	Alt. Hypo.	1. Cons. ESCAP<Cons.Africa	0.3697	0.4947	0.8449	0.8331	0.5345
	2. Cons. ESCAPI=Cons.Africa	0.6352	0.1038	0.0048	0.7486	0.2857		2. Cons. ESCAPI=Cons.Africa	0.7394	0.9895	0.3103	0.3337	0.9311
	3. Cons. ESCAP>Cons.Africa	0.3176	0.9481	0.9976	0.6257	0.8527		3. Cons. ESCAP>Cons.Africa	0.6303	0.5053	0.1551	0.1669	0.4655
Result		Null Acc.	Alt1	Alt1	Null Acc.	Null Acc.	Result		Null Acc.	Null Acc.	Null Acc.	Null Acc.	Null Acc.
Trade factors													
Null Hypo.	Exp. ESCAP=Exp.Africa						Null Hypo.	Exp. ESCAP=Exp.Africa					
Alt. Hypo.	1. Exp. ESCAP<Exp.Africa	0.0992	0.2184	0.3667	0.3093	0.4596	Alt. Hypo.	1. Exp. ESCAP<Exp.Africa	0.2337	0.2966	0.1707	0.3965	0.6916
	2. Exp. ESCAPI=Exp.Africa	0.1984	0.4367	0.7335	0.6185	0.3193		2. Exp. ESCAPI=Exp.Africa	0.4608	0.5864	0.3350	0.7861	0.6236
	3. Exp. ESCAP>Exp.Africa	0.9008	0.7816	0.6333	0.6907	0.5404		3. Exp. ESCAP>Exp.Africa	0.7663	0.7034	0.8293	0.6035	0.3084
Result		Alt.1	Null Acc.	Null Acc.	Null Acc.	Null Acc.	Result		Null Acc.	Null Acc.	Null Acc.	Null Acc.	Null Acc.

BLE
1.7
td.)

p-value of t-test for difference of group means							p-value of F-test for difference of group variances						
		1971-75	1976-80	1981-85	1986-90	1991-95			1971-75	1976-80	1981-85	1986-90	1991-95
Null Hypo.	NTA ESCAP=NTA Africa						**Null Hypo.**	NTA ESCAP=NTA Africa					
Alt. Hypo.	1. NTA ESCAP<NTA Africa	0.1982	0.0105	0.0414	0.5741	0.6381	**Alt. Hypo.**	1. NTA ESCAP<NTA Africa	0.1572	0.2227	0.0240	0.0070	0.0420
	2. NTA ESCAPI=NTA Africa	0.3963	0.0211	0.0828	0.8518	0.7237		2. NTA ESCAPI=NTA Africa	0.3144	0.4454	0.0479	0.0141	0.0841
	3. NTA ESCAP>NTA Africa	0.8018	0.9895	0.9586	0.4259	0.3619		3. NTA ESCAP>NTA Africa	0.8438	0.7773	0.9760	0.9930	0.9580
Result		Null Acc.	Alt.1	Alt.1	Null Acc.	Null Acc.	**Result**		Null Acc.	Null Acc.	Alt.1	Alt.1	Alt.1
Null Hypo.	Aid ESCAP=Aid Africa						**Null Hypo.**	Aid ESCAP=Aid Africa					
Alt. Hypo.	1. Aid ESCAP<Aid Africa	0.0475	0.0142	0.0061	0.0038	0.0024	**Alt. Hypo.**	1. Aid ESCAP<Aid Africa	0.0005	0.1204	0.3125	0.0201	0.0001
	2. Aid ESCAPI=Aid Africa	0.0949	0.0284	0.0123	0.3375	0.0048		2. Aid ESCAPI=Aid Africa	0.0012	0.2475	0.6249	0.0378	0.0002
	3. Aid ESCAP>Aid Africa	0.9525	0.9858	0.9939	0.9962	0.9976		3. Aid ESCAP>Aid Africa	0.9995	0.8796	0.6875	0.9799	0.9999
Result		Alt. 1	Alt. 1	Alt. 1	Alt. 1	Alt. 1	**Result**		Alt. 1	Null Acc.	Null Acc.	Alt. 1	Alt. 1
Government Sector													
Null Hypo.	Def. ESCAP=Def.Africa						**Null Hypo.**	Def. ESCAP=Def.Africa					
Alt. Hypo.	1. Def. ESCAP<Def.Africa	0.8171	0.7906	0.7472	0.3263	0.8711	**Alt. Hypo.**	1. Def. ESCAP<Def.Africa	0.0671	0.0657	0.2139	0.0247	0.4204
	2. Def. ESCAPI=Def.Africa	0.3658	0.4189	0.5057	0.6526	0.2579		2. Def. ESCAPI=Def.Africa	0.1389	0.1313	0.4279	0.0495	0.8409
	3. Def. ESCAP>Def.Africa	0.1829	0.2094	0.2528	0.6737	0.1289		3. Def. ESCAP>Def.Africa	0.9329	0.9343	0.7861	0.9753	0.5796
Result		Null Acc.	Null Acc.	Null Acc.	Null Acc.	Null Acc.	**Result**		Alt.1	Null Acc.	Null Acc.	Alt.1	Null Acc.
Null Hypo.	Tax ESCAP=Tax Africa						**Null Hypo.**	Tax ESCAP=Tax Africa					
Alt. Hypo.	1. Tax ESCAP<Tax Africa	0.1064	0.1578	0.2747	0.2483	0.1988	**Alt. Hypo.**	1. Tax ESCAP<Tax Africa	0.0454	0.0537	0.0154	0.0062	0.0277
	2. Tax ESCAPI=Tax Africa	0.2127	0.3156	0.5495	0.4967	0.3976		2. Tax ESCAPI=Tax Africa	0.0948	0.1073	0.0309	0.0159	0.0670
	3. Tax ESCAP>Tax Africa	0.8936	0.8422	0.7253	0.7517	0.8012		3. Tax ESCAP>Tax Africa	0.9546	0.9463	0.9846	0.9935	0.9723
Result		Null Acc.	Null Acc.	Null Acc.	Null Acc.	Null Acc.	**Result**		Alt. 1	Alt. 1	Alt. 1	Alt. 1	Alt. 1
Null Hypo.	Cp.Exp ESCAP=Cp.Exp Africa						**Null Hypo.**	Cp.Exp ESCAP=Cp.Exp Africa					
Alt. Hypo.	1. Cp.Exp ESCAP<Cp.Exp Africa	0.0232	0.0571	0.2728	0.2985	0.0578	**Alt. Hypo.**	1. Cp.Exp ESCAP<Cp.Exp Africa	0.3108	0.4113	0.7756	0.955	0.0572
	2. Cp.Exp ESCAPI=Cp.Exp Africa	0.0464	0.1143	0.5456	0.597	0.1157		2. Cp.Exp ESCAPI=Cp.Exp Africa	0.6294	0.8226	0.4487	0.082	0.1257
	3. Cp.Exp ESCAP>Cp.Exp Africa	0.9768	0.9429	0.7272	0.7015	0.9422		3. Cp.Exp ESCAP>Cp.Exp Africa	0.6892	0.5887	0.2244	0.045	0.9438
		Alt. 1	Alt. 1	Null Acc.	Null Acc.	Alt. 1	**Result**		Null Acc.	Null Acc.	Null Acc.	Alt.3	Alt.1
Result													
Acronyms:													
G.r. : Growth Rate of GDP			NTA : Net Transfer from Abroad / GDP					**Result's description**					
Gr.PCY : Growth rate of Per Capita Income			Aid : Aid / GNP					Null Acc : Null hypothesis is accepted					
Gr.Popu : Growth rate of Population			Def. : Government Deficit / GDP					Alt1: Alternative hypothesis1 is accepted					
Inv. : Investment / GDP			Tax : Tax Revenue / GDP					Alt3: Alternative hypothesis3 is accepted					
Cons. : Consumption / GDP			Cp. Exp : Capital Expenditure of Govt. / GDP										
Exp. : Export / GDP													

Appendix of Chapter 2 of section 1

Table 1.1A

Investment as a proportion of GDP in the ESCAP countries

	1971-75	1976-80	1981-85	1986-90	1991-95
Fiji	19.26	21.72	21.27	14.42	12.11
India	15.56	18.40	19.89	22.03	22.16
Myanmar	10.10	16.85	19.66	14.80	16.50
Nepal	15.22	18.11	17.54	20.68	21.58
Pakistan	12.91	17.81	16.79	17.11	17.98
Sri lanka	13.93	21.13	27.27	22.55	24.71
Korea	22.93	30.13	28.69	31.17	36.67
Malaysia	23.28	25.49	34.03	27.04	38.79
Philippines	17.99	25.09	24.93	18.86	22.11
Singapore	36.23	36.63	45.58	36.38	38.20
Thailand	22.93	25.49	27.83	31.82	40.41
Indonesia	17.92	20.64	28.12	32.45	26.31
Iran	22.90	27.43	19.28	14.15	22.44

Table 1.2A

Investment as a proportion of GDP in the African countries

	1971-75	1976-80	1981-85	1986-90	1991-95
Botswana	44.59	27.24	29.48	26.25	27.32
Burundi	7.06	12.50	16.37	16.59	13.49
Ethiopia	11.24	8.93	13.40	15.87	13.09
Ghana	10.45	7.70	5.68	11.25	14.33
Kenya	22.82	26.14	23.20	21.09	18.60
Morocco	16.55	26.56	25.00	17.58	21.87
Nigeria	17.32	26.41	13.69	9.20	8.92
Sierra Leone	12.39	12.34	13.09	8.46	7.24
Swaziland	20.16	34.44	29.60	19.27	27.02
Tanzania	20.54	22.23	15.73	30.16	42.86
Tunisia	21.38	29.68	30.88	22.09	26.13
Zambia	28.36	20.47	14.45	12.69	16.58
Zimbabwe	20.66	16.15	18.39	15.83	22.46

Table 1.3A

Export as a proportion of GDP in the ESCAP countries

	1971-75	1976-80	1981-85	1986-90	1991-95
Fiji	46.62	43.63	43.40	53.83	53.76
India	5.06	6.93	6.36	6.69	9.80
Myanmar	6.43	7.91	5.08	2.61	1.19
Nepal	-	11.29	11.25	11.29	18.79
Pakistan	11.08	10.61	11.43	13.77	16.63
Sri lanka	25.04	32.71	27.79	26.49	32.74
Korea	23.87	31.00	35.20	35.75	29.89
Malaysia	42.17	52.86	52.71	67.37	84.95
Philippines	17.68	19.36	22.71	27.40	32.05
Thailand	18.54	21.35	22.40	31.31	38.22
Indonesia	20.51	25.58	25.08	23.95	27.27
Iran	34.97	26.65	12.15	7.82	19.85

Note: Singapore's Export data is not available in the International Financial Statistics of the year 1995 and 1999

Table 1.4A

Export as a proportion of GDP in the African countries

	1971-75	1976-80	1981-85	1986-90	1991-95
Botswana	41.49	51.08	56.96	67.26	49.61
Burundi	9.95	13.32	9.24	9.63	10.26
Ethiopia	12.13	12.49	9.57	8.48	8.82
Ghana	20.81	10.85	6.16	16.11	21.52
Kenya	31.60	34.83	30.58	25.11	32.74
Sierra Leone	26.12	19.50	10.89	11.85	-
Swaziland	20.16	34.44	29.60	19.27	27.02
Tanzania	22.14	16.62	8.90	10.15	16.98
Tunisia	28.32	33.80	42.31	39.32	42.04
Zambia	44.24	40.72	32.46	32.71	32.13
Zimbabwe	30.14	28.69	23.64	23.68	31.02

Table 1.5A

Sector wise value added in the ESCAP countries

Agriculture sector's value added as a proportion of GDP

Year	1971-75	1976-80	1981-85	1985-90	1990-95
Fiji	25.22	22.95	19.20	20.36	20.65
India	43.09	37.86	34.84	31.26	30.05
Myanmar	41.49	45.63	47.80	55.43	61.08
Nepal	69.30	64.47	58.98	51.02	44.53
Pakistan	35.00	31.09	29.82	26.56	25.58
Sri Lanka	28.85	28.93	27.74	26.47	24.81
Korea	25.17	19.57	13.32	9.76	6.90
Malaysia	27.11	24.64	19.85	19.17	15.25
Philippines	30.34	27.75	23.99	23.10	21.61
Singapore	2.02	1.55	0.96	0.42	0.18
Thailand	26.17	24.64	18.67	15.03	11.44
Indonesia	36.13	27.72	23.22	22.24	17.85
Iran	11.63	13.28	20.02	24.31	23.31

Industry sector's value added as a proportion of GDP

Year	1971-75	1976-80	1981-85	1985-90	1990-95
Fiji	22.19	21.26	20.11	20.89	23.97
India	20.83	23.54	25.35	26.59	26.22
Myanmar	12.49	12.40	12.79	10.74	9.33
Nepal	9.11	11.18	13.14	16.12	20.89
Pakistan	22.41	23.69	22.42	24.17	25.18
Sri Lanka	25.15	28.17	26.63	26.69	25.66
Korea	31.28	37.21	40.34	42.67	43.49
Malaysia	28.66	34.86	35.72	36.48	41.68
Philippines	33.64	36.84	38.04	34.71	32.83
Singapore	33.19	35.53	37.71	36.89	34.33
Thailand	26.71	29.11	30.80	34.90	38.73
Indonesia	28.04	36.69	38.80	36.98	40.43
Iran	56.96	44.83	32.48	23.53	33.95

Service sector's value added as a proportion of GDP

Year	1971-75	1976-80	1981-85	1985-90	1990-95
Fiji	52.59	55.79	60.69	58.74	55.38
India	36.08	38.60	39.81	42.15	43.73
Myanmar	46.02	41.97	39.41	33.83	29.58
Nepal	21.59	24.35	27.87	32.86	34.57
Pakistan	42.59	45.22	47.76	49.27	49.24
Sri Lanka	46.00	42.89	45.64	46.84	49.54
Korea	43.55	43.22	46.34	47.57	49.61
Malaysia	44.23	40.51	44.43	44.36	43.07
Philippines	36.02	35.41	37.97	42.19	45.57
Singapore	64.79	62.91	61.34	62.69	65.49
Thailand	47.12	46.25	50.53	50.07	49.83
Indonesia	35.83	35.59	37.98	40.78	41.72
Iran	31.41	41.89	47.50	52.16	42.75

Table 1.6A

Sector wise value added in the African Countries

Agriculture sector's value added as a proportion of GDP

Year	1971-75	1976-80	1981-85	1985-90	1990-95
Botswana	27.50	15.99	7.58	4.91	4.39
Burundi	66.82	62.44	59.42	55.49	50.47
Ethiopia	-	-	53.52	49.78	58.29
Ghana	47.71	57.07	52.86	48.36	35.30
Kenya	34.31	36.79	33.30	31.19	29.92
Morocco	20.50	18.18	15.00	17.31	16.66
Nigeria	35.40	27.69	33.21	36.00	27.72
Sierra Leone	33.22	35.37	40.44	50.31	41.45
Swaziland	34.63	28.66	20.51	16.76	14.26
Tanzania	-	-	-	51.17	47.17
Tunisia	19.56	15.27	13.85	13.99	14.30
Zambia	12.20	15.17	14.28	15.36	19.46
Zimbabwe	18.86	16.16	16.53	15.99	14.39

"-": Data not available

Industry sector's value added as a proportion of GDP

Year	1971-75	1976-80	1981-85	1985-90	1990-95
Botswana	30.84	39.38	48.51	58.68	48.58
Burundi	12.21	14.41	14.24	17.19	20.64
Ethiopia	-	-	12.68	14.01	9.86
Ghana	18.75	14.25	9.86	16.71	18.19
Kenya	20.50	19.48	19.52	18.85	17.81
Morocco	30.60	31.90	33.17	32.85	31.86
Nigeria	25.22	36.08	31.52	34.94	51.88
Sierra Leone	25.29	20.53	16.16	18.90	27.47
Swaziland	25.99	26.37	28.24	38.99	42.20
Tanzania	-	-	-	15.16	15.93
Tunisia	22.98	27.46	32.36	30.30	28.69
Zambia	48.77	40.18	39.45	44.42	38.75
Zimbabwe	32.17	31.18	28.27	33.04	34.62

"-": Data not available

Service sector's value added as a proportion of GDP

Year	1971-75	1976-80	1981-85	1985-90	1990-95
Botswana	41.66	44.64	43.91	36.41	47.03
Burundi	20.97	23.14	26.34	27.32	28.89
Ethiopia	-	-	33.80	36.20	31.84
Ghana	33.54	28.68	37.28	34.93	46.51
Kenya	45.19	43.73	47.18	49.96	52.27
Morocco	48.90	49.92	51.83	49.84	51.48
Nigeria	39.38	36.22	35.27	29.06	20.40
Sierra Leone	41.49	44.11	43.40	30.78	31.07
Swaziland	39.38	44.97	51.25	44.25	43.53
Tanzania	-	-	-	33.67	36.90
Tunisia	57.46	57.28	53.79	55.71	57.00
Zambia	39.04	44.65	46.27	40.22	41.80
Zimbabwe	48.97	52.66	55.21	50.97	50.99

"-": Data not available

Continued in the next page

Table 1.7A

Government's Total Expenditure as a proportion of GDP for the ESCAP countries

	1971-75	1976-80	1981-85	1985-90	1991-95
Fiji	19.60	21.63	25.20	24.92	25.22
India	14.85	17.51	19.75	20.78	18.83
Myanmar	17.86	15.67	17.02	17.46	14.85
Nepal	9.59	12.84	17.45	17.55	16.44
Pakistan	24.16	23.31	22.96	26.21	25.51
SriLanka	26.48	34.22	32.89	32.72	29.27
Korea	16.12	18.71	19.65	16.86	19.12
Malaysia	27.87	30.27	37.29	31.27	26.34
Philippines	14.08	14.78	14.93	18.29	19.07
Singapore	22.87	23.61	29.35	29.34	23.09
Thailand	15.36	17.20	19.94	16.40	15.63
Indonesia	18.44	20.73	22.32	19.62	16.82
Iran	35.86	39.51	28.49	19.95	22.30

Table 1.8A

Government's Current Expenditure as a proportion of GDP for the ESCAP countries

	1971-75	1976-80	1981-85	1985-90	1991-95
Fiji	16.10	18.90	23.17	22.28	24.82
India	9.61	11.84	12.50	15.42	13.97
Myanmmar	15.75	12.75	12.91	13.51	9.18
Pakistan	13.83	13.96	16.30	20.37	19.67
SriLanka	20.35	22.46	17.99	20.94	21.76
Korea	11.96	13.45	14.40	13.18	14.47
Malaysia	20.62	20.19	24.11	25.53	20.96
Philippines	11.25	10.69	9.24	14.32	15.57
Singapore	13.67	15.89	17.96	19.32	15.28
Thailand	11.65	12.69	15.70	13.43	11.00
Indonesia	11.18	11.82	11.20	10.53	8.40
Iran	25.28	27.37	21.44	16.18	15.66

Note: Nepal's data regarding the Government Current Expenditure is not available in the Government Financial Statistics of

Table 1.9A

Government's Capital Expenditure as a proportion of GDP for the ESCAP countries

	1971-75	1976-80	1981-85	1985-90	1991-95
Fiji	5.66	6.55	5.34	4.21	3.72
India	1.57	1.52	1.94	2.25	1.78
Myanmmar	1.97	2.90	4.60	4.47	5.72
Pakistan	3.14	3.48	2.73	2.91	3.90
SriLanka	5.90	10.96	13.61	9.83	6.18
Korea	3.46	2.83	2.51	2.30	2.66
Malaysia	3.91	5.80	8.47	4.63	4.98
Philippines	1.84	2.39	2.78	2.30	3.16
Singapore	2.72	4.07	6.04	9.60	4.41
Thailand	3.39	4.15	4.02	2.67	4.49
Indonesia	7.26	8.91	11.13	9.10	8.41
Iran	10.58	12.14	7.06	3.77	6.65

Note: Nepal's data is not available in the Government Financial Statistics

Table 1.10A

Government's total expenditure as a percentage of GDP for the African countries

	1971-75	1976-80	1981-85	1986-90	1991-95
Botswana	41.86	37.69	40.93	42.61	42.94
Burundi	20.47	22.33	-	-	28.80
Ethiopia	15.04	22.09	26.60	28.32	21.64
Ghana	19.22	17.39	10.92	14.07	18.35
Kenya	24.27	29.58	32.81	29.46	28.23
Morocco	27.75	36.97	33.95	28.89	31.58
Nigeria	16.56	-	-	15.48	-
Sierra Leone	-	22.39	15.46	6.80	12.57
Swaziland	26.54	35.61	35.35	27.55	
Tunisia	27.63	34.90	47.17	37.27	33.73
Tanzania	25.51	28.47	-	-	-
Zambia	40.80	39.04	36.25	33.34	34.74
Zimbabwe	-	32.17	36.62	32.36	33.69

"-": Data not available

Table 1.11A

Government's current expenditure as a percentage of GDP for the African countries

	1971-75	1976-80	1981-85	1986-90	1991-95
Botswana	20.45	22.20	27.75	29.83	30.86
Ethiopia	12.53	18.59	21.97	24.64	18.25
Ghana	14.79	12.66	9.16	10.92	14.81
Kenya	17.25	20.91	26.27	24.16	24.51
Morocco	19.99	21.44	24.62	21.70	24.70
Nigeria	8.59	-	-	5.65	-
Sierra Leone	-	15.75	10.87	4.53	9.94
Swaziland	16.95	18.04	22.64	19.35	-
Tanzania	17.79	18.90	-	-	-
Tunisia	19.14	22.15	31.05	27.14	26.07
Zambia	7.01	4.80	5.18	7.71	14.41
Zimbabwe		2.11	2.53	2.80	3.53

Note: Burundi's data is not available in the Government's Finance Statistics of
"-" : Data not available

Table 1.12A

Government's capital expenditure as a percentage of GDP for the African countries

	1971-75	1976-80	1981-85	1986-90	1991-95
Botswana	11.14	12.21	8.94	7.09	10.11
Ethiopia	2.04	3.34	3.83	3.69	3.39
Ghana	3.42	3.95	1.42	2.60	3.18
Kenya	5.13	6.05	5.17	4.74	3.41
Morocco	7.33	15.20	9.18	7.18	6.77
Nigeria	5.18	-	-	5.65	-
Sierra Leone	-	6.46	3.92	2.20	2.63
Swaziland	7.61	11.79	10.02	6.01	-
Tanzania	6.93	9.57	-	-	-
Tunisia	6.57	10.42	13.26	8.52	6.77
Zambia	7.01	4.80	5.18	7.71	14.41
Zimbabwe		2.11	2.53	2.80	3.53

Note: Burundi's data is not available in the Government's Finance Statistics of

Table 1.13A

Government's total Revenue as a percentage of GDP in the ESCAP countries

	1971-75	1976-80	1981-85	1985-90	1991-95
India	11.21	12.47	12.88	14.38	13.08
Myanmmar	12.97	16.65	17.47	13.15	10.36
Nepal	7.72	9.96	11.17	10.76	10.77
Pakistan	13.48	15.26	16.83	18.87	17.89
SriLanka	20.43	23.09	22.20	23.12	21.65
Indonesia	16.00	20.49	21.14	17.92	17.57
Iran	35.10	32.12	22.19	13.75	21.64
Fiji	19.60	21.63	25.20	24.92	25.22
Korea	14.36	17.04	17.70	17.13	18.95
Malaysia	20.60	23.62	27.35	26.82	27.63
Philippines	13.11	13.51	11.98	15.10	18.42
Singapore	22.89	24.69	31.77	35.34	38.18
Thailand	13.35	13.31	15.45	16.80	18.52

Table 1.14A

Government's tax revenue as a percentage of GDP I n the ESCAP countries

	1971-75	1976-80	1981-85	1985-90	1991-95
India	9.32	9.91	10.23	11.19	9.61
Myanmmar	9.59	10.60	9.89	6.93	6.16
Nepal	5.11	6.23	7.13	7.00	7.39
Pakistan	11.07	11.85	12.92	13.47	12.73
SriLanka	18.03	19.39	17.11	17.87	17.73
Indonesia	14.70	19.11	18.48	15.03	15.62
Iran	26.45	23.41	13.85	6.40	14.41
Fiji	16.43	17.86	20.50	20.17	21.43
Korea	12.38	15.20	15.38	15.10	16.31
Malaysia	17.90	21.22	22.20	18.74	20.62
Philippines	9.69	11.68	10.55	12.40	15.59
Singapore	15.57	16.77	18.44	16.34	15.40
Thailand	11.27	11.91	13.69	14.95	16.64

Table 1.15A

Government's non tax revenue as a percentage of GDP in the ESCAP countries

	1971-75	1976-80	1981-85	1985-90	1991-95
India	1.56	2.12	2.34	2.92	2.93
Myanmmar	2.60	5.26	6.58	5.07	3.67
Nepal	0.86	1.20	1.29	1.64	1.74
Pakistan	1.84	2.74	3.24	4.58	4.70
SriLanka	1.62	1.52	2.35	2.80	2.23
Indonesia	1.19	1.38	2.66	2.89	1.95
Iran	8.66	8.71	8.34	7.36	7.19
Fiji	2.49	3.33	3.88	3.96	3.39
Korea	1.37	1.69	2.15	1.78	2.25
Malaysia	2.62	2.33	5.05	8.04	6.91
Philippines	4.00	1.68	1.35	2.15	2.00
Singapore	5.99	7.04	9.53	14.07	14.13
Thailand	1.70	1.13	1.38	1.45	1.68

Table 1.16A

Government's total revenue as a percentage of GDP in the African countries

	1971-75	1976-80	1981-85	1986-90	1991-95
Botswana	28.79	30.63	45.27	56.71	48.98
Burundi	19.26	-	-	19.44	24.15
Ethiopia	13.23	17.64	20.26	21.76	14.88
Ghana	13.51	13.65	13.62	13.63	13.63
Kenya	19.67	23.91	25.56	24.09	25.26
Morocco	22.81	24.30	25.43	24.34	28.85
Nigeria	16.78	-	-	11.47	-
Sierra Leone	-	15.04	8.29	3.52	8.97
Swaziland	25.32	33.05	31.30	27.95	-
Tanzania	18.93	20.03	-	-	-
Tunisia	26.43	30.76	40.92	32.19	30.38
Zambia	30.69	25.16	23.68	20.84	20.71
Zimbabwe	-	23.80	28.90	25.61	26.13

"-" : Data not available

Table 1.17A

Government's tax revenue as a percentage of GDP in the African countries

	1971-75	1976-80	1981-85	1986-90	1991-95
Botswana	21.04	20.41	26.17	30.90	24.11
Burundi	10.15	-	-	13.53	15.56
Ethiopia	9.96	13.32	13.93	14.42	9.98
Ghana	11.79	8.39	5.89	12.06	12.59
Kenya	16.46	20.15	22.32	20.28	21.20
Morocco	17.79	20.35	20.60	21.43	24.16
Nigeria	14.42	-	-	5.62	-
Sierra Leone	-	12.98	6.94	2.43	7.58
Swaziland	22.95	29.31	27.62	25.13	-
Tanzania	15.25	15.75	-	-	-
Tunisia	20.79	24.30	30.53	23.89	24.49
Zambia	23.38	21.64	21.38	18.83	17.46
Zimbabwe	-	19.58	25.19	22.19	21.65

"-" : Data not avaulable

Table 1.18A

Government's non-tax revenue as a percentage of GDP in the African countries

	1971-75	1976-80	1981-85	1986-90	1991-95
Botswana	7.74	10.04	18.85	25.63	24.59
Burundi	0.55	-	-	0.72	1.66
Ethiopia	1.43	2.69	4.33	6.66	3.42
Ghana	1.66	0.87	1.08	1.27	2.20
Kenya	2.74	3.05	2.70	2.33	2.18
Morocco	4.69	3.61	3.86	2.74	4.15
Nigeria	2.36	-	-	5.85	-
Sierra Leone	-	1.39	0.53	0.34	0.30
Swaziland	2.20	2.42	2.49	2.00	-
Tanzania	2.69	2.19	-	-	-
Tunisia	4.31	5.68	10.22	7.72	5.52
Zambia	3.81	2.50	1.55	1.17	1.97
Zimbabwe	-	4.19	2.90	2.59	2.66

"-" : Data not avaulable

Results of Section 2

Table 1.9A

Mean and Standard deviation of the variables included in the Mean Difference test

Growth rate of GDP

ESCAP Economies

Year	Mean	Std. Dev.
1971-75	7.39	0.08
1976-80	7.32	0.08
1981-85	6.05	0.04
1986-90	5.72	0.05
1991-95	9.37	0.46

African Economies

Year	Mean	Std devn
1971-75	8.50	0.06
1976-80	6.17	0.05
1981-85	2.09	0.05
1985-90	5.33	0.03
1990-95	9.18	0.62

Per Capita Growth of GDP

ESCAP Economies

Year	Mean	Std. Dev.
1971-75	4.54	0.06
1976-80	7.47	0.07
1981-85	2.32	0.05
1986-90	4.54	0.04
1991-95	4.10	0.04

African Economies

Year	Mean	Std devn
1971-75	3.44	0.07
1976-80	1.81	0.06
1981-85	-2.30	0.04
1985-90	1.57	0.03
1990-95	1.35	0.61

Population Growth

ESCAP Economies

Year	Mean	Std. Devn.
1971-75	2.38	0.01
1976-80	2.26	0.01
1981-85	3.84	0.06
1986-90	2.05	0.01
1991-95	2.46	0.01

African Economies

Year	Mean	Std. Devn.
1971-75	4.41	0.06
1976-80	3.56	0.02
1981-85	4.34	0.04
1986-90	3.33	0.02
1991-95	3.65	0.03

Investment as a proportion of GDP

ESCAP Economies

Year	Mean	Std. Devn.
1971-75	19.18	0.07
1976-80	23.23	0.06
1981-85	25.50	0.08
1986-90	23.10	0.08
1991-95	26.08	0.09

African Economies

Year	Mean	Std. Devn.
1971-75	19.50	0.10
1976-80	20.83	0.09
1981-85	19.15	0.08
1985-90	17.41	0.06
1990-95	19.87	0.10

Consumption as a proportion of GDP

ESCAP Economies

Year	Mean	Std. Devn.
1971-75	81.73	0.11
1976-80	77.66	0.10
1981-85	77.21	0.11
1986-90	79.60	0.15
1991-95	76.77	0.15

African Economies

Year	Mean	Std. Devn.
1971-75	79.64	0.12
1976-80	84.01	0.10
1981-85	89.07	0.08
1985-90	81.27	0.11
1990-95	83.19	0.15

Export as a proportion of GDP

ESCAP Economies

Year	Mean	Std. Devn.
1971-75	21.72	0.14
1976-80	24.03	0.15
1981-85	23.18	0.15
1986-90	25.90	0.19
1991-95	30.54	0.22

African Economies

Year	Mean	Std. Devn.
1971-75	29.96	0.17
1976-80	29.08	0.17
1981-85	25.59	0.20
1985-90	29.99	0.21
1990-95	31.38	0.19

Net transfer from abroad as a proportion of GDP

ESCAP Economies

Year	Mean	Std. Devn.
1971-75	-0.09	0.06
1976-80	0.86	0.05
1981-85	3.60	0.04
1986-90	2.19	0.05
1991-95	4.34	0.05

African Economies

Year	Mean	Std. Devn.
1971-75	2.61	0.09
1976-80	6.51	0.06
1981-85	8.38	0.08
1985-90	1.50	0.12
1990-95	3.39	0.08

Aid as a proportion of GDP

ESCAP Economies

Year	Mean	Std. Devn.
1971-75	2.03	0.01
1976-80	2.30	0.03
1981-85	2.28	0.03
1986-90	2.84	0.04
1991-95	2.33	0.03

African Economies

Year	Mean	Std. Devn.
1971-75	4.52	0.04
1976-80	5.47	0.04
1981-85	5.85	0.04
1985-90	9.58	0.07
1990-95	13.48	0.12

Government deficit as a proportion of GDP

ESCAP Economies

Year	Mean	Std. Devn.
1971-75	3.04	0.03
1976-80	3.94	0.03
1981-85	4.39	0.04
1986-90	4.01	0.04
1991-95	1.55	0.06

African Economies

Year	Mean	Std. Devn.
1971-75	4.35	0.04
1976-80	5.39	0.05
1981-85	5.60	0.05
1985-90	2.82	0.07
1990-95	4.23	0.06

Tax revenue as a proportion of GDP

ESCAP Economies

Year	Mean	Std. Devn.
1971-75	12.62	0.04
1976-80	14.32	0.04
1981-85	14.67	0.05
1986-90	13.95	0.04
1991-95	14.42	0.05

African Economies

Year	Mean	Std. Devn.
1971-75	15.41	0.08
1976-80	16.76	0.07
1981-85	16.41	0.09
1985-90	16.17	0.11
1990-95	17.14	0.11

Capital Expenditure of Government as a proportion of GDP

ESCAP Economies

Year	Mean	Std. Devn.
1971-75	4.19	0.03
1976-80	5.41	0.04
1981-85	5.45	0.04
1986-90	4.44	0.04
1991-95	4.36	0.02

African Economies

Year	Mean	Std. Devn.
1971-75	6.61	0.04
1976-80	8.06	0.04
1981-85	6.33	0.03
1985-90	5.78	0.03
1990-95	6.67	0.05

CHAPTER – III

Chapter 3.

Weisskopf's Test:

The test we have formulated here to investigate about the binding constraint in a three-gap model paradigm is basically a development of Weisskopf's[1] test for the two-gap model. The objective is to develop and apply econometric methods that can be used systematically to classify countries according to the dominant during a time period. The model so developed is simple an aggregative model of an economy based upon standard macroeconomic identities, an ex ante saving function, an ex ante import function and an ex ante government's net revenue function.

The model begins with the following identities

$$Y + M + W = C + I + G + E \qquad (1)$$

$$S = (Y - C) = I_p + (E-M) + (W - G - I_g) \qquad (2)$$

$$F = M - E \qquad (3)$$

$$Z = W - (G + I_g) \qquad (4)$$

and a function that links the private investment to government investment

$$I_P = \rho I_g + \psi Y \qquad (i)$$

Where $I = I_p + I_g$

Where Y is Gross Domestic product, M is total import of goods and services, W is the total government revenue which consists to total current and capital receipts of the government, C is the total consumption, I is the gross investment which is actually the sum of the private investment I_p and the government investment I_g, F is the net capital inflow, E is the total export of goods and services, G is the government expenditure and Z is the net public revenue. Equation (i) is described in the first chapter but for quick

1. Weiskopf, T. E (1972) : An econometric test of alternative constraints on the growth of underdeveloped countries, Review of Economics and Statistics. pp 67- 78

reference ψ is the instantaneous accelerator, an output investment linkage, which is common in the developing countries. A positive ρ signifies that public investment crowds in private investment and a negative ρ reflect the idea of 'crowding out' either from the financial market or from the foreign exchange market.

Now the ex-ante saving which is the domestic savings potential available for investment, although not necessarily realized is determined by the following behavioral function.

$$S^* = a + b\,Y + c\,F + d\,E \qquad (5)$$

The ex-ante import defined as the minimum level of import required for sustaining the current level of production and investment is given by

$$M^* = \alpha + \beta\,Y + \gamma\,I \qquad (6)$$

And ex ante the net government receipts can be defined by the behavioral relationship

$$Z^* = \varsigma + \eta Y + \tau\,F + \varepsilon\,I_g \qquad (7)$$

Equation (5) and (6) is directly borrowed from Weisskopf's model. Equation (7) is added to study the behavior of the government sector. The functional dependence of Z^* on Y is positive, i.e. because an increase of output will increase the net tax receipt of the government for a given tax rate. An increase of the net foreign capital inflow can be devoted either for domestic consumption or it can be directly invested or it can be used by the government to meet its balance. So an increase in the net foreign transfer will be matched by corresponding decline in domestic savings or a decline in the net revenue required by the government to meet its expenditures. Therefore τ is negative. Finally an

increase in government investment (or the capital expenditure of the government) will reduce net government receipt. Thus ε is negative.

At this stage there are thirteen variable Y, C, I, G, M, W, E, I_g, F, S, S^*, M^*, Z^* and seven equations leaving six degrees of freedom. Two of these degrees of freedom can be closed by treating exports and net foreign capital inflows as exogenously determined parameters.

So,

$E = \bar{E}$ (8)

$F = \bar{F}$ (9)

The remaining four d.f are limited by four inequality constraints.

$S \leq S^*$ (10) Actual savings cannot exceed potential savings

$M \geq M^*$ (11) Actual imports must be at least equal to required imports.

$Z \leq Z^*$ (12) Net public revenue cannot exceed potential revenue determined by the activity level of the economy.

$Y \leq \bar{Y}$ (13) The gross domestic product cannot exceed the exogenously given productive capacity of the economy

In order to study the implication of the model as set by equations (1) to (13), it is helpful to express it in a reduced form. The end result is that set of four inequality constraints (10) to (13) are expressed in term of two endogenous variable, I and Y and four exogenous variable $\bar{Y}$, $\bar{F}$, $\bar{E}$ and $\bar{Z}$.

These equations are

$I \leq a + bY + (1 + c)\bar{F} + d\bar{E} + e\bar{Z}$ (10′)

$$I \leq -(\alpha/\gamma) - (\beta/\gamma)\, Y + (\beta/\gamma)\, \bar{F} + (1/\gamma)\, \bar{E} \qquad (11')$$

$$I \leq \varsigma' + \eta' Y + \tau' \bar{F} - \theta\, \bar{Z} \qquad (12')$$

$$Y \leq \bar{Y} \qquad (13')$$

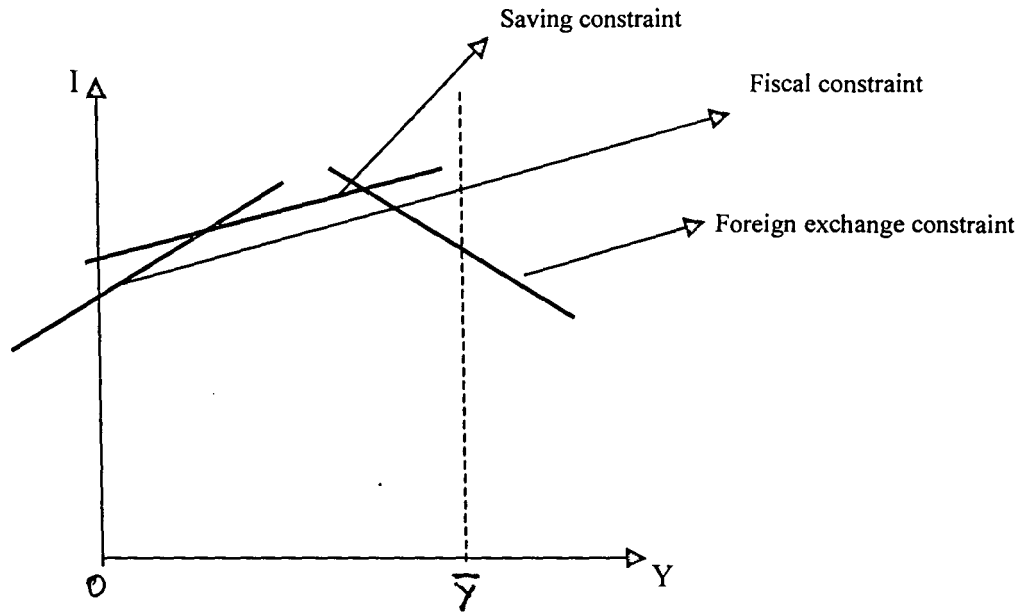
Equation $10'$ is derived by substituting equation (2) and (5) in equation (10). Equation $11'$ is derived by substituting equation (3) and (6) in equation (11). Equation $13'$ is derived by substituting equation (i) and (7) in equation (12). Now the equations $(10')$ $(11')$ $(12')$ are investment determined by saving, foreign and fiscal constraints together with them are the two non-negativity activity constraints.

$$I \geq 0 \qquad (14)$$

$$Y \geq 0 \qquad (15)$$

These inequalities define a feasible region in the I-Y plane. The size and shape of this feasible region varies with the values of the coefficient and exogenous parameters in the constraints. The most crucial parameter from this point of view is the exogenously given level of net foreign capital inflow $\bar{F}$. In the figure below 'I' is measured on the vertical axis and Y on the horizontal axis. Each of the six constraints is depicted as a straight line in the plane. Constraints (14) and (15) are the axes themselves. Constraint (13) is a vertical line crossing the Y axis at the potential output level. The saving constraint is given by the equation $(10')$ is a line of slope 'b'. Since 'b' is the marginal propensity to save it is presumable positive and less than unity. So the savings constraint is positively sloped. The fiscal constraint equation (12) also has positive slope is given by η'. For the sake of stability it can be assumed that investment determined by the fiscal constraint responds less then that by the savings constraint the $b|_s > \eta|_g$ (where 's' is the savings and

'g' is the fiscal sector). Thus, the savings constraint curve intersects the fiscal constraint curve from below. Finally the trade constraint curve (11′) for a given level of E and F is a line whose slope is -β/γ. β, γ represents import content on production and investment respectively. Therefore, they are non-negative and slope of the trade constraint is non-positive. Moreover the in equalities in (10) to (13) confine the feasible region in the area below the saving, trade and fiscal lines corresponding to the same level of $\bar{F}$. The precise shape of the feasible region varies parametrically with the level of $\bar{F}$.



Now our objective is to maximize either the net output or the investment given the constraint in the equations (10′) to (13′) and (14) and (15). Thus our problem boils to a standard Linear-programming problem. As the constraints themselves depend upon the amount of the foreign capital inflow they will shift as the $\bar{F}$ changes and this will determine various regimes. We can proceed by determining the corner points for the possible ranges of $\bar{F}$ and thereafter we can determine the optimizing point given the

maximizing criteria. All the possible configurations of F that will determine the breakpoints for the ranges of F are given below:

(1) F_A: - Saving and Foreign trade constraints at Y= $\bar{Y}$, i.e. at the intersection (10), (11), and (13)

(2) F_B: - Saving and Fiscal constraints intersect at Y= $\bar{Y}$, i.e. at the intersection of (10), (12), and (13)

(3) F_C: - Foreign and Fiscal constraints intersect at Y= $\bar{Y}$, i.e. at the intersection of (11), (12), and (13)

(4) F_D: - Saving and foreign trade constraints intersect at I=O, i.e. at the intersection of (10), (11), and (14)

(5) F_E: - Saving and fiscal constraints intersect at I=O, i.e. at the intersection of (10), (12), and (14)

(6) F_F: - Trade and fiscal constraints intersect at I=O, i.e. at the intersection of (11), (12), and (14)

(7) F_G: - Is determined where saving constraints intersect at Y=Y and I=O, i.e. at the intersection of (10), (13), and (14)

(8) F_H: - Is determined where Trade constraints intersect at Y=Y and I=O, i.e. at the intersection of (11), (13), and (14)

(9) F_I: - Is determined where fiscal constraints intersect at Y=Y and I=O, i.e. at the intersection of (12), (13), and (14)

The values of Fs that we get after solving these equations are:

$$F_A = \frac{(\alpha + \gamma a) + (\beta + b\gamma)Y + (\gamma d - 1)E + eZ}{1 - \gamma(1 + c)}$$

$$F_B = \frac{(a - \zeta') + (b - \eta')Y + dE + (e + \theta)Z}{\tau' - (1 + c)}$$

$$F_c = \frac{(\alpha + \gamma\zeta) + (\eta'\gamma + \beta)Y - \theta\gamma Z - E}{1 - \gamma\tau}$$

$$F_D = -\frac{(b\alpha - \beta a) - (b + \beta d)E - \beta c Z}{b + \beta(1 + c)}$$

$$F_E = -\frac{(a\eta' - \zeta' b) + d\eta' E + (e\eta' + \theta)Z}{\tau' b - (1 + c)\eta'}$$

$$F_F = \frac{(\alpha\eta' - \zeta') - \eta' E + \theta\beta Z}{\beta\tau' + \eta'}$$

$$F_G = -\frac{\alpha + bY + dE + eZ}{1 + c}$$

$$F_H = \alpha + \beta Y - E$$

$$F_I = -\frac{\zeta + \eta' Y + \theta Z}{\tau'}$$

We have the following parametric constraints

$-1 \leq c \leq 0$

$d \geq 0$

$e \geq 0$

$\beta \geq 0$

$1 \geq \gamma \geq 0$

$0 \leq \eta' \leq 1$

$b > \eta'$

$\theta \geq 0$

$\tau \leq 0$

$\varepsilon \leq 0$

By considering the above parametric constraints we can rank the Fs. Before the ranking there are two points that should be mentioned. Firstly, the points F_A and F_D lie outside the feasible region. F_A and F_D are the intersection points of the saving constraint and the foreign exchange constraint. Since, the saving constraint line is steeper than the fiscal constraint line, the intersection of the saving constraint line and the foreign constraint line is above the feasible region. Secondly, we will only consider the case where there is net inflow of foreign capital. Under the case where there is net outflow of capital then we can outright reject the case of the existence of a dominant foreign exchange constraint. In that case we can presume that it is only either the fiscal constraint or the saving constraint which limits the growth and even not both of them simultaneously. So F_G and F_I are rejected for ranking. The sequence of alternative boundaries to the feasible region depends upon the level of F. It can be demonstrated algebraically that as long as the level of $\bar{F}$ remains positive

$F_B > F_C > F_E > F_H > F_F$

Hypothesizing a maximization criterion and given the pattern of alternative feasible region for the various ranges of F it is possible to categorize a set of cases into which the capital receiving countries can be classified. The classification is given in the table below.

Table 3.1

Sl.no	Levels of F	Maximizing Criteria	Operating Constraint			Cases	Stability	
			Saving	Fiscal	Foreign		Stable	Unstable
1.	$F > F_B$	Maximizing both I and Y	✓			CASE A	✓	
2.	$F_B > F > F_C$	Maximizing both I and Y		✓		CASE B	✓	
		Non Optimal corner solution	✓	✓		CASE C		✓
3.	$F_C > F > F_E$	Non Optimal corner solution	✓	✓		CASE C		✓
		Maximizing I		✓	✓	CASE D	✓	
		Maximizing Y			✓	CASE E	✓	
4.	$F_E > F > F_H$	Maximizing I		✓	✓	CASE D	✓	
		Maximizing Y			✓	CASE E	✓	
5.	$F_H > F > F_I$	Maximizing I		✓	✓	CASE D	✓	

From the table above it is clear that there are five distinct cases. Under Case A only the savings constraint is binding. Under Case B only the fiscal constraint is binding. Case C, where the saving and fiscal constraints are binding, is not a optimal solution even though it is a corner point. This is because the intersection of the fiscal constraint line and the foreign constraint line ensures higher investment and output both. If an economy is operating under this condition then it has excess capacity in the economy, which is not economically used. Case D arises when investment is being maximized both the fiscal and foreign exchange constraints are binding. In case E that arises when output is being maximized only foreign exchange constraints are binding. The investment functions for

each of the five cases can be obtained by solving the system of equations corresponding to the relevant binding constraints in each case. For Case A, B and E the other equation that is used to solve the simultaneous equation is equation (13′). Each pair of equations involves the two endogenous variables, I and Y, that can be solved for I by substituting out Y. The investment equation under each case is given by

CASE A:- Here only savings constraint is binding.

$$I = a + b\ \bar{Y} + (1+c)\ \bar{F} + d\ \bar{E} + e\ \bar{Z}$$

CASE B:- Here only fiscal constraint is binding.

$$I = \zeta' + \eta' Y + \tau' F - \theta\ Z$$

CASE C:- Here savings and fiscal constraints are binding.

$$I = \frac{\eta' a - b\zeta'}{\eta' - b} + \frac{\eta'(1+c) - b\tau')}{\eta' - b} F + \frac{\eta' e + \theta b}{\eta' - b} Z + \eta' dE$$

CASE D:- Here fiscal and foreign exchange constraints are binding.

$$I = \frac{\beta\zeta'}{\eta'\gamma + \beta} + \frac{\eta' + \beta\tau'}{\eta' + \beta} F + \frac{\eta'}{\eta'\gamma + \beta} E - \frac{\theta\beta}{\eta'\gamma + \beta} Z$$

CASE E:- Here foreign exchange constraint only is binding.

$$I = -\frac{\alpha}{\gamma} - \frac{\beta}{\gamma} Y + \frac{1}{\gamma} F + \frac{1}{\gamma} E$$

A priori knowledge about the sign and range of the original coefficient a, b, c, d, e, α, β, γ, ζ', η', τ', θ', which has been spell out before, enables us to determine the corresponding

sign of the for the new investment function. The sign of the coefficients of the investment function applicable in each case are displayed in the Table 3.2 below.

Table 3.2

Sign of the coefficient of the investment function under each case.

	Y	F	E	Z
CASE A	≥0	≥0	≥0	≥0
CASE B	≥0	≥0	-	≤ 0
CASE C	-	<0	≥0	≤ 0
CASE D	-	≥0	≥0	≤ 0
CASE E	≤ 0	≥0	≥0	-

"-" : The variable considered is not relevant in that case.

The test applied to any given time series involves four separate regressions with investment as a dependent variable. In the first case the independent variables are GDP, Net transfer from abroad (this is the difference between Import and export), exports and fiscal deficit. In the second case the independent variables are GDP, Net transfer from abroad and fiscal deficit. In the third case the independent variables are Net transfer from abroad, and fiscal deficit. In the fourth case the independent variable is GDP, Net transfer from abroad, and exports. In each case the numerical value of the estimated coefficient is to be checked for consistency with the range as given in the above table. A measure of the degree of consistency of each estimate is the confidence with which one can reject the null hypothesis that the estimated coefficient is equal to the cut off value that defines the appropriate signs. Thus one can set a minimum standard for accepting a set of estimated coefficients as consistent to the corresponding gap by specifying the level of confidence for rejecting the null hypothesis.

Before proceeding to an application of this test a few points should be noted. Firstly the test described above will not necessarily assign every country to one of the

five cases. Time series data for some countries may not be consistent with any of the five cases. Alternatively, the time series data may be consistent with more than one of these cases. It remains to be seen just how successfully a sample of countries can be classified by these criteria. Furthermore, each test relates not only to a particular country but also to a particular time period. It is quiet conceivable that a single country might have passed through phases corresponding to different cases over the course of time. If a given set of time series data has spanned a period involving such phase shift one would expect result that were either inconclusive or possible consistent with more than one case. So one can get rid of the problem by breaking the entire time span into smaller sub-periods. This kind of experiment may lead to discovery of a period during which the a country classified as one case or another.

Methodology:

The test described above is applied to data from a sample of 26 underdeveloped countries of the ESCAP region and African countries. Value for all the relevant variables were compiled originally at current domestic prices and subsequently converted to constant prices by deflating them with their relevant price index. Weisskopf in his paper has used single gross domestic deflator of each country to convert the current prices of each variable to constant prices. This method has a serious problem. If we are deflating each variable (both the dependent and independent) with a same deflator and regressing them then it boils down to regressing each variable in their current prices. So in my study I have used different price series to deflate different variable. The GDP at constant price was calculated by deflating by GDP deflator (of 1995 base). Investment, export and net

foreign transfer[1] from the abroad (i.e import minus export) were deflated by the Wholesale Price Index (WPI) (of 1995 base) and government's net revenue by the Consumer Price Index (CPI) (of 1995 base). For most of the African countries and for Myanmar countries the WPI series is not available. So in that case, beside GDP all other variables were deflated by the CPI. Before proceeding to carry out the regression upon which the constraint test is based, it is necessary to screen the data for each country to determine whether or not there was in fact a net inflow of foreign capital during the period under consideration. Of the 26 countries in the sample, only five (Iran, Indonesia, Malaysia, Singapore, Nigeria and Sierra Leone) showed persistent trade surplus and they were rejected from the test. Moreover, some countries had trade surplus in some period. They were ironed out while calculating the moving average. All The variable showed huge volatility is in order to reduce the volatility the regression were performed over the centered five year moving average of all the variables. The test results are shown in the table (Table 3.3) below.

The test has been carried out for each case separately. The first column of the test table gives the name of the country. The second column indicates the period for which the test has been run. The next thirteen columns show the regression result in a compact form. Each numerical entry shows the level of significance with which the coefficient is either accepted or rejected. The sign of each numerical entry signifies the sign of the coefficient from the regression, i.e. "+" if the coefficient is positive and "-" if otherwise. The meanings of the numerical entries are described below.

[1] Exports and net transfer from abroad should have been deflated by import price index, since there data are not available they are deflated by Wholesale Price Index.

4=> if the coefficient is significant at 50% level of significance

3=> if the coefficient is significant at 25% level of significance

2=> if the coefficient is significant at 10% level of significance

1=> if the coefficient is significant at 5% level of significance

5=> otherwise, i.e if the coefficient is insignificant at 50% level of significance

NC=> If the test result is not consistent with any of the cases.

Table 3.3

Country	Period	Case A				Case B			Case C & D			Case E			Holds
India	1971-83	+3	-4	+2	-2	+1	-4	-1	-3	+1	-1	+1	+3	+4	C
	1984-95	+1	-1	-3	5	+1	-1	-1	+4	+1	-1	+1	-1	-1	D
Pakistan	1971-83	5	+1	-3	5	5	1	+4	+1	-3	+4	+2	+1	-3	NC
	1984-96	-1	+2	+1	5	5	-1	-1	5	+1	-4	-1	+1	+1	E
Sri Lanka	1971-83	+1	5	-1	-1	+1	+1	-1	+1	+2	5	+1	+1	+3	B
	1984-95	-1	5	+1	-3	+1	+1	+1	+1	+1	+3	-1	+2	+1	E
Myanmar	1975-85	+1	+1	+1	+3	+4	+1	+4	+1	+2	-4	+1	+1	+1	A&D
	1986-96	5	5	-4	5	+2	5	5	5	-1	+2	+1	5	5	NC
Nepal	1977-85	5	+4	+4	-1	+2	+3	-1	+3	+1	-1	+1	5	-4	B&D
	1986-95	5	+4	+1	-1	+1	-3	+1	+3	+1	-1	+1	-4	+1	D
S-Korea	1972-84	+4	+1	+3	+1	+1	+1	+1	+1	+1	+1	5	+1	+4	A
	1985-96	+1	+1	-2	-3	+1	+1	-3	+1	+1	5	+1	+1	-2	B
Philippines	1971-83	5	+1	+1	5	+1	+1	5	+1	+1	-4	5	+1	+1	D
	1984-96	-1	+1	+1	-2	5	+1	5	+2	+3	5	-1	+1	+1	E
Thailand	1972-83	5	+1	+3	5	+1	+1	-4	+1	+1	5	+4	+1	+3	B
	1984-95	+4	+1	5	5	+1	+1	-4	+2	+2	5	5	+4	5	B
Botswana	1971-81	+1	-3	-3	-1	-4	-1	+4	+1	-3	+3	+3	5	-4	D
Burundi	1971-82	+3	+2	+1	+4	+1	-4	5	+1	+1	+4	+3	+3	+1	A
	1983-95	-1	+1	-4	+1	-1	+1	+1	5	+4	5	-3	+4	+1	E
Ethiopia	1971-82	+1	-3	-4	+2	+1	-4	+1	+4	+4	+4	+1	+1	-2	NC
	1983-94	+2	5	5	+1	+1	5	+1	5	5	+4	5	5	+4	NC
Ghana	1971-82	+1	+1	+1	5	-1	-3	-1	+1	+1	-1	+1	+1	+1	D
	1983-91	+2	+1	+1	+4	+2	5	+1	+1	+1	-4	+1	+1	+1	D
Kenya	1971-83	-1	+1	+1	+3	+3	+4	5	+1	+1	+2	-1	+1	+1	E
	1984-95	+1	+1	-2	5	+3	+1	-3	+1	-2	+2	+1	+1	-1	B
Morocco	1971-83	+2	+2	+3	-2	+1	+1	-1	+1	+1	5	5	+1	+1	B
	1984-95	-1	+1	+1	+2	+1	+4	5	+3	+2	-1	-1	+1	+1	D&E
Swaziland	1977-85	-1	+3	5	5	-1	+2	+4	5	5	5	-1	+3	+4	E
	1986-95	-3	+1	+1	-2	+1	+1	-4	+1	+1	-2	-4	+1	+1	B,D,E
Tanzania	1971-82	+4	+4	+1	-3	5	+1	+4	+3	+1	-1	+2	+1	+1	D
	1983-91	+3	-2	+1	5	+1	-3	-1	-3	+1	+2	+1	-1	+1	NC

Country	Period	Case A				Case B			Case C & D			Case E			Holds
Tunisia	1971-83	+3	+1	+2	5	+1	+3	-4	+1	+1	5	+4	+1	+2	B
	1984-95	+3	+1	5	+1	+1	+1	+1	+1	+1	+1	+4	+1	5	NC
Zambia	1976-84	5	5	+1	-1	-2	-4	-4	5	+1	-1	-4	+2	+1	E
	1985-94	-4	-4	5	+1	-2	-3	+1	5	+3	+1	-3	+1	+1	E
Zimbabwe	1981-91	+1	+1	-1	5	+1	+1	5	+3	+1	-4	+1	+1	-1	D

The entire period is divided into two sub-periods. The first sub period is from the initial year of seventies to some midyear of eighties. This was the period when there were two oil shocks. The second sub period was from some mid year of eighties to the nineties. There was statistical basis according to which we have divided the entire range. The break point has been decided by keeping two thighs in mind. Firstly, the first sub period spans the oil shocks and secondly the number of years remains roughly same in both the sub period. This will enable us to study whether there was any structural shift in the post oil crisis scenario among the developing nations. Since Botswana had consistent trade surplus in the second sub period it has been dropped from the analysis. In case of Zimbabwe there was data from 1978 so the analysis has been done from 1981 onwards.

Continued in the next page...

Table 3.4:

Result of Weisskopf's test for the Asian countries

Sub-Period 1	Sub-period 2
Case A	**Case A**
S-Korea	
Case B	**Case B**
Sri Lanka	S-Korea
Thailand	Thailand
Case C	**Case C**
India	
Case D	**Case D**
Myanmar	India
Nepal	Nepal
Philippines	
Case E	**Case E**
	Pakistan
	Sri Lanka
	Philippines
Non Conclusive	**Non Conclusive**
Pakistan	Myanmar

The result of the Weisskopf's test for the ESCAP economies is given in the above table (Table 3.4). It is clear from the table that according to the Weisskopf's test the Asian countries have undergone structural shift in the post oil crisis period.

S-Korea that was initially savings constrained during the first sub period but it was fiscally constrained during post oil crisis period. In case of Philippines the constraint shifted from foreign exchange gap to fiscal gap during the post oil crisis period. Sri Lanka was initially constrained by fiscal gap but in the later sub period it was constrained by foreign exchange gap. The result of Pakistan was inconclusive in the first sub period but it was constrained by foreign exchange gap during the post oil crisis period. The constraint that was operating in Nepal and Thailand did not change in the post oil crisis period. Nepal was constrained by foreign exchange gap and by fiscal gap and Thailand

was constrained by fiscal gap through out the time period under consideration. In case of India that there has been a shift from the sub optimal solution, where saving gap and fiscal gap was operating, to an optimal solution in during the post oil crisis period where fiscal gap and foreign exchange gap was operating.

The important finding form the test is that during the post oil crisis period foreign exchange gap was dominant among the ESCAP countries. In the first sub period there were only three out of the sample of total eight ESCAP countries were constrained by the foreign exchange gap. In these countries fiscal gap was also operating. These countries were Myanmar, Nepal, and Philippines. In the post oil crisis scenario five of the ESCAP countries (India, Nepal, Pakistan, Philippines and Sri lanka) were facing foreign exchange gap. Among these five economies two of them (India and Nepal) were further constraint by the fiscal gap.

Table 3.5: Result of Weisskopf's test for the African countries

Sub-Period 1	Sub-period 2
Case A	**Case A**
Burundi	
Case B	**Case B**
Morocco	Kenya
Tunisia	
Case D	**Case D**
Botswana	Ghana
Ghana	Morocco
Tanzania	Swaziland
	Zimbabwe
Case E	**Case E**
Kenya	Burundi
Swaziland	Zambia
Zambia	
Non Conclusive	**Non Conclusive**
Ethiopia	Ethiopia
	Tanzania
	Tunisia

The result of the Weisskopf's test for the African economies is given in the above table (Table 3.5). Among the sample of the African countries there has been no observable structural shift. This is because the test could not classify three countries (Ethiopia, Tanzania and Tunisia), out of the sample of ten African countries, into any one of the cases during the post oil crisis. So we could not draw any conclusion from the remaining countries. Even though a country-by-country observation shows that beside Ghana and Zambia there has been a shift in the binding constraint that is operating in the economy. In case of Burundi, savings gap was operating during the first sub period but foreign exchange gap was binding during the second sub period. Morocco was initially constrained by the fiscal gap but during the second sub period foreign exchange gap also became binding in addition to the fiscal gap. In case of Swaziland foreign exchange gap was binding during the first sub period but fiscal gap also became binding during second sub period. Foreign exchange gap was binding for Kenya during the first sub period but fiscal gap was binding during the post oil crisis scenario. Tanzania and Tunisia cannot be classified into any of the case during the post oil crisis period. But in the first sub period Tanzania was constrained by the foreign exchange gap and fiscal gap whereas Tunisia was constrained by the fiscal gap.

Thus from the Weisskopf test for the three gap analysis we could conclude that given the sample of the developing countries of ESCAP and the African there has been a observable structural shift among the ESCAP countries. A country-by-country analysis of Africa also shows that there has been a structural shift in these economies.

Result of the Weisskopf's Test																		
Dependent Variable: Investment																		
ESCAP Countries																		
		Case A					Case B				Case C and D				Case E			
		Y	F	E	Z	Cons	Y	F	Z	Cons	F	E	Z	Cons	Y	F	E	Cons
India																		
1971-82	Coeff	0.0555	-0.1661	0.4515	-1.2340	0.9716	0.1425	-0.2714	-0.9048	-1.3440	-0.2564	0.5997	-1.6063	2.5306	0.1945	0.4597	0.2422	-2.8812
	p-value	0.1470	0.4250	0.0080	0.0020	0.3500	0.0030	0.3790	0.0390	0.2470	0.2430	0.0000	0.0000	0.0000	0.0000	0.1100	0.2950	0.0130
	R-Squ	0.9990					0.9976				0.9987				0.9965			
1984-94	Coeff	0.3302	-0.2937	-0.3248	0.0632	-8.2399	0.2687	-0.1810	-0.2728	-7.0599	0.2591	1.3995	-1.7710	-1.9024	0.3199	-0.2772	-0.2719	-8.0711
	p-value	0.0000	0.0360	0.2270	0.8230	0.0000	0.0000	0.0480	0.0310	0.0000	0.2690	0.0000	0.0000	0.1590	0.0000	0.0100	0.0120	0.0000
	R-Squ	0.9997					0.9996								0.9997			
Pakistan																		
1971-83	Coeff	0.0232	1.1009	-0.3343	0.1957	0.7844	-0.0190	1.2297	0.5121	0.8886	1.2339	-0.2313	0.4435	0.9088	0.0371	1.0001	-0.3777	0.6843
	p-value	0.6030	0.0050	0.2240	0.7190	0.0230	0.5360	0.0020	0.3190	0.0110	0.0000	0.1860	0.1070	0.0000	0.0970	0.0000	0.1120	0.0000
	R-Squ	0.9955					0.9945				0.9953				0.9954			
1984-96	Coeff	-0.1206	0.4080	1.3102	-0.1762	0.9324	0.0186	-0.6596	-1.4395	1.3913	-0.053	0.6037	-0.381	0.9228	-0.124	0.4929	1.405	0.8798
	p-value	0.0030	0.0680	0.0000	0.5490	0.001	0.65	0.0110	0.0100	0.0050	0.8500	0.0230	0.4410	0.0160	0.0010	0.0050	0.0000	0.0000
	R-Squ	0.9957					0.9975				0.9875				0.9960			
Sri Lanka																		
1971-83	Coeff	0.5210	-0.0664	-0.3100	-1.2279	-488.15	0.3527	0.4094	-0.5333	-342.41	1.1365	0.3036	0.0189	59.236	0.3128	0.7175	0.1130	-290.64
	p-value	0.0000	0.6590	0.0050	0.0000	0.0000	0.0000	0.0080	0.0080	0.0010	0.0010	0.0910	0.9720	0.3360	0.008	0.001	0.215	0.0270
	R-Squ	0.9987					0.9950				0.9837				0.9928			
1984-95	Coeff	-0.9679	-0.2420	1.6539	-0.6323	1766.3	0.2586	1.7856	0.7152	-258.09	1.3325	0.3533	0.4343	176.07	-0.517	0.5218	1.0503	1064.9
	p-value	0.0150	0.6520	0.0050	0.1350	0.0090	0.0000	0.0000	0.0460	0.0270	0.0000	0.0000	0.1280	0.1120	0.0100	0.0900	0.0010	0.0080
	R-Squ	0.9979					0.9929				0.9948				0.9970			
Myanmar																		
1975-85	Coeff	0.0965	1.0511	1.4824	0.2104	-185.85	0.0419	2.4731	0.3953	138.48	2.437	0.8733	-0.3252	79.616	0.0822	1.2006	1.5374	-171.7
	p-value	0.0020	0.0100	0.0010	0.2340	0.0180	0.3310	0.001	0.3640	0.1040	0.0000	0.0980	0.2910	0.3060	0.0010	0.0030	0.0000	0.0240
	R-Squ	0.9988					0.9903				0.9926				0.9984			
1986-96	Coeff	0.0909	0.2219	-2.9248	1.0395	685.76	0.1979	-1.4601	-0.1952	-114.1	0.9552	-5.0259	2.2300	1400.6	0.1533	0.2432	-1.654	139.49
	p-value	0.5590	0.9460	0.4590	0.6500	0.5840	0.0100	0.5370	0.8980	0.8550	0.741	0.009	0.054	0.0010	0.049	0.937	0.518	0.652
	R-Squ	0.9182					0.9097				0.9130				0.9151			

Dependent Variable: Investment																		
		Case A					Case B				Case C and D				Case E			
		Y	F	E	Z	Cons	Y	F	Z	Cons	F	E	Z	Cons	Y	F	E	Cons
Nepal																		
1977-85	Coeff	0.0223	0.1113	0.5527	-0.8517	40.045	0.1057	0.1223	-0.6593	18.582	0.1168	0.6646	-0.9127	49.368	0.3071	0.0008	-0.654	-101.4
	p-value	0.8100	0.2860	0.3310	0.0260	0.4140	0.0600	0.2410	0.0150	0.6640	0.2010	0.0300	0.0000	0.0790	0.001	0.996	0.349	0.014
	R-Squ	0.9996					0.9970				0.9977				0.991			
1986-95	Coeff	-0.0109	0.1358	0.6401	-0.7815	76.788	0.3916	-0.4978	0.6265	-221.14	0.1145	0.6241	-0.7465	68.792	0.1955	-0.178	0.3088	-70.7
	p-value	0.8590	0.3780	0.0010	0.0120	0.1360	0.0000	0.1890	0.0080	0.0010	0.1790	0.0000	0.0000	0.0000	0.0030	0.4250	0.0000	0.1030
	R-Squ	0.9995					0.9947				0.9955				0.9981			
S.Korea																		
1972-84	Coeff	0.2997	3.0527	0.3998	6.3505	-157.13	0.4219	3.0194	6.4856	-196.6	3.075	1.3671	5.8621	-58.755	-0.169	1.0425	1.4255	41.587
	p-value	0.2880	0.0000	0.6530	0.0010	0.1090	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0010	0.0010	0.7350	0.0360	0.4030	0.7910
	R-Squ	0.9964					0.9963				0.9958				0.9846			
1985-96	Coeff	0.5256	0.6467	-0.1384	-0.8129	-443.97	0.4606	0.8736	-0.9206	-377.04	2.6031	0.9435	-1.582	127.09	0.5301	0.6572	-0.1488	-445.30
	p-value	0.0000	0.0030	0.0880	0.1780	0.0000	0.0000	0.0000	0.1830	0.0000	0.0000	0.0000	0.6180	0.0750	0.0000	0.0030	0.0810	0.0000
	R-Squ	0.9995					0.9992				0.9804				0.9933			
Philippines																		
1971-83	Coeff	0.0030	1.4328	0.9290	-0.3470	-0.1845	0.2795	1.0193	0.6168	-0.8933	1.4394	0.9368	-0.3644	-0.1732	0.0408	1.3245	0.8703	-0.3790
	p-value	0.9780	0.0010	0.0170	0.6630	0.6940	0.0030	0.0140	0.5360	0.1260	0.0000	0.0000	0.4310	0.4330	0.5240	0.0000	0.0100	0.0190
	R-Squ	0.9949					0.9892				0.9949				0.9948			
1984-96	Coeff	-0.3032	1.8073	0.2397	-0.9689	5.7607	-0.0524	1.3864	0.2692	3.2889	1.0950	0.0743	0.0680	2.1885	-0.215	1.4632	0.1701	5.0892
	p-value	0.0030	0.0000	0.0020	0.0600	0.0000	0.5530	0.0030	0.6800	0.0280	0.0000	0.2290	0.9150	0.0000	0.0150	0.0000	0.0070	0.0010
	R-Squ	0.9942					0.9792				0.9817				0.9909			
Thailand																		
1972-83	Coeff	0.0654	0.7286	0.6421	-0.3407	0.2783	0.1980	0.7236	-0.4861	0.0690	0.7303	0.9406	-0.3526	0.3892	0.0672	0.7757	0.6919	0.2713
	p-value	0.5080	0.0040	0.1890	0.5550	0.1710	0.0000	0.0040	0.4230	0.5800	0.0020	0.0000	0.5250	0.0020	0.4770	0.0010	0.1350	0.1590
	R-Squ	0.9985					0.9980				0.9984				0.9984			
1984-86	Coeff	0.4312	1.2141	0.0202	-0.1130	-3.5278	0.4429	1.2034	-0.1162	-3.651	1.6063	0.7649	0.0079	1.0263	0.2541	1.3407	0.3236	-1.6331
	p-value	0.3120	0.0120	0.9770	0.5220	0.4270	0.0000	0.0000	0.3580	0.0000	0.0000	0.0000	0.9520	0.0000	0.4030	0.0020	0.5360	0.6030
	R-Squ	0.9995					0.9995				0.9994				0.9995			

Dependent Variable: Investment																		
African Countries																		
		Case A					Case B				Case C and D				Case E			
Botswana		Y	F	E	Z	Cons	Y	F	Z	Cons	F	E	Z	Cons	Y	F	E	Cons
1971-81	Coeff	0.9704	-1.4955	-0.7369	-2.9719	-2.7831	0.4695	-0.6204	-2.8290	-2.7933	0.5033	0.5278	-1.7538	-1.6963	0.6288	-0.5772	-0.6357	2.1036
	p-value	0.0220	0.1190	0.1430	0.0290	0.2700	0.0060	0.4140	0.0460	0.3140	0.4900	0.0470	0.2610	0.6290	0.1740	0.6070	0.3390	0.3610
	R-Squ	0.9650					0.9419				0.8985				0.9073			
Burundi																		
1971-82	Coeff	0.1777	0.7418	0.7329	1.2786	-401.54	0.6090	-0.3775	1.1499	-846.75	1.1563	0.9623	1.0646	-190.45	0.1613	0.5503	0.7277	-339.68
	p-value	0.1810	0.0720	0.0040	0.3070	0.0310	0.0000	0.3590	0.5840	0.0020	0.0010	0.0000	0.4140	0.0050	0.2170	0.1130	0.0040	0.0420
	R-Squ	0.9924					0.9739				0.9900				0.9911			
1983-95	Coeff	-0.486	0.7413	-0.398	4.82	1674.1	-0.4696	0.7353	4.3616	1519.5	0.0119	1.1554	1.1349	84.719	-0.2649	0.7897	2.2061	322.80
	p-value	0.0000	0.0010	0.4560	0.0000	0.0000	0.0000	0.0010	0.0000	0.0000	0.9740	0.4080	0.5180	0.8400	0.0310	0.0430	0.0110	0.2420
	R-Squ	0.9365					0.9322				0.4414				0.6419			
Ethiopia																		
1971-82	Coeff	1.3565	-1.8614	-1.3896	3.1105	-64.390	1.1082	-0.396	3.8524	-89.42	1.4335	1.4998	2.592	-20.51	1.2795	-3.6405	-2.6702	-9.9006
	p-value	0.0140	0.2720	0.3630	0.0970	0.1980	0.0090	0.3660	0.0270	0.0430	0.4440	0.3970	0.3140	0.7590	0.0270	0.0360	0.1040	0.8140
	R-Squ	0.724					0.7071				0.3459				0.6072			
1983-94	Coeff	0.5084	-0.573	0.4073	3.5623	1.3551	0.4972	-0.204	3.737	7.2586	0.4972	-0.204	3.737	7.2586	0.0896	-0.543	1.3014	6.5091
	p-value	0.0540	0.6100	0.7130	0.0370	0.9590	0.0420	0.6590	0.0170	0.7100	0.0420	0.6590	0.0170	0.7100	0.6510	0.7080	0.3490	0.8470
	R-Squ	0.6741					0.6741				0.6672				0.3862			
Ghana																		
1971-82	Coeff	0.0375	0.8782	0.5056	-0.0019	-1092.5	-0.2163	-0.7019	-1.7695	8438.3	0.7389	0.4443	-0.2491	266.11	0.0378	0.8795	0.5061	-1102.2
	p-value	0.0430	0.0000	0.0000	0.9860	0.0900	0.0010	0.2930	0.0000	0.0000	0.0010	0.0000	0.0000	0.0260	0.0000	0.0000	0.0000	0.0000
	R-Squ	0.9977					0.8857				0.9957							
1983-94	Coeff	0.1154	0.2173	0.3409	0.0715	-3677.2	0.3391	0.0820	0.4184	-12293	0.3237	0.4901	-0.0813	863.47	0.0842	0.2392	0.3881	-2493.1
	p-value	0.0670	0.0180	0.0060	0.4240	0.1130	0.0010	0.5420	0.0150	0.0020	0.0020	0.0000	0.3270	0.0020	0.0350	0.0050	0.0000	0.0950
	R-Squ	0.9996					0.9969				0.9990				0.9995			
Kenya																		
1971-83	Coeff	-0.286	0.9125	131.48	0.552	945.26	0.2274	0.4636	0.3291	402.44	0.5687	87.507	0.9727	648.09	-0.352	0.9572	128.45	984.55
	p-value	0.0490	0.0030	0.0010	0.2300	0.0000	0.2030	0.2960	0.7250	0.0650	0.0170	0.0020	0.0770	0.0000	0.0150	0.0020	0.0010	0.0000
	R-Squ	0.9957					0.7748				0.9236				0.9472			
1984-95	Coeff	0.1446	0.5017	-11.917	0.1240	560.43	0.0665	0.9348	-0.582	466.35	0.6821	-6.666	0.6276	1132.3	0.1508	0.5213	-11.33	497.01
	p-value	0.0000	0.0000	0.0000	0.5300	0.0010	0.2170	0.0000	0.1880	0.1320	0.0030	0.0830	0.1510	0.0000	0.0000	0.0000	0.0000	0.0000
	R-Squ	0.9827					0.8741				0.8941							

Dependent Variable: Investment																		
		Case A					Case B				Case C and D				Case E			
Morocco																		
1971-83	Coeff	0.0655	0.5642	0.1394	-0.578	0.0482	0.0918	0.3389	-0.829	0.0481	1.0551	0.3363	-0.081	0.0866	0.0070	1.0900	0.3608	0.0751
	p-value	0.0690	0.0540	0.2910	0.0650	0.1250	0.0020	0.0490	0.0010	0.1260	0.0000	0.0080	0.6110	0.0090	0.7060	0.0000	0.0020	0.0370
	R-Squ	0.9992					0.9990				0.9986				0.9986			
1984-95	Coeff	-0.6483	0.7510	1.7811	2.0672	1.3435	0.3942	1.2461	-1.324	-0.897	1.3510	1.1805	-1.0554	-0.4639	-0.1930	1.0656	1.2404	0.1646
	p-value	0.0080	0.1830	0.0000	0.0590	0.0330	0.3300	0.4760	0.6330	0.5310	0.1450	0.0020	0.1530	0.0950	0.0380	0.0440	0.0000	0.4370
	R-Squ	0.9560					0.4296				0.8456				0.8942			
Swaziland																		
1977-85	Coeff	-0.479	0.1515	0.1484	0.3493	15.368	-0.479	0.1679	0.4687	18.174	0.0930	0.2000	-0.8905	3.1747	-0.4664	0.1459	0.2694	12.535
	p-value	0.0040	0.1800	0.7620	0.6430	0.1590	0.0010	0.0650	0.4230	0.0000	0.7310	0.8800	0.6470	0.8990	0.0010	0.1490	0.4860	0.1050
	R-Squ	0.9029					0.9004				0.0783				0.8968			
1986-95	Coeff	-0.1886	0.4214	0.6226	-0.3818	-2.5846	0.3835	0.7617	-0.3421	-6.9667	0.5383	0.4198	-0.356	-4.113	-0.1526	0.6541	0.6030	-3.8610
	p-value	0.1980	0.0230	0.0060	0.0550	0.0770	0.0000	0.0130	0.3200	0.0020	0.0030	0.0000	0.0770	0.0000	0.4100	0.0020	0.0180	0.0360
	R-Squ	0.9971					0.9850				0.9958				0.9934			
Tanzania																		
1971-82	Coeff	0.1444	0.4197	0.8442	-1.095	-2.862	0.0531	1.6771	0.8223	1.5689	0.4534	0.8238	-1.4237	-1.5271	0.3004	0.8541	0.6410	-3.3407
	p-value	0.4120	0.3050	0.0030	0.1410	0.1460	0.8650	0.0070	0.3990	0.5690	0.2570	0.0020	0.0290	0.1040	0.080	0.022	0.004	0.117
	R-Squ	0.9279					0.772				0.9200				0.8996			
1983-91	Coeff	0.5017	-0.254	1.7895	0.2385	-6.1002	2.7735	-0.5446	-3.1645	-39.776	-0.124	2.0627	0.8551	1.2312	0.621	-0.27	1.7103	-7.962
	p-value	0.2270	0.1020	0.0010	0.6870	0.3020	0.0110	0.2410	0.0460	0.0110	0.2090	0.0000	0.0720	0.0570	0.0270	0.0500	0.0000	0.0280
	R-Squ	0.9980					0.9672				0.9969				0.9979			
Tunisia																		
1971-83	Coeff	0.1351	0.9538	0.2871	-0.2117	-1.3238	0.3313	0.6039	-0.497	-7.879	1.2229	0.4537	-0.1470	3.5084	0.1307	1.0434	0.3038	-1.2700
	p-value	0.2650	0.0290	0.0970	0.7030	0.7530	0.0000	0.1180	0.4240	0.0130	0.0020	0.0000	0.7940	0.0010	0.2480	0.0030	0.0560	0.7480
	R-Squ	0.9982					0.9973				0.9978				0.9982			
1984-95	Coeff	0.1196	1.7890	0.0206	0.9608	8.9716	0.1318	1.7979	0.9619	8.3225	1.7020	0.2088	1.0034	16.285	0.1627	1.7600	0.1391	-8.2635
	p-value	0.1450	0.0000	0.8670	0.0010	0.1220	0.0000	0.0000	0.0000	0.0330	0.0000	0.0000	0.0000	0.0000	0.4280	0.0000	0.6740	0.4920
	R-Squ	0.9912					0.9911				0.9878				0.9341			
Zambia																		
1976-84	Coeff	-0.0280	0.1354	0.8006	-0.9367	-9170.6	-0.3471	-0.7354	-0.9362	12806	0.1135	0.8316	-0.9655	-1051.3	-0.0760	0.579	0.801	-3256
	p-value	0.5720	0.5650	0.0000	0.0100	0.0230	0.0860	0.4780	0.3820	0.1320	0.5940	0.0000	0.0030	0.0000	0.4790	0.2390	0.0050	0.5410
	R-Squ	0.9896					0.7025				0.9887				0.9351			
1985-94	Coeff	-0.2089	-0.6823	0.1528	1.1054	1485.8	-0.2383	-0.8394	1.1790	1794.2	0.1179	0.6587	0.7007	428.75	0.2044	1.4779	1.4462	-1895
	p-value	0.2680	0.4310	0.8070	0.0340	0.3010	0.0780	0.1250	0.0020	0.0060	0.8200	0.1970	0.0150	0.9450	0.1710	0.0130	0.0490	0.0610
	R-Squ	0.8982					0.8969				0.8665							

Dependent Variable: Investment																		
		Case A					Case B				Case C and D				Case E			
Zimbabwe																		
1981-91	Coeff	0.5547	1.4535	-1.0779	0.0354	-18.828	0.2794	1.0041	0.3233	-24.033	0.3355	0.7559	-0.6430	-35.672	0.5533	1.4451	-1.0818	-19.116
	p-value	0.0010	0.0000	0.0250	0.9560	0.0380	0.0010	0.0030	0.6880	0.0310	0.1830	0.0270	0.4780	0.0190	0.0000	0.0000	0.0160	0.0060
	R-Squ	0.9844					0.9719				0.9416				0.9844			
Y= GDP/GDP deflator																		
F=Net transfer from abroad/WPI																		
E=Exports of goods and services/WPI																		
Z=Fiscal deficit/CPI																		

CHAPTER – IV

CHAPTER 4 :

An alternative test of three gap analysis

The short run test of Weisskopf's has some limitations. Firstly, according to the test there is a tradeoff between investment and output before full capacity output is reached. Increase in investment leads to a fall in output when import doesn't keep pace with domestic demand. But according to the neoclassical paradigm that emphasizes resource allocation rather than resource quality (see A. Harberger, 1983), a higher growth rate can be achieved by investment that shifts resources from a low productive to high productive sector even if the foreign exchange constraint is binding. Such a possibility is not captured in Weisskopf's test. Secondly, Weisskopf's test results in an uninterrupted membership in a single regime for an economy in the short run. No allowance was made of the fact that an economy can be in more than one regime during the period of estimation.

When the Weisskopf's test was generalized in the three-gap models there were other problems. According to the test there cannot be a case where saving and foreign exchange constraint holds simultaneously. But there is no theoretical logic why one shall consider so. Gersovitz (1982) used the Weisskopf's investment functions for testing the two-gap model by using the disequilibrium market model. Unlike Weisskopf's, Gersovitz used sector specific price deflator to deflate the nominal variable. The investment functions used by Gersovitz are:

$$I_1 = a + b\,(P_Y/P_I)Y + (1+c)(P_M/P_I)F + d(P_E/P_I)E + u$$

$$I_2 = (-\alpha/\gamma) - (\beta/\gamma)\,Y + (1/\gamma)\,F + (1/\gamma)(P_E/P_M)E - v$$

Where P_i denotes money price of respective goods.

The first equation is the investment determined from the saving constraint and the second equation is the investment determined from the foreign exchange constraint. The observed investment level is I is minimum of the two i.e.

$I = \min(I_1, I_2)$

This model can be generalized by incorporating the fiscal constraint investment level for testing the three-gap model. Unlike the formulation of Weisskopf's model the disequilibrium market model gives the leverage to calculate the probability of the existence of a constraint in a given period of time in an economy. A disequilibrium market model has its own problem. The existence of a constraint is determined by the sign restriction on the coefficients of the independent variables, and because the independent variables are the same in all the above two equations there will be an identification problem. Moreover one may raise a question regarding the stability of the ex-ante savings and import functions. This problem has forced us to search for an alternative methodology to test for the constraining factor under the three-gap analysis.

The Model :

The basic macro economic identities of the model in a simple form are

$Y + M + W = C + I + G + E$ ----------(1)

We can write the above expression in the form of

$Y = A + (G - W) + (E - M)$ ----------(2)

Where, A is domestic absorption.

G is the government expenditure that is the sum of capital and current expenditure, which consists of expenditure on defence, education, economic services, general public services and interest payment.

W is the sum of total revenue and grants. Total revenue consists of current and capital revenue of which current revenue is the sum of tax and non-tax revenue. Capital revenue comes from the sale of government's fixed assets.

So (G -W) is the government's overall surplus or deficit.

E is export and M is import.

So E-M is the trade surplus of the economy.

Let us assume that for an economy the capital account transaction consists only of gross disbursement and repayment and interest payment on loans and the current account consists of only the merchandise trade, then the net resource transfer will be identically equal to the merchandise trade balance. So

M-E (trade deficit) = F-J = N (say)

Where, F is the total foreign transfer to the economy and J is the interest payment both by the public and private sector on the accumulated foreign debt, so F- J is the net foreign transfer to the economy in a given period, and is denoted by 'N'. This is the financial counterpart of the net resource transfer. For a financially constraint economy this definition implies that a country must finance an excess of net international factor payments over net capital inflows by having a positive trade balance. Furthermore, if the net capital account disbursement is zero (i.e.. the existing loans are rolled over but no new loans are provided) then the economy must generate enough a large merchandise trade surplus to meet the interest payments. In that case the trade surplus represents an outward resource transfer in that domestic output must exceed absorption by an amount sufficient to service the external debt.

The relationship between the GDP growth rate and investment, net transfers and fiscal deficit can be obtained by using the national income accounting identity between income and spending plus the definition of net resource transfer. From equation (2) we get that

$$I = (Y-C) + (W-G) + N \text{----------} (4)$$

The right hand side is the total saving from the three sources namely the saving of the private sector, the government sector and the foreign sector. Thus equation (4) gives a simple macro economic identity of saving investment equality. So here we make a hypothesis that whenever the saving increases it increases investment and thus the growth rate. This is the simple case of saving constraint economy. But according to gap models the net foreign resource transfer has dual role. Apart from augmenting the saving it provides imported intermediate goods for production and imported capital goods for investment. So an economy that has a foreign exchange shortage cannot meet the demand of the imported intermediate goods and imported capital goods. Therefore other things remaining constant if the growth rate has a positive relationship between net foreign resource transfer then a foreign exchange gap is operating in the economy. In the three-gap model the role of the public sector has got special emphasis. According to it there are certain government expenditure that generates sufficient positive externality that crowds in private investment. Thus, other things remaining constant if the growth rate has a positive relationship between net government expenditure then a fiscal constraint is operating in the economy. Moreover in the developing economies export plays a positive role in promoting growth in the developing economies. According to the three gap model

g = f(S/Y, F/Y, N/Y)----------(5)

Ex-post saving is equal to investment I/Y is used as a proxy of S/Y

So empirically the three-gap approach for a country can be captured in the following empirical equation.

$$g = \alpha + \beta(I/Y) + \gamma(F/Y) + \delta(N/Y) + \eta(E/Y) + (\dot{M}/M - \dot{E}/E) \quad \text{----------(6)}$$

g is the growth rate of real GNP

I/Y is the domestic investment per unit of GDP

F/Y is the fiscal deficit per unit of GDP

N/Y is the Net foreign resource transfer per unit of GDP

E/Y is the export per unit of GDP.

M/M - E/E is the growth rate of foreign assistance.... In some of the literature it is consider as the proxy variable for the openness of the economy.

E/Y and $\dot{M}/M$ - $\dot{E}/E$ are included in the regression to see whether apart from the gaps these variables has contributed positively in the growth of the developing economy. Since these variables are outside the model they are included in the regression only after performing the omitted variable test.

The rationality of considering investment as an exogenous variable stems from the Harrod Domar growth equation. In the development literature there are a plethora of studies, which emphasize the role of investment in the growth process. Some economists (Meier (1995), Todarro(1994)) have emphasized that physical capital accumulation may be a necessary condition of development, but has not proved sufficient. Gillis et al. (1996) point out that "for countries, with an ICOR of 3, a necessary, but not sufficient condition for achieving sustained aggregate growth in output of 5 percent is securing capital resources equivalent to

15 percent of GDP." Thus, even if investment is a necessary condition for growth it is not a sufficient condition.

We have to prove the justification for treating net resource transfers as exogenous. The argument for treating net resource transfer as exogenous appears weak. Trade deficits are financed both by autonomous capital flows and by purely compensatory capital flows that arise in response to the short run variation of the deficit. The later is clearly endogenously related to the flow of export and import. However, the above argument cannot be taken to be decisive in determining the exogeneity or the endogeneity of the net foreign resource transfer. New financial flows to developing countries consist of official disbursements, private investment and loans. There is no reason to believe that private flows are dependent upon ones need of recipient country. The allocation of foreign aid is determined primarily by political and strategic factors that by no way relate to the rate of savings of the recipient country. In the long run a developing country cannot run a sustained trade deficit that will be financed by autonomous capital flow and by public foreign aid. A short run fluctuation of the deficit will be financed by compensatory short-term capital flows. Thus, in a given year a non-negligible part of the trade deficit consists of endogenously determined compensatory capital flow. In order to minimize the significance of this effect and thereby to establish the validity of the above assumption the model will be applied to five year moving averages with a lag of one period.

Rationality of including exports as an explanatory factor :-

Exports play a pivotal role in promoting growth in developing economies. During the last four decades export growth by volume and the diversification of

exports contributed enormously to the development of these countries. The hypothesis that exports are a key component of growth can be documented in terms of both the direct and the secondary beneficial impacts of export on economic growth.

An increase in the level of exports generally means the country can import more. This is particularly important for the developing nations that rely on the imports of capital goods for domestic investment. Also, development of the exportable sector enables a country to concentrate investment on the efficient sectors of the economy in which it has comparative advantage and take advantage of the scale economies resulting from catering to the larger international market. The necessity of remaining competitive in the international market is a pressure to keep costs low and to strive for more efficient operation. This competitive pressure leads to an improvement in the quality of exportables. In addition to the direct benefits, a dynamic export sector also produces substantial secondary benefits. This includes increases in investment, and flow of technical knowhow. Export led growth will raise both investment and savings so that capacity and productivity will grow without causing inflation. In the development literature there are two main models of export led growth. The first relates to the possibility that export growth may set up a virtuous circle of growth, such that once a country is launched on the growth path it maintains a competitive position in the world trade and performs continually better relative to other countries. This type of model can be used to explain the geographical dualism in the world economy Myrdal (1957). The second category of models stresses that export growth relieves a country from a balance of

payment constraint. Hence the faster export grows, the faster is the output growth that can be maintained without running into balance of payment difficulties.

The empirical evidences on the link between export performance and growth in today's developing countries is not unequivocal. Some studies of the role of export examine the export growth relation directly and others the import growth relation. The export-growth studies are of two types: time series for a single country and cross-section ones for a group of countries. In a fifty countries cross-section study Emery (1967) found a strong relation between average value of per capita income growth and export growth over a period of 1953-63. Syron and Walsh (1968) divided Emery's sample of countries in developed and underdeveloped countries and found the relation to be strong for both the group of countries. In the twenty countries studied by Stein (1971) for the period of 1961-66 there was a strong relationship between exports and imports and growth. A recent study by Salvatore and Hatcher (1991) of 26 countries for the period of 1963-85 found that export growth variable was significantly positive related to the growth of GDP for sixteen countries.

Testing Procedure:-

The Weisskopf test presumes uninterrupted membership of the economy in a given regime. Whereas the Gersovitz's disequilibrium market model for testing two gap analysis also presumes that at a given point of time a economy is constrained by a single structural bottleneck[1]. He recognized the fact that a country may shift from one regime to another during the time period under consideration. The disequilibrium market model enables us to calculate the probability of a

[1] Given by the equation that $I=\min(I_s, I_{fo})$, where I is the actual observed investment, I_s is the investment from the saving sector and I_{fo} investment generated from the trade side

economy being in a given regime. It by no means hints over the fact that more than one single constraint can plague an economy in a given period of time.

The technique that we are using in testing the three-gap model presumes that a country can be plagued by more than one gap in a given period of time. We assume that when a constraint is operating on an economy it prevent it from achieving its potential growth rate. Relaxing that constraint will increase the growth rate. Thus a positive marginal effect of a variable on growth shows that the economy is facing that constraint. In term of equation (6) a positive coefficient on the Investment output ratio shows a savings gap, a positive coefficient on government deficit shows a fiscal gap and a positive coefficient on net foreign transfer implies a foreign exchange gap.

Some Important Cases

Case 1: $\gamma, \delta, \eta, \lambda = 0$ and $\beta > 0$ The growth is saving constrained and one are in a Harrod Domar type situation.

Case 2: Either $\gamma, \delta, \lambda = 0$ and $\beta > 0$; $\eta > 0$ The growth rate is saving constraint, export led growth. Here higher export growth increases domestic productivity that increases domestic investment and growth.

Or

$\eta \cdot \cap$ this is an example of export led growth.

Case 3: $\mu, \lambda = 0$ and $\gamma > 0$ The growth rate is only fiscally constraint.

Case 4: $\beta, \gamma, \eta, \lambda = 0$ and $\delta > 0$ The growth rate is foreign exchange constraint.

Case 5: $\delta, \eta, \lambda = 0$ and $\beta > 0$ and $\gamma > 0$ The growth rate is constrained by savings and fiscal deficit

Case 6: $\beta, \eta, \lambda = 0$ and $\gamma > 0$ and $\delta > 0$ The growth rate is fiscally and foreign exchange constrained.

Case 7: $\gamma, \eta, \lambda = 0$ and $\beta > 0$ and $\delta > 0$ The growth rate is savings and foreign exchange constraint.

Case 8: $\beta > 0$, $\gamma > 0$, $\delta > 0$ The growth rate is savings, fiscally, and foreign exchange constrained.

Estimation Procedure:-

All the observations of the dependent variable, i.e. the growth rate of output, lie between –1 to 1. Because of this range restriction of the dependent variable, the Tobit model may seem appropriate. But a pre-requisite of the Tobit model is that the mass function concentrates at the limits, and real experience does not validate this. The observed growth rate of an economy seldom jumps beyond the 10% mark. So it is more judicious to use simple OLS estimation to determine the coefficients of the equation (6). Moreover as we work with five yearly moving averages of the growth rates, spikes in the variable will be ironed out. The estimation technique is as follows.

Steps in the estimation

Annual GDP growth rates have been calculated from 1965 onwards. The annual GDP growth rates vary considerably. To smoothen the data I have calculated the five year moving average for the annual GDP growth rate. The figure for I/Y, F/Y, E/Y and N/Y are arrived by dividing the current price values for Gross fixed capital formation, fiscal deficit, net resource transfer and export respectively

by GDP at current price. This took care of the scale effect and also of price fluctuations, though it does not take care of the changes in the relative prices. It is presumed that the return from the investment is realized with a lag so that the investment figure is lagged by one year. Thereafter for smoothing the data five yearly simple moving averages has been calculated for all the variables. The acceptance of a variable in the analysis is on the basis of the p-value and a benchmark of 5% and 10% level of significance is considered.

The E/Y variable and the openness proxy has been included after doing the omitted variable test. This test enables us to test whether any new set of variables to an existing equation has enough explanatory power explaining the variation in the dependent variable. The null hypothesis is that the additional sets of regressors are not jointly significant. The test was run for E/Y and the openness proxy variable separately. If the null hypothesis was rejected at 5% level of significance then the variable was included in the regression otherwise the variable was dropped. The output from the test is an F-statistic and a likelihood ratio (LR) statistic with associated p-values, together with the estimation results of the unrestricted model under the alternative. The F-statistic is based on the difference between the residual sums of squares of the restricted and unrestricted regressions. The LR statistic is computed as

$LR = -2 (L^r - L^u)$

where L^u and L^r are the maximized values of the (Gaussian) log likelihood function of the unrestricted and restricted regressions, respectively. Under, the LR statistic has an asymptotic distribution with degrees of freedom equal to the number of

restrictions, i.e. the number of added variables. We had incorporated the new set of variables only if we had rejected our null hypothesis.

I have used the Breusch-Godfrey Lagrange multiplier test to test for serial correlation and the ARCH LM test for heteroscedasticity of the error terms. The Breusch-Godfrey Lagrange multiplier test belongs to the class of asymptotic (large sample) tests known as Lagrange multiplier (LM) tests. Unlike the Durbin-Watson statistic for AR(1) errors, the LM test may be used to test for higher order ARMA errors, and is applicable whether or not there are lagged dependent variables. The null hypothesis of the Breusch-Godfrey Lagrange multiplier test is that there is no serial correlation up to lag order p, where p is a pre-specified integer. The local alternative is ARMA(r,q) errors, where the number of lag terms $p = \max\{r,q\}$. The test statistic is computed by an auxiliary regression as follows: suppose the model that has to be estimated is:

$$Y_t = X_t b + e_t$$

where e are the residuals. The test statistic for lag order p is based on the regression

$$e_t = X_t \gamma + \alpha_1 e_{t-1} + \alpha_2 e_{t-2} + \ldots + \alpha_p e_{t-p} + \nu_t$$

This is a regression of the residuals on the original regressors X and lagged residuals up to order p. This LM statistic is computed as the number of observations, times the R^2 from the test regression. Under quite general conditions, the LM test statistic is asymptotically distributed as a $\chi^2(p)$. The ARCH LM tests for the hetroscedasticity in the residual terms is computed by using the auxiliary regression

$$e_t^2 = \beta_0 + \beta_1 e_{t-1}^2 + \beta_2 e_{t-2}^2 + \ldots + \beta_p e_{t-q}^2 + \nu_t$$

The Engle's LM test statistic, computed as the number of observations times the R^2 from the test regression. The exact finite sample distribution LM test statistic is asymptotically distributed as a $\chi^2(q)$ under quite general conditions.

Since our time period of the analysis is more than twenty years, it is likely that the error terms are correlated. So in order to take care of the above problem I have estimated the model by incorporating suitable additional ARMA terms in the equation (6). The ARMA terms were fitted by observing the correlogram of residuals after estimating equation (6). This has enabled to get rid of the serially correlated error terms. We have tested up to the five lags for serial correlation and heteroscedasticity in the residuals. The p-value of the Breusch-Godfrey LM test and the ARCH LM test is reported in the appendix of the chapter. In some cases the heteroscedasticity in the error terms still remains after including the ARMA terms in the estimating regression. Since it is difficult to know the exact form of heteroscedasticity we have estimated the model by using White's Heteroscedasticity consistent standard error.

The results are continued in the next page:-

Results of the ESCAP countries:-

Countries	Savings	Fiscal gap	Forex Gap	Ex. Led	Openness
East Asia					
S-Korea	N	P**	N	N.Ac	N.Ac
Indonesia (wh)	-	P	P	N.Ac	N.Ac
Malaysia	P	P	-	P	N.Ac
Philippines	P	P	P	P	N.Ac
Singapore	N	P	N	-	N.Ac
Thailand	N	P .	P**	-	P
South Asia					
India	N	-	P	P	P
Iran	P**	P	-	N.Ac	N.Ac
Myanmar	P	P	P	N.Ac	P
Nepal	P	P	P	N	N.Ac
Pakistan (Wh)	P	-	-	N**	N**
Sri Lanka	-	P**	-	P	N.Ac
Pacific Island					
Fiji	-	P	-	P**	N.Ac

Results of the African Countries

Countries	Savings	Fiscal gap	Forex Gap	Ex. Led	Openness
Botswana	P	-	P	P	P
Burundi	P	-	N	N.Ac	N.Ac
Ethiopia	N	P	P	N	N.A
Ghana	-	P**	N	N.Ac	P
Morocco	N	N	-	P	N.Ac
Kenya	P	P	N	N	N.Ac
Nigeria	P	-	N**	-	N.Ac
Sierra Leone	N**	-	P**	P	N.Ac
Swaziland	N	-	P	N.Ac	N.Ac
Tanzania	N	P	P	N.Ac	N.Ac
Tunisia (wh)	-	P	-	N	N.Ac
Zambia	-	N	P	P	N.Ac

Notes

P: The coefficient is positive and significant at 5% level of significance

N: The coefficient is negative and significant at 5% level of significance

P**: The coefficient is positive and significant at 10% level of significance

N**: The coefficient is negative and significant at 10% level of significance

-: the value of the coefficient is insignificant at 5% level of significance.

N.Ac- The null hypothesis of omitted variable[2] test was accepted so the variable was not included in the regression

(*wh*)-The coefficient are estimated using White's Heteroscedasticity consistent standard error

[2] The null hypothesis of the omitted variable test is that the additional set of new variable is not jointly significant

From the estimation result we can see that the sample of East and Southeast Asian countries were predominantly constrained by fiscal gap in their growth process. This is evident from the development process of these economies. During the decade of seventies and eighties mostly all the governments of the southeast and east Asian economy embarked in the development process with strict government controls. The government of these economies not only took active role in developing infrastructure and social overhead capitals but also interfere in the financial market to allocate credit among the competing entrepreneurs. The development of the manufacturing base of these economies was strictly under the government control. So we see that a fiscal constraint is operating in these economies in the time period under consideration. Among the groups of south and southeast Asian countries South Korea, Singapore and Thailand are the high saver countries. Given the investment demand savings was not a binding constraint in their growth process for these economies. Moreover the government in these economies took active role in the credit market so there was not any problem regarding mobilization of saving to investment. In case of Thailand the export performance was not good in the initial years of the time period under the analysis. Even though the saving was high it was facing a foreign exchange constraint. Malaysia though it is a high saving country but the investment demand was so high that adequate saving was not coming to finance it. As a result savings constraint was operative. The increase in the investment demand was due to the development of their manufacturing sector during the decade of eighties. Moreover Malaysia received huge foreign direct investment, mainly from Japan, so foreign exchange gap was not a binding constraint. On the contrary Indonesia also received huge

foreign direct investment but due to their bad export performance foreign exchange gap became a binding constraint to their growth process. Philippines is the only country among the east and southeast Asian countries where all the three constraints are binding. Firstly Indonesia's saving performance was not good. Like other east and southeast Asian countries it could not tap the export market. As a result its growth process was constrained by all the three gaps. It is important to note from the estimation result that beside Thailand the openness proxy does not have sufficient explanatory power in explaining the growth among the east and southeast Asian economies. We cannot make any strong conclusion regarding this result. Beside the measure that I have used there are other measures of openness[3]. It is possible that the result might have differed if we had used other measure of openness.

Among the sample of the south Asian countries Iran, Myanmar, Nepal and Pakistan were constrained by savings gap in their growth process. Myanmar, Nepal and Iran had low saving rate to start with so it was operating as a constraint for investment. Moreover the export performance of Nepal and Myanmar was not strong enough to compensate for the low saving by inflow of net foreign transfer. The shortage of foreign transfer acted as a further binding due to unavailability of adequate foreign resources to set up a strong manufacturing sector. In the case of Nepal exports have negatively affected the growth rate. This is mainly because since the beginning of the eighties, Nepal tried to develop manufacturing export

[3] The other measures of openness a) to measure the simple trade flow, i.e. the sum of import and export as a proportion of GDP. b) One improved method is to use deviation of actual from predicted trade flow as developed by Syrquin and Chenery (1989). c) Another approach is by Leamer (1988) where he uses theoretical model to predict and pattern of volume of trade in absence of protection. Leamer then measure openness as a function of the extend to which actual trade deviates from pattern of trade predicted by the model.

like textiles. This raised investment requirements since Nepal has a saving constrained the increased investment demand was not fulfilled. So in order to boost the manufacturing export the output of the commodities in which it has comparative advantage was reduced and as a result the growth rate fell. This was not a problem for Iran because of its huge oil revenues. As a result Iran was not foreign exchange constrained in their growth process. The government of these economies had resorted to huge foreign borrowing. This resulted in debt overhang and the economies were fiscally constrained in their growth process. India's savings rate is usually high so it was never a binding constraint in its growth process. The foreign exchange happens to be a binding constraint due to its policy of import substitution industrialization, which it has embarked from the decade of fifties. Imports were restricted and as a result the capital goods industry could not grow. This became a serious impediment in the growth process of India prior to the decade of nineties. Fiji, which is the single pacific island country in our sample is fiscally constrained economy with export led growth.

In the case of the African countries the results are mixed one. Economies like Botswana, Ethiopia, Sierra leone, Swaziland Tanzania and Zambia are foreign exchange constrained. This result is in line with the findings of Ravenhill (1986) and Killick (1992). The shortage of foreign exchange seriously retarded the growth of these economies due to the shortage of the imported inputs. In the economies of Botswana, Burundi, Kenya and Nigeria savings was a constraint in their growth process. Countries like Ethiopia, Ghana, Kenya, Tanzania and Tunisia were fiscally constrained economies. The export sector has positively affected the growth rate in the countries like Botswana, Burundi, Morocco, Sierra Leone and Zambia. The

openness proxy has positively affected the growth rates in the countries like Botswana and Ghana. In fact Ghana that has recently abided by the IMF paradigm towards developing more market-oriented policies has significantly increased its growth rate. Beside these countries the openness proxy did not have sufficient explanatory power in explaining the growth of the other African countries included in our study.

The negative coefficient for the investment output ratio (i.e. the saving gap) and the foreign exchange gap in the estimation are disturbing and need to be explained. We could make out two discernible phenomena from the estimated result. Firstly, among the African countries like Ethiopia, Sierra Leone, Swaziland and Tanzania the foreign exchange gap is binding and the investment output ratio is inversely related to the growth rate. Secondly, among the east and southeast Asian like S-Korea and Singapore countries savings gap and the foreign exchange gap is negatively related to the growth rate. The first case can be explained in the following way. The export sector of these economies is mostly oriented towards commodity trade. There has been a secular decline of the terms of trade of this product resulting to the decline of output. This resulted in a severe foreign exchange constraint in these economies that is apparent from the positive coefficient of the net resource transfer. As a result the economy operated below the potential output capacity level due to the absence of essential imported inputs. As a result in these economies even if the saving was forthcoming and domestic investment was increasing it failed to counteract the decline in the reduction of output due to the terms of trade effect.

The law of the diminishing return can explain the second case. The economies that fall in the second case are relative developed. The increase in investment or imported intermediate inputs increases output in a diminishing rate. This results in the fall of the growth rate of output. Moreover in these economies the increase of investment or increased flow of imported inputs may result in inventory build up. This do not results in the growth of the output if the demand of the output is not forthcoming.

Regression Result of the ESCAP Countries										
Dependent Variable: GDP_GR										
Country	S-Korea		Indonesia		Malaysia		Philippines		Singapore	
	Sample: 1968-1997		Sample: 1968-1996		Sample: 1968-1995		Sample: 1969-1996		Sample: 1970-1995	
Variable	Coefficient	p-value	Coefficient	p-value (wh)	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
C	0.1958	0.0000	0.0991	0.0001	0.1330	0.0002	-2.0861	0.0107	0.1649	0.0000
I_Y	-0.3621	0.0000	-0.0445	0.5062	0.2391	0.0417	11.8752	0.0010	-0.2545	0.0040
DEF_Y	0.0191	0.0912	0.8300	0.0328	0.6434	0.0069	30.1838	0.0001	0.1469	0.0094
M_X_Y	-0.2431	0.0020	0.0000	0.0351	-0.1428	0.2739	0.0252	0.0000	-0.1058	0.0026
E_Y	-	-	-	-	-0.1598	0.0282	9.0145	0.0046	-	-
E_I_GR_A	-	-	-	-	-	-	-	-	-	-
MA(1)	0.5283	0.0165	0.9137	0.0000	0.9898	0.0000	-	-	-	-
AR(1)							0.4121	0.0470	1.5386	0.0000
MA(2)									-0.8323	0.0000
AR(2)									-0.9130	0.0000
R-squared	0.7942		0.6064		0.7200		0.8117		0.9557	
Adjusted R-squared	0.7599		0.5408		0.6564		0.7689		0.9417	
F-statistic	17.2805		9.2454		11.3151		18.9622		68.3136	
p-value(F-statistic)	0.0000		0.0001		0.0000		0.0000		0.0000	
Ommitted variable test for										
E_Y										
p-value of the log-likelihood	0.1741		0.6818		0.0420		0.0074		-	
E_I_GR_A										
p-value of the log-likelihood	0.2189		0.2345		0.1062		0.8902		0.8377	
Test for Serial Correlation	p-value		p-value		p-value		p-value		p-value	
Lag1	0.5753		0.1065		0.3222		0.9455		0.042481	
Lag2	0.4871		0.0642		0.4614		0.6048		0.123593	
Lag3	0.4769		0.1358		0.2015		0.6599		0.221090	
Lag4	0.5197		0.2352		0.2444		0.4345		0.272163	
Lag5	0.3196		0.065		0.0714		0.2242		0.158313	
Test for Hetroscedasticty	p-value		p-value		p-value		p-value		p-value	
Lag1	0.5067		0.6599		0.3609		0.9196		0.73307	
Lag2	0.7567		0.0133		0.4623		0.9474		0.18782	
Lag3	0.9527		0.0189		0.6044		0.9677		0.04879	
Lag4	0.9011		0.0501		0.7456		0.9748		0.06475	
Lag5	0.9431		0.1042		0.8566		0.9567		0.12744	

Regression Result of the ESCAP Countries										
Dependent Variable: GDP_GR										
Country	Thailand		India		Iran		Myanmar		Nepal	
	Sample: 1975-1995		Sample: 1968-1995		Sample: 1970-1995		Sample: 1972-1996		Sample: 1980-1995	
Variable	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
C	0.3307	0.0005	0.4805	0.0012	0.1807	0.1188	0.0879	0.0397	-0.0880	0.0000
I_Y	-1.1431	0.0187	-6.3040	0.0007	-0.5958	0.0760	0.7733	0.0142	1.1988	0.0000
DEF_Y	1.0781	0.0503	4.1799	0.0012	1.8006	0.0006	2.4047	0.0000	0.7250	0.0009
M_X_Y	1.4150	0.0001	-2.6311	0.2242	0.3818	0.1857	4.5960	0.0000	0.5608	0.0001
E_Y	0.2967	0.2123	8.0360	0.0000	-	-	-	-	-0.7149	0.0000
E_I_GR_A	-0.0092	0.0908	0.0322	0.0000	-	-	0.0077	0.0581	-	-
MA(1)	-	-	-0.9899	0.0000	-	-	0.9899	0.0000	-0.9899	0.0000
AR(1)	-	-	-	-	0.9222	0.0000	-	-	-0.3469	0.0493
MA(2)	-	-	-	-	-	-	-	-	-	-
AR(2)	-	-	-	-	-	-	-	-	-0.5137	0.0006
R-squared	0.6901		0.9680		0.8831		0.9041		0.9810	
Adjusted R-squared	0.6040		0.9466		0.8609		0.8789		0.9644	
F-statistic	8.0164		45.3342		39.6742		35.8361		58.9740	
p-value(F-statistic)	0.0004		0.0000		0.0000		0.0000		0.0000	
Ommitted variable test for										
E_Y										
p-value of the log-likelihood	0.0862		0.0557		0.1229		0.1042		0.0483	
E_I_GR_A										
p-value of the log-likelihood	0.0601		0.0244		0.0913		0.0252		0.1174	
Test for Serial Correlation	p-value		p-value		p-value		p-value		p-value	
Lag1	0.1765		0.1181		0.4416		0.1816		0.0190	
Lag2	0.1104		0.1369		0.1672		0.2192		0.5252	
Lag3	0.0378		0.1009		0.2479		0.3855		0.0823	
Lag4	0.0764		0.1138		0.3794		0.1563		0.0152	
Lag5	0.1280		0.1152		0.0436		0.0283		0.0103	
Test for Hetroscedasticty	p-value		p-value		p-value		p-value		p-value	
Lag1	0.8231		0.6320		0.4833		0.9878		0.8377	
Lag2	0.6111		0.6559		0.8512		0.4355		0.6557	
Lag3	0.5444		0.7381		0.9292		0.5598		0.524	
Lag4	0.5375		0.8370		0.9192		0.5907		0.671	
Lag5	0.5175		0.8612		0.8268		0.7354		0.6801	

Regression Result of the ESCAP Countries							
Dependent Variable: GDP_GR							
Country	Pakistan		Sri Lanka		Fiji		
	Sample: 1968-1996		Sample: 1970 1997		Sample: 1968-1995		
Variable	Coefficient	p-value(wh)	Coefficient	p-value(wh)	Coefficient	p-value	
C	-0.6190	0.0335	-0.0529	0.0001	-0.0488	0.6393	
I_Y	4.5767	0.0466	0.0520	0.4777	0.1357	0.5457	
DEF_Y	-0.1908	0.6734	-0.1189	0.0950	1.9195	0.0001	
M_X_Y	-1.5290	0.2411	0.0795	0.3950	0.1332	0.4636	
E_Y	-1.4688	0.0965	0.2906	0.0000	0.2663	0.0727	
E_I_GR_A	-0.0569	0.0361	-	-	-	-	
MA(1)	-	-	-	-	0.4101	0.0434	
AR(1)	-	-	-	-	-	-	
MA(2)	-	-	-	-	-	-	
AR(2)	-	-	-	-	-	-	
R-squared	0.4572		0.9051		0.7367		
Adjusted R-squared	0.3392		0.8886		0.6768		
F-statistic	3.8744		54.8156		12.3084		
p-value(F-statistic)	0.0108		0.0000		0.0000		
Ommitted variable test for							
E_Y							
p-value of the log-likelihood	0.0454		0.0000		0.0479		
E_I_GR_A							
p-value of the log-likelihood	0.0578		0.1387		0.7587		
Test for Serial Correlation	p-value		p-value		p-value		
Lag1	0.2487		0.1383		0.6619		
Lag2	0.3069		0.218		0.3066		
Lag3	0.2999		0.0742		0.1649		
Lag4	0.0531		0.1356		0.0752		
Lag5	0.0915		0.0195		0.0174		
Test for Hetroscedasticty	p-value		p-value		p-value		
Lag1	0.0086		0.5208		0.2377		
Lag2	0.0401		0.8539		0.1361		
Lag3	0.1104		0.1102		0.3011		
Lag4	0.1174		0.7834		0.8760		
Lag5	0.121		0.5944		0.6301		

Regression Result of the African countries										
Dependent Variable: GDP_GR										
Country	Botswana		Burundi		Ethiopia		Ghana		Morocco	
	Sample: 1968-1997		Sample: 1969-1996		Sample: 1968-1994		Sample: 1969-1996		Sample: 1968-1993	
Variable	Coefficient	p-value	Coefficient	p-value (wh)	Coefficient	p-value	Coefficient	p-value(wh)	Coefficient	p-value
C	-0.1750	0.0328	-0.0047	0.8334	0.1665	0.0005	0.0005	0.9906	0.0006	0.9872
I_Y	0.4002	0.0041	0.8883	0.0021	-0.4303	0.0133	1.2433	0.3070	-0.5100	0.0424
DEF_Y	-0.0895	0.6221	-0.6122	0.3423	1.5218	0.0000	1.0586	0.0550	-0.5849	0.0003
M_X_Y	0.2385	0.0077	-0.8784	0.0005	0.9826	0.0000	-2.2856	0.0467	0.0853	0.6937
E_Y	0.2789	0.0222	-	-	-0.6576	0.0035	-	-	0.5393	0.0260
E_I_GR_A	0.0395	0.0006	-	-	-	-	0.0098	0.0231	-	-
MA(1)	-	-	-	-			0.9990	0.0000	-	-
AR(1)	-	-	0.5227	0.0171			-	-	-	-
MA(2)	-	-	-	-			-	-	-	-
AR(2)	-	-	-	-						
R-squared	0.823749		0.7632		0.746576		0.8048		0.6107	
Adjusted R-squared	0.777367		0.7220		0.700499		0.7506		0.5366	
F-statistic	17.76019		18.5291		16.20277		11.3455		8.2364	
p-value(F-statistic)	0.000001		0.0000		0.000003		0.0007		0.0004	
Ommitted variable test for										
E_Y	0.0156		0.2828		0.0011		0.7745		0.012233	
p-value of the log-likelihood										
E_I_GR_A										
p-value of the log-likelihood	0.0001		0.5357		0.1559		0.0018		0.2155	
Test for Serial Correlation	p-value		p-value		p-value		p-value		p-value	
Lag1	0.1234		0.5873		0.3816		0.0808		0.7793	
Lag2	0.3052		0.6160		0.6267		0.2178		0.5952	
Lag3	0.1545		0.5994		0.7972		0.2698		0.5110	
Lag4	0.2167		0.6435		0.6716		0.0486		0.4017	
Lag5	0.1128		0.1392		0.1134		0.0779		0.1232	
Test for Hetroscedasticty	p-value		p-value		p-value		p-value		p-value	
Lag1	0.6390		0.4586		0.7279		0.6414		0.5431	
Lag2	0.7008		0.2564		0.9179		0.0065		0.8351	
Lag3	0.7939		0.3513		0.4810		0.0219		0.8716	
Lag4	0.8343		0.3115		0.6385		0.0914		0.9163	
Lag5	0.8836		0.2505		0.8070		0.1688		0.9208	

Regression Result of the African countries										
Dependent Variable: GDP_GR										
Country	Kenya		Nigeria		Sierra leone		Swaziland		Tanzania	
	Sample: 1973-1995		Sample: 1969-1991		Sample: 1968-1992		Sample: 1974-1995		Sample: 1968-1991	
Variable	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
C	-0.08775	0.00220	-0.0522	0.3157	0.3125	0.389	0.1882	0.0007	0.1424	0.0000
I_Y	1.41092	0.00010	0.4859	0.0357	-4.8002	0.093	-0.6207	0.0057	-0.2483	0.0011
DEF_Y	0.46003	0.03500	-0.6502	0.1117	0.9936	0.4538	0.2235	0.5442	0.8646	0.0000
M_X_Y	-0.99282	0.00070	-0.6570	0.0620	2.1583	0.086	0.2063	0.0101	-0.0341	0.0081
E_Y	-0.40365	0.00250	-0.2920	0.2191	1.2029	0.002	-	-	-	-
E_I_GR_A	-	-	-	-	-	-	-	-	-	-
MA(1)	-	-	-	-	-	-	-1.49124	0.0073	-	-
AR(1)	-	-	-	0.0000	-	-	0.762481	0.0000	-	-
MA(2)	-	-	-0.9800	0.0000	-	-	-	-	-0.9435	0.0000
AR(2)	-	-	-	-	-	-	-	-		
R-squared	0.6814		0.9264		0.4322		0.8101		0.8871	
Adjusted R-squared	0.6106		0.8988		0.3187		0.7508		0.8633	
F-statistic	9.6249		33.5601		3.8062		13.6510		37.3067	
p-value(F-statistic)	0.0002		0.0000		0.0185		0.0000		0.0000	
Ommitted variable test for										
E_Y	0.000529		0.0441		0.0001		0.1622		0.2334	
p-value of the log-likelihood										
E_I_GR_A										
p-value of the log-likelihood	0.143451		0.1875		0.8314		0.1874		0.9842	
Test for Serial Correlation	p-value		p-value		p-value		p-value		p-value	
Lag1	0.3757		0.3773		0.3524		0.2658		0.4023	
Lag2	0.6684		0.6563		0.2567		0.3247		0.4698	
Lag3	0.7804		0.7923		0.1248		0.1459		0.1002	
Lag4	0.7106		0.6654		0.5687		0.6589		0.0970	
Lag5	0.1471		0.1606		0.6247		0.2541		0.0883	
Test for Hetroscedasticty	p-value		p-value		p-value		p-value		p-value	
Lag1	0.6235		0.5887		0.6508		0.7344		0.4184	
Lag2	0.4058		0.7047		0.8017		0.9284		0.7328	
Lag3	0.6677		0.8864		0.4155		0.2763		0.8112	
Lag4	0.7841		0.3291		0.5115		0.2118		0.8904	
Lag5	0.9167		0.2007		0.3106		0.2593		0.6936	

Regression Result of the African countries				
Dependent Variable: GDP_GR				
Country	Tunisia		Zambia	
	Sample: 1970-1994		Sample: 1970 1997	
Variable	Coefficient	p-value(wh)	Coefficient	p-value
C	0.086922	0.0019	-0.834402	0.0078
I_Y	0.272249	0.1326	-0.355122	0.4992
DEF_Y	0.679151	0.0075	-1.112963	0.0061
M_X_Y	-0.424721	0.2242	1.556175	0.0139
E_Y	-0.147612	0.0265	2.092647	0.0275
E_I_GR_A	-	-	-	-
MA(1)	-	-	-	-
AR(1)	-	-	-	-
MA(2)	-	-	-0.221765	0.3595
AR(2)	-	-	-	-
R-squared	0.811129		0.612812	
Adjusted R-squared	0.773355		0.516015	
F-statistic	21.47308		6.330892	
p-value(F-statistic)	0.00000		0.001122	
Ommitted variable test for				
E_Y	0.0065		0.0140	
p-value of the log-likelihood				
E_I_GR_A				
p-value of the log-likelihood	0.7381		0.3066	
Test for Serial Correlation	p-value		p-value	
Lag1	0.155609		0.508256	
Lag2	0.089863		0.259673	
Lag3	0.175688		0.123602	
Lag4	0.289705		0.146827	
Lag5	0.342955		0.247023	
Test for Hetroscedasticty	p-value		p-value	
Lag1	0.064064		0.946745	
Lag2	0.047771		0.860287	
Lag3	0.099682		0.784585	
Lag4	0.028215		0.72249	
Lag5	0.061771		0.87956	

Acronyms used in the regression analysis

GDP_GR	Growth rate of GDP
I_Y	Investment as a proportion of GDP
DEF_Y	Fiscal Deficit as a proportion of GDP
M_X_Y	Net transfer from abroad as a proportion of GDP
E_Y	Export as a proportion of GDP
E_I_GR_A	Proxy of openness
MA(1)	First order moving average error term
AR(1)	First order auto regressive error term
MA(2)	Second order moving average error term
AR(2)	Second order auto regressive error term

Null hypothesis of the test

Omitted variable test: Additional set of new variable are not jointly significant

Test for serial correlation

Breusch Godfery LM test: There is no serial correlation in the residuals up to the specified order

Test for Hetroscedasticity

ARCH LM test: There is no hetroscedasticity in the residuals up to the specified order

CHAPTER-V

Chapter 5:

Conclusion

The purpose of my dissertation is to empirically estimate the binding constraints in the developing economies of the ESCAP region and in the African counties according to the theory of three-gap analysis. Our main empirical conclusion is that fiscal constraint appears to have been in dominant in most of the ESCAP countries and foreign exchange constraint among the African countries either single or in combination with the other two gaps in the cross-country analysis. According to the Weisskopf's test in the chapter three foreign and fiscal constraints have dominated over the saving constraint during the eighties and in the first half of the nineties. This means that lack of government's investment in the social overhead capitals among the ESCAP countries and limit to imports due to the paucity of foreign exchange among the African countries has been a major factor impeding growth in these economies. As a result economic growth of the developing countries in the ESCAP region and the African countries appears to be strangulated by the fiscal and external factor respectively.

The main question that arises is that how the developing economies will get itself free from these binding constraints. There are two main streams of thoughts, the neo classical thought and the structuralist thought. According to the neoclassical paradigm opening up of the economy ensures automatic adjustment to the market forces. The policy recommendation of the neo classical economists happens to be

1.Fiscal austerity aiming at balancing the fiscal budget, with deficit of at most a few percent of GDP. This has to be accomplished by the reducing the public expenditure, public investment and subsidy; increased taxation and privatization of the state.

2. Monetary austerity beyond simple reduction of the public sector borrowing requirement, this is achieved through price reform aiming at positive real interest rates and credit restraint.

3. Devaluation of the local currency, unification of the multiple exchange rate etc.

4. Privatization of state enterprise

5. Deregulation of the markets, especially for the labour.

6. Trade liberalizations, which is suppose to improve the "economy's efficiency". These recommendation are transmitted towards the developing economies principally by the twin Bretton Woods Institution namely the International Monetary Fund (IMF) and the World Bank (WB).

According to the structural economists institution and available technology strongly constraints changes in the economy. The policymakers should recognize the structural bottlenecks and the policies should be tailored according to it. The main criticisms of the structuralist against the neo classical recommendations are:

1. Fiscal equilibrium is desirable but it is difficult to attain. The fiscal, foreign and savings gap are closely linked. Improvement in the first is not likely without gains for the other two as well. External support may well be required in all three fronts; it was certainly available (provisionally) successful reform cases in 1980s. Reducing a fiscal deficit is always tricky in political terms; in some corners of the world, distributional conflicts make it near inconceivable.
2. Changing real "Macro" prices such as wage, interest rate, and exchange rate is not easy. Movements in their nominal counterparts have complicated, economy wide effects and overall inflation is difficult to control. Numerous orthodox programs postulating big changes in exchange and interest rates have resoundingly failed

gains in allocative efficiency when real macro prices are revised can be misleading, if improvements in productive efficiency are trivial at best.

3. External liberalization programmes have fared no better than packages based on intelligent use of quotas and controls. The advantage of the later include the possibility of using the threat of withdrawing protection to extract efficient production from the private sector without having to estimate and impose a whole set of allocative correct prices. Direct foreign investment bolster the balance of payment and may help with the acquisition of technology, but home-based firms may be able to do the better still.
4. Privatization brings no obvious productivity gains, and if done in slapdash fashion it can adversely perturb savings, investment and financial flows. The same observation applies to restructure a " repressed" financial system by raising interest rates and abdicating prudential control.
5. Labour market deregulation may slash wage cost in short run, presumably to some export advantage. But it may prove inimical to long run socioeconomic development, and can slow productive human assets.
6. An increasing educated, healthy, and well-paid population is necessary for long-run productivity growth. However, speeding up human capital accumulation is not sufficient condition for raising actual or even potential output in the short run.

The important point to note is that orthodox IMF policies have been amply tested over the past decades in the Third World, and they have been point to be wanting. But none of the Third World country has tested any structuralist package. So until and unless there is a case of the Third World that proves the effectiveness of structuralist package we can justify its preeminence over the neo classical theory.

Scope for further research

In my dissertation I have tested the three-gap model by using a weisskopf's test in the third chapter and single equation regression model in the fourth chapter. There are other methods to test the three-gap analysis. Here in this section I will briefly spell out the other methods, which can be an improvement over the methods that I have used.

Disequilibrium market model

In the weisskopf's test the basic structural equations that is used in estimation is given by the equations $10'$ to $13'$ and the equations (14) and (15) of chapter 3. The equations are given below

$$I \leq a + bY + (1 + c)\ \bar{F} + d\ \bar{E} + e\ \bar{Z} \qquad (10')$$

The above equation is the investment determined by the savings constraint.

$$I \leq -(\alpha/\gamma) - (\beta/\gamma)\ Y + (\beta/\gamma)\ \bar{F} + (1/\gamma)\ \bar{\bar{E}} \qquad (11')$$

The above equation is the investment determined by the fiscal constraint.

$$I \leq \varsigma' + \eta' Y + \tau'\ \bar{F} - \theta\ \bar{Z} \qquad (12')$$

The above equation is the investment determined by the fiscal constraint.

$$Y \leq \bar{Y} \qquad (13')$$

And actual investment is minimum of the investment determined by the above three equations.

And the non-negativity constraints

$$I \geq 0 \qquad (14)$$

$$Y \geq 0 \qquad (15)$$

The estimation of the above equations is similar to the estimation of markets in the disequilibrium. Madala and Nelson (1974) developed the estimation technique of this type of model. Consider the model

$$y_1 = A_1 x_1 + u_1$$

$y_2 = A_2x_2 + u_2$

$y_3 = A_3x_3 + u_3$

$y = \min (y_1, y_2, y_3)$

where x's are the set of exogenous variables, A_i (i = 1,2,3) are the coefficients to be estimated and u_i (i = 1,2,3) are independently and normally distributed error terms. The crucial aspect of the above system of equation is only 'y' is observed. It is not known *a priori* whether y belongs to y_1 or to y_2 or to y_3, yet it is possible to estimate the parameters of the above equations. Let the joint likelihood of y_1, y_2 and y_3 be denoted by $g(y_1, y_2, y_3)$ and the likelihood of y be given h(y). Then

$$h(y) = \sum_{i=1}^{n} \int_{y_1}^{\infty}\int_{y_2}^{\infty}\int_{y_3}^{\infty} g(y_1, y_2, y_3)dy_1 dy_2 dy_3$$

The first part of the above equation refers to the situation where $y_1 = y$ and ($y_2 > y$ and $y_3 > y$) and similarly for the other parts. Assuming that the error terms are independently distributed with variance σ_1 , σ_2 and σ_3 and the distribution function is given by f_i (i = 1,2,3) and the cumulative density function is given by F_i(i = 1,2,3) then the likelihood function of y is given by

$h(y) = f_1 F_2 F_3 + f_2 F_1 F_3 + f_3 F_1 F_2$

Maximizing the above likelihood function will yield the estimates if A_i's and σ_i's. Gersovitz (1982) has used the disequilibrium market model to test the two-gap analysis.

Other than the above methodology one can use Calibration model to determine the binding constraint directly from the growth equations spelled out in first chapter. To utilize the model for financing calculations values must be assigned to its parameter. Calibration involve starting with reasonable values for some of the parameters and then determining the implied values of other parameters.

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