The economic Transition in China at the Crossroads－ A Perspective on Three-Gap Analysis[*]

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Abstract:

This article assesses the significance of domestic and foreign savings for China`s economic growth. Using annual data for the period between 1981 and 2009 a three-gap model is formulated and estimated. The model illustrates quite vividly the centrality of the fiscal effort constraint to the achievement of a higher growth rate in the long-term. In particular, it highlights improvements to the analytic process along with a simulation experiment conducted with the model developed by us, finding the economic transition in China at the crossroads, which is the dilemma between the original economic structure and the aims of Twelfth-Five Plan over 2011-2015. These findings suggest Chinese government relative adjustment policies.

Key Words: Three-gap model, Transition, Growth, Fiscal effort constraint, Policies

1. INTRODUCTION

After more 3 decades of significant and substantive adjustment programs, an intense debate has arisen about how the past and future effects of adjustment policies influence macroeconomic performance in China. The aim of this study is to add another voice to this controversy based on the prospective of three-gap.

There are more scholars who analyses the constraint of every gap impacting on economic growth using three-gap model in order to offer selecting program of macroeconomic performance.

F.M.MWEGA NJUGUNA MWANGI and F. OLE WE-OCHILO (1994) use a simple analytical framework to study whether it is the saving, fiscal or foreign exchange gap which is the binding constraint on capacity growth in Kenya and how these gaps have evolved since the early 1970s. They find that, for plausible intermediate import ratios, foreign exchange is the binding resource constraint to potential growth in Kenya. Thus, its increased availability through exports promotion and more concessionary capital inflows and the associated reduction of import compression would alleviate the saving, fiscal, and external gaps that undermine good macroeconomic performance. Sepehri and et al.(2000) simulate a model and illustrate quite vividly the centrality of the foreign exchange constraint to the achievement of a modest growth rate in the medium-term. Zafar Iqbal and et al. (2000) use a three-gap framework to explore the contributions to macroeconomic performance of the adjustment policy reforms and external shocks. Thilak Ranaweera(2003) uses a three-gap framework which focuses on the major imbalances of the economy for evaluating police choices facing Uzbekistan. ARDESHIR SEPEHRI and et al.(2005) assess the significance of domestic and foreign savings for Vietnam's economic growth. ECLAC(2005) considers that there are three policy options to overcome the balance-of-payments constraint. The first is to call for an overhaul of the current international financial arrangements. The second is to change the relationship between the export and import elasticity parameters. The third is to attract foreign savings. CARICOM countries have opted for the third solution. Thanoon, Baharumshah & Rahman(2006) develope an open economy model to identify which of the gaps—savings, foreign exchange, and fiscal—become the binding constraints in the adjustment process of Malaysia as it strives to sustain economic growth in the post crisis era.

Our analysis is quite different perspective from researchers who analyses macro China Economics using three-gap model (Cai Sifu, 2003; Zhang Hejie and Chen Weili, 2007, 2008; Zhang Hejie and He Yanqing, 2011) .

China implemented a series of economic reforms in the late 1970s, which have collectively become known as renovation. Markets became increasingly accepted as the principal mechanism of resource allocation, and there was, as a consequence, a steady erosion of the role of central planning and its two main institutions, agricultural production co-operatives and

state-owned enterprises (SOEs). Among other things, reform sought to redirect industrial policy by seeking to enhance the role of the private sector, while at the same time vigorously pursuing external trade liberalization and internal de-regulation, including changes in agricultural markets, public sector restructuring, and financial sector reform. Moreover, at several critical points in the reform process the state undertook macroeconomic stabilization apart from several years, such as the late 1980s and early 1990s.

It is generally acknowledged that China`s transition from plan to market was a relative success, when compared to many other transitional economies. Its style 'gradualism' brought about by a series of reforms implemented in the late 1970s and 1980s. Whatever might be the reason for the successful transition, China was firmly on a high growth path. From 1981 to 2009, the average annual rate of growth of real gross domestic product (GDP) was 7.5 per cent, exports soared, net export levels accounted for almost 16.1 per cent of GDP, growth was driven by unprecedented levels of investment, which reached a high of 37.6 per cent of GDP, as the market economy modernized the efficiency of its productive structure, and foreign direct investment (FDI) levels accounted for almost 5.5 per cent of gross investment.

The East Asian crisis reduced the demand for China`s exports in 1998, FDI flows in 1999 and 2000. Real GDP growth rate fell to 5.3 and 4.0 per cent per annum, in 1998 and 1999, respectively. Consumer prices continued to fall, and the inflation rate was negative in 1998 and 1999. However, there has been no published systematic analysis of the relative importance of domestic and external resources in providing the foundations that underpinned investment and growth in China in the 2000s. Neither has there been an in-depth analysis of the domestic and foreign resources required for China to meet its medium term GDP growth target of 7-9 per cent per annum from 2011 to 2015. This article try to fill these gaps by assessing the role and significance of domestic private, government and foreign savings on China`s economic growth over the medium term.

The article is structured as follows. Following this introduction, Section 2 specifies the three-gap model. In Section 3, the results from the estimation of the model is presented and discussed along with a simulation experiment conducted with the model developed by us. Conclusions are presented in Section 4.

2. A THREE-GAP MODEL

To assess the relative importance of domestic and external resources on China`s economic growth this section specifies a three-gap model of growth along the lines suggested by Bacha (1990), Taylor (1993) . The analysis draws heavily on the methodological framework by ARDESHIR SEPEHRI and A HAROON AKRAM-LODHI (2005). According to the three-gap model, the utilization and expansion of existing productive capacity is constrained not only by domestic and foreign savings, as was initially discussed by Chenery and Strout (1966) in the context of the two-gap model, but also by the impact of fiscal limitations on government spending and thus on its public investment choices. In the context of a low-income transitional

economy such as China, public sector saving and investment play a crucial role in determining the productive capacity of the economy and its growth rate. Moreover, the urgent need for the reconstruction of infrastructure and years of neglect under central planning have reinforced the crucial role of public investment in restoring and maintaining a healthy growth path. However, in the absence of well-developed financial markets in China at present, the available methods of financing public investment are mostly confined to budget surpluses and inflation.

While such a highly aggregated one-sector model has its own obvious limitations it is well suited to low-income transitional economies, where economies continue to operate at less than full capacity, mainly as a result of the lack of availability of foreign exchange such as China before 1993 and other structural bottlenecks. In contrast to macroeconomic growth models of full employment, the three-gap model explicitly considers the interaction between capacity expansion and capacity utilization. Moreover, the limited data requirement of the model makes it well suited to countries such as China, where the coverage and availability of time series data is very limited. Gap analysis of course assumes that the incremental capital-output ratio (ICOR) and other behavioral parameters are fixed at least in the medium-term or study term and that there is limited substitution between domestic and foreign resources.

The formulation of model is presented in Table 1. All variables in the model are defined as a percentage of potential output (Q), which will be estimated in the following section by the sum of GDP (or real value-added) and the maximum Industrial Value Added of some month in calculated year times 12 for the period between 1981 and 2009. Equation (1) defines real output (X) as the sum of GDP and real intermediate imports (M_k). Following Taylor (1993) output is here defined in a somewhat non-standard fashion, reflecting the importance of intermediate imports in the early stages of industrialization and agricultural modernization for a low-income transitional economy such as China. Capacity utilization (u) is defined by equation (2) as a ratio of output (X) over potential output (Q). The rationale for working with (X) and (Q) as separate variables is that, as noted above, many transitional economies often operate at less than full capacity, such as the average value of capacity utilization u in China in the period between 1981 to 2009 is only 60.2 per cent per annum. Rather than setting output equal to productive capacity, as was done in early two-gap models, utilizing excess capacity to raise output allows an exploration of the way the three gaps interact in the process of economic growth during transition.

Output growth is determined along Harrod–Domar lines, according to which the rate of growth of potential output (g) is specified in equation (3) as a linear function of the investment rate (i), which is in turn defined as investment as a percentage of potential output. The parameter (k) denotes the incremental capital output ratio (ICOR), while (g_o) denotes other factors affecting the rate of growth of output, such as labor productivity growth. Equation (4) states the equilibrium condition, or savings constraint, according to which investment (i) is equal to savings (s). Total investment in equation (5) is specified as the sum of private investment (i_p) and government investment (i_g).

Equation (6) specifies total savings as consisting of private saving (s_p), public sector saving (s_g) and foreign saving (s_f). Private investment is defined in equation (7). It is assumed that private investment varies with changes in demand conditions, as measured by (u), and with government investment. Private sector investment can vary positively with government investment, a so-called 'crowding-in' effect (a significant proportion of government investment is in infrastructure, public utilities and basic industries which raise the profitability of private investment), or negatively with government investment, a so-called 'crowding out' effect (which occurs when the government borrows heavily from the banking system, thereby limiting the amount of loanable funds available to the private sector as found by various studies, for example cited in Ndulu (1990)), depending on whether these two types of investment are complements or substitutes. Private savings are defined in equation (8) and are specified in a standard way, according to which savings are assumed to vary positively with the capacity utilization variable (u).

Public sector savings are defined in equation (9) as the difference between the fiscal effort variable (z) and interest payments on the foreign debt of government (ζj^*), where (j^*) denotes interest payments on foreign debt and (ζ) the share of government. In equation (10) the variable (z) defines the fiscal effort rate, also known as the public sector operating surplus, which is that s_g plus ζj^*. According to equation (10), the public sector operating surplus is assumed to be primarily determined by the capacity utilization rate (u). The strength of this response is measured by the parameter (z_1), the marginal fiscal effort rate. In addition to the rate of capacity utilization, the fiscal effort rate is influenced by other factors such as size of the tax base and the effectiveness of tax collection system. The strength of these other factors is captured by the parameter (z_o). Equation (11) defines the public sector borrowing requirement (πu), or the public sector saving constraint, as the difference between government investment (i_g) and public sector saving (s_g). Note that in equation (11), the public sector borrowing requirements, PSBR, expressed as a proportion of Q. This is equal to the PSBR/actual output ratio, π, multiplied by the capacity utilization rate with PSBR targets usually set against the actual rather than potential output. Formally, $PSBR/Q = PSBR/X^* \; X/Q = \pi u = i_g - s_g$. PSBR was measured by annualized budget deficits (F.M.MWEGA NJUGUNA MWANGI and F. OLE WE-OCHILO, 1994).

The external sector is summarized by equations (12) through (14). The import demand for intermediate goods (m_k) is specified as a function of the capacity utilization rate (u) in equation (12), while import demand for capital goods (m_z) is specified as a function of domestic investment (i) in equation (13). Equation (14) defines foreign savings, or the balance of payments constraint. The first part of equation (14) defines the current account deficit as competitive imports (m) plus intermediate imports (m_k) plus capital goods imports (m_z) plus interest payments on foreign debt (j^*) less exports (e). The capital account is presented in the second part of equation (14), where (δ) denotes the ratio of foreign debt over potential output and ($\Delta\delta$) changes in the ratio of foreign debt over potential output, (g) is the growth rate, (r) the

ratio of other capital inflows—such as FDI—over potential output, and ($\emptyset$) total capital inflows as a percentage of potential output. Exports and capital inflows are treated as exogenous variables.

The growth-investment equation, as well as the three gap equations, is presented in the lower panel of Table 1.In equation (15), government investment (i_g) and the capacity utilization rate (u) are treated as variables that can be traded off to give macroeconomic equilibrium, meaning that the growth rate of capacity output (g) can be treated as a target policy variable. Indeed, as explained above, one of the innovative features of the three-gap model in the context of a transitional economy is its explicit consideration of the interaction between capacity expansion and capacity utilization. This specification of growth may be more relevant in circumstances where structural and foreign exchange bottlenecks (such as China before 1993) prevent the full utilization of existing capacity. Equation (15) thus relates government investment (i_g) to the capacity utilization rate (u) and targeted potential output growth ($\bar{g}$). The savings gap equation (16) gives the maximum government investment attainable from a given rate of capacity utilization (u) that satisfies the equilibrium condition defined in equation (4). Assuming that government and private investment are complimentary, higher total government investment increases private investment and capacity utilization, thereby generating sufficient savings to finance the higher investment. Moreover, even if total government investment crowds out private investment, as long as the crowding out effect is incomplete higher government investment will increase capacity utilization. According to the foreign savings gap equation (17), there is a trade off between government investment (i_g) and the capacity utilization rate (u). Higher capacity utilization generates a higher demand for intermediate imports that can only be met, given available foreign exchange, by cutting into capital goods imports and hence by lowering the growth rate of capacity. Lastly, the fiscal gap equation (18) shows government investment (i_g) and the capacity utilization rate (u) moving together as higher capacity utilization generates more net fiscal revenue that can be channeled into capital formation.

3. ECONOMETRIC RESULTS

3.1. Estimated Parameters

The model specified in Table 1 was estimated using annual data for the period between 1981 and 2009, using an ordinary least-squares technique. Data sources and definitions are presented in the Appendix and the data itself is presented in Appendix Table A1. Using the estimated values of the parameters and the values of the exogenous variables, the model was calibrated for 2005, the resulting three-gap equations are shown in Table 2.

In light of the diagnostics, the overall results of the estimated behavioural equations in Table 2 are satisfactory. The estimated parameters for private investment suggest that the capacity utilization rate is statistically significant determinants of private investment. The positive sign of the government investment variable indicates that government investment is a complement

to private investment but the effectiveness is weak. The negative sign of the lagged government investment variable suggests that it seems to crowd out actual private investment, and the effectiveness is weaker than former. The synthetic effectiveness seems that private sector investment can vary positively with government investment, but the 'crowding-in' effect is rather weak.

The economy would be in macro balance in a given time period if the three gap equations intersected at one (u, i_g) point which can be brought about by an upward shift of the fiscal gap equation; a downward shift of the savings gap equation and/or a leftward shift of the foreign exchange gap equation. The size of the gap triangles can therefore be used to measure the degree of macro imbalances in a given period in the economy.

The capacity utilization variable also appears to be a statistically significant determinant of private saving, fiscal effort and intermediate imports. Thus, the greater the degree of productive activity in the economy, the greater the rate of private savings, which can be used to finance investment; the greater the rate of government revenue collection, and the greater the rate of imports which are used as inputs in productive activity. It can be noted that the estimates for intermediate imports indicate a low degree of dependence on imports. Finally, the estimates for imports of capital goods demonstrate that the marginal propensity to import with respect to capital formation is statistically significant. It is also relatively small, especially considering the negative sign of the lagged capital goods variable, indicating China`s low degree of dependence on imported capital goods. China`s higher current account surplus which supports its higher economic growth exhausts itself not richer resources per capita.

Figure 1 demonstrates a sharp trade-off between government investment and capacity utilization under the foreign exchange constraint. The fiscal constraint line is positive, as the stability condition of equation (4) is satisfied, and is flatter than the savings constraint line. This indicates that the government fiscal constraint is more binding than the private saving constraint as more foreign capital becomes available. In such circumstances, an attempt to raise government investment in order to stimulate economic growth will be frustrated by the lack of taxes. If more taxes than ever are available, it would reduce the private saving, investment and consumption, continuing to frustrate private welfare as ever. The result will be that China`s economic growth would not be sustainable in long-term, considering that, from 1995 to 2009, the average of growth rate of China`s tax revenue is 13.5%. Although, in the same time, the average of growth rate of private savings is 11.5%, and private income 10.7%, the ratios of taxes by private income are greater than ever from 10.2% of 1995 rising to 17.7% of 2009, the average value is 13.6%, see Figure 2. **It seems that the economic transition in China is just at the crossroads, and maybe it would bring up the dilemma between the original economic structure and the aims of Twelfth-Five Plan over 2011-2015?**

As Figure 3 indicates, the estimated growth path of potential output is sensitive to the time period used. There is output gap between potential and actual growth rate from 1981 to 1983, 1983 to mid of 1987, and 1989 to 1991. The vales of actual output are in 1981, 1986 and 1990,

respectively. The relative peaks over period are in 1983, 1988, 1993, 1995 and 2008, respectively. From 2000 to 2009, the growth rates of actual outputs are almost equal to the growth rate of potential output.

There seem five business cycles over estimated period. From 1981 to 1983, the probable cause of the business cycle is unknown. From 1983 to 1991, the main cause is chaos in China`s economic situation, for example, commercial banks could operate any business, such as investment in real estate and stock market etc. From 1991 to 1995, Premier Zhu Rongji made the hyperinflation "soft land" by way of three-year effort to improve the economic environment and rectify the economic order. From 1995 to 2000, the Asian crises made China`s export declines, and influenced the economic situation. From 2000 on, because of financial crisis of late 2007, China`s economic growth started decline in 2008, see Figure 3 and Table 3. Where is the valley of China`s business cycle from now on? A question is that the active fiscal policy of 4,000,000 millions RMB could not prevent the decline from the crisis? These questions would be debated in another paper.

A question would have been asked: whether or not China would accomplish its Twelfth Five-Year Development Plan over 2011-2015 under the trend of decline of potential growth rate? If can, what would Chinese government do?

3.2. Simulation Results

Using the estimated values of the parameters, the model is simulated for the period between 2010 and 2015, which corresponds closely to the Government's Twelfth Five-Year Development Plan. The purpose of the simulation is to evaluate the role and significance of domestic and foreign savings on possible growth projections over the medium run. The underlying assumptions and the results of these simulations are summarized in Table 4.

Equation (3) was estimated using annual data for the period between 1981 and 2009, using an ordinary least-squares technique. We can get g_0= -0.156, and k=0.574, see equation (19).

$$g = -0.156 + 0.574i \qquad\qquad (19)$$

t (0.534)   (0.559)

$R^2 = 0.013$, $D.W.$= 2.05

Assume $\bar{g} = 9\%$, $u = 85\%$, get i_g=1.59%, based on equation (15) considering keeping harmony society in China.

$$\ln(y) = -0.274 + 0.983 * \ln(g) \qquad\qquad (20)$$

t (-0.540)   (4.31)

$R^2 = 0.482$, $D.W.$= 1.33

Where, y indicates the real growth rate of actual GDP ($GDP + M_k$), and g the growth rate of potential GDP, assume $g = \bar{g} = 9\%$, get y=7.1% over the coverage of 2010 to 2015.

In order to keep i_p=40% over the period between 2010 to 2015, we need to raise autonomous component of private investment (i_o) from -0.12 to 25.54 by way of improving investment environment and bank reform and economic marketization etc.，because the parameter (i_o) captures the strength of these factors. Higher investment rates also increase imports of capital goods (m_z) and intermediate goods (m_k) to 0.009 percent and 0.007 percent per annum over the period between 2010 to 2015, respectively. These increases in imports would not result in projections of a current account deficit. To finance higher investment in general, and private investment in particular, the private savings rate is projected to grow by as much as 34.6% over the period between 2010 and 2015.

Higher capacity utilization and the broadening of the tax base is also projected to increase government tax revenues, the steady reduction in tariff rates under the China`s economic open would reduce the fiscal effort rate while the broadening of the tax system would increase the fiscal effort rate (z_1) . Because the parameter (z_0) captures the strength of other factors, such as size of the tax base and the effectiveness of tax collection system, we would raise z_0 from 0.200 to 1.4992 by 2015 by way of getting the taxes from capital revenues and mono-enterprises of SOEs not from salary or wage income, and z_1 from 0.011 to 0.100 in order to rise fiscal effort rate z to 1.584 by 2015, the growth rate of z would rise to 29.6% per annum.

Summation of the results of scenario is as Table 5.

4. CONCLUSIONS

The purpose of this article has been to assess the relative significance of domestic private savings, domestic public sector savings, and foreign savings on China`s economic growth. Using annual data for the period between 1981 and 2009 a three-gap model has been formulated and estimated.

Firstly, the government fiscal constraint was shown to be more binding than the domestic private savings constraint. The capacity utilization rate is positive to private investment and saving, government investment seems to crowd in private investment in merely weak effectiveness. The rate of government revenue collection is positive to the rate of imports which are used as inputs in productive activity. Intermediate imports and capital goods are a low degree of dependence on imports, seeming that China`s economic growth is main dependence on domestic market.

Secondly, to assess the significance for China of the foreign exchange and domestic savings constraints the model was simulated for the period between 2010 and 2015. The medium-term simulation was undertaken a path scenario.

The size of the fiscal gap under the growth path scenario illustrated quite vividly the centrality of the fiscal effort constraint in general on China`s ability to achieve a socially acceptable rate of growth in the medium-term. **It indicates the economic transition in China at crossroads,** and it is the dilemma which, on the one hand, Chinese economic structure required to boost the

growth rate of output results in much higher levels of public savings than the period 1981-2009 in order to complete the Twelfth-Five Plan; on the other hand, it is not suitable for setting up harmony society if no deeper reform is carried because of Chinese lower income comparing with most countries in the world.

These findings suggest Chinese government adjustment policies as below.

4.1. Encouragement in private investment

Chinese government should improve relative investment laws and rules and policies, withdraw its investment from non important resource for the people's livelihood, improve investment environment and bank reform and economic marketization etc. in order to encourage private investment.

4.2. Tax reform

Adjustment in the gap in work wages through reform of individual income tax. It is possible for the most Chinese can get more disposable income of residents than ever by increase in the earnings threshold for the individual income tax. The taxation mode of personal income tax should be transformed from classified collection system to mixed collection system. Reform taxation for part rich men not to be imposed. Collect capital revenue. Taxation should be fair, tax steal and evasion reduction.

Reform in enterprise income tax. It should be gradually transformed from single fixed tax rate to progressive tax rate. Authority should reduce the small and medium-sized enterprise tax burden pressure, reduce the state-owned monopoly enterprises retained profit and increase their turning over to the country for dividends, increase the resource tax levy.

"Fixed assets investment regulation tax" should again open window of reform in China. Reduce the duplication of investment, high-pollution and high energy-consuming and consumption of resources enterprises and industries. Further increase the high-tech enterprise income tax preferential measures. Improve enterprises the interest to the public sector investment and its enthusiasm of development of remote regional economy.

4.3. Optimization in the structure of fiscal expenditure

It is positive effect to real national income for fiscal expenditure to invest livelihood and public affairs which could effectively reduce the residents prudent savings, especially the projections of education, medical and health work, and social security. Government should reduce its expenditures, such as reductions in staff of government and "Sangong consumption" (Consumption of public funds on three major private purposes-cars, banquets and oversea visits) and environment pollution; increases in productivity and eco efficiency, and employment rate; encouragements in low-carbon work and living; offers in safer product and service in order to increase private consumption rate.

4.4. Raise in investment to natural resources of other countries

China should invest more natural resources abroad in order to keep sustainable development of China`s economic growth and protect domestic natural resources.

Further studies prospectives seem that why is the route of China`s economic structure adjustment so slow? Whether or not the way of China`s economic structure adjustment could be quicker?

REFERENCES

[1]ARDESHIR SEPEHRI1, A HAROON AKRAM-LODHI, 2005, "TRANSITION, SAVINGS AND GROWTH IN VIETNAM: A THREE-GAP ANALYSIS", *Journal of International Development*. 17, pp.553–574.

[2]Bacha EL., 1990, "A three-gap model of foreign transfers and the GDP growth rate in developing countries", *Journal of Development Economics,* 32(2), pp.279–296.

[3]Cai Sifu, 2003, "New Operation of fiscal, monetary and international Trade Policy", *Management World*, pp.23-27.

[4]Chenery HB, Strout AM., 1966, "Foreign assistance and economic development", *American Economic Review,* 56(4), pp.149–179.

[5]ECLAC, 2005, "LONG TERM GROWTH IN THE CARIBBEAN A BALANCE OF PAYMENTS CONSTRAINT APPROACH", LIMITED,LC/CAR/L.63,14 December 2005, ORIGINAL: ENGLISH(This document has been reproduced without formal editing) http://www.eclac.org/publicaciones/xml/2/23232/L.63.pdf.

[6]F.M.MWEGA NJUGUNA MWANGI and F. OLE WE-OCHILO, 1994, "MACROECONOMIC CONSTRAINTS AND MEDIUMTERM GROWTH IN KENYA: A THREE-GAP ANALYSIS", *African Economic Research Consortium*，AERC Research Paper. 23，1994, http://sd-cite.iisd.org/cgi-bin/koha/opac-detail.pl?biblionumber=4672.

[7]Ndulu, B., 1990, "Growth and adjustment in sub-Saharan Africa", paper presented at a World Bank seminar on African Economic Issues.

[8]Sepehri, Ardeshir, Moshiri, S. and Doudongee, M., 2000, "The Foreign Exchange Constraints to Economic Adjustment: The Case of Iran", *International Review of Applied Economics*, vol. 14, No. 2, pp.235-251.

[9]Taylor L., 1993, "The rocky road to reform", In *The Rocky Road to Reform: Adjustment, Income Distribution and Growth in the Developing World*, Taylor L (ed.). The MIT Press: Cambridge, MA.

[10]Thilak Ranaweera , 2003, "Alternative paths to structural adjustment in a three-gap Model: The Case of Uzbekistan", Post-Communist Economies, vol. 15, No. 4, pp. 595-611.

[11]Zafar Iqbal, Jeffrey James, Graham Pyatt, 2000, "Three-Gap Analysis of Structural Adjustment in Pakistan", *Journal of Policy Modeling,* 22(1), pp.117–138.

[12]Zhang Hejie and Chen Weili, 2007, "A Literature Review of Internal-external Equilibrium
Policy Coordination under Three-gap Model", *TATISTICAL RESEARC,* Vol. *24*(12),
pp.22-28.

[13]Zhang Hejie and Chen Weili, 2008, "The Analysis on the Influence of Expansionary Fiscal
Policy on Internal-external Equilibrium-Based on the Mundell-Fleming Model",
TATISTICAL RESEARCH, Vol. 25(10), pp.26-33.

[14]Zhang Hejie and He Yanqing, 2011, "The Analysis of the Impact of Fiscal Policy and
Monetary Policy on National Income－Based on the Exchange Rate Regime of Basket
Currencies", *TATISTICAL RESEARCH,* Vol. 28 (5), pp.21-26.

APPENDIX1: DATA DEFINITIONS AND SOURCES

Potential output (Q) was estimated as follow over the period 1981–2009.

$Q＝$GDP+B

Where B is the maximum Industrial Value Added of some month in calculated year times 12.

Private savings (s_p) were estimated as a residual from the Keynesian national income identity,

which can be written in normalized form as:

$s_p = i–(s_g+s_f)$

where other terms are as they are defined in the text.

All real variables are in 2005 prices.

Table 1. Macroeconomic data: 1981–2009

Year	GDP	X	Q	i	i_p	i_g	s_p	z	m_k	m_z
1981	6,163	6,441	18,035	0.067	0.048	0.019	0.076	0.105	0.005	0.004
1982	5,690	5,939	20,336	0.065	0.050	0.015	0.064	0.082	0.003	0.002
1983	5,918	6,147	21,965	0.065	0.049	0.015	0.063	0.087	0.003	0.002
1984	5,838	6,105	24,032	0.062	0.048	0.014	0.063	0.087	0.002	0.002
1985	5,572	5,850	26,798	0.059	0.049	0.009	0.054	0.094	0.002	0.004
1986	5,298	5,551	29,904	0.054	0.046	0.008	0.049	0.069	0.001	0.003
1987	5,568	5,850	33,355	0.052	0.046	0.007	0.052	0.050	0.001	0.002

1988	6,672	7,076	37,071	0.056	0.051	0.005	0.058	0.028	0.002	0.002
1989	7,110	7,421	40,057	0.046	0.042	0.004	0.058	0.018	0.001	0.002
1990	5,833	6,091	8,918	0.158	0.144	0.014	0.222	0.074	0.004	0.006
1991	5,868	6,207	8,660	0.174	0.162	0.012	0.247	-0.048	0.005	0.006
1992	6,795	7,194	10,117	0.202	0.193	0.009	0.261	-0.137	0.005	0.008
1993	8,288	8,644	12,153	0.252	0.243	0.009	0.280	-0.157	0.004	0.009
1994	7,367	7,690	10,351	0.263	0.255	0.008	0.311	-0.287	0.003	0.008
1995	9,328	9,709	12,770	0.247	0.239	0.007	0.303	-0.195	0.004	0.006
1996	10,657	11,042	14,155	0.247	0.240	0.007	0.304	-0.194	0.004	0.006
1997	11,588	12,025	15,231	0.243	0.237	0.007	0.313	-0.176	0.004	0.005
1998	12,212	12,611	15,718	0.264	0.253	0.011	0.312	-0.166	0.003	0.005
1999	12,699	13,189	15,959	0.264	0.248	0.016	0.312	-0.152	0.004	0.006
2000	13,591	14,349	17,467	0.260	0.243	0.017	0.304	-0.138	0.006	0.007
2001	14,612	15,373	18,821	0.269	0.251	0.018	0.301	-0.072	0.005	0.008
2002	15,783	16,651	20,845	0.283	0.264	0.020	0.300	-0.011	0.005	0.009
2003	17,415	18,602	24,109	0.312	0.297	0.014	0.301	0.049	0.006	0.010
2004	19,967	21,685	28,192	0.330	0.316	0.014	0.307	0.116	0.007	0.011
2005	22,366	24,485	32,199	0.359	0.343	0.016	0.308	0.157	0.008	0.011
2006	25,756	28,309	37,330	0.387	0.372	0.015	0.306	0.228	0.008	0.012
2007	31,868	34,974	45,742	0.408	0.392	0.016	0.310	0.332	0.009	0.011
2008	41,004	45,044	57,969	0.412	0.394	0.018	0.300	0.316	0.010	0.010
2009	45,367	48,742	64,531	0.517	0.490	0.026	0.318	0.334	0.008	0.008

Notes:

From i to m_z are as a proportion of potential output (Q)

GDP=gross domestic product (in a hundred millions of USD, constant 2005 prices).

X=real output (real GDP+intermediate imports).

Q=potential output.

i=investment.

i_p= private investment.

i_g=public sector investment.

s_p=private domestic saving.

z=fiscal effort ($s_g+ \zeta j^*$).

m_k=intermediate goods imports.

m_z=capital goods imports.

The data were obtained from various sources: Real GDP, the components of GDP by sector and ownership, investment, savings, exports and imports were obtained as below.

1. database on DRCNet: http://data.drcnet.com.cn/web/default.aspx

2. Network station of National Bureau of Statistics of China，

http://www.stats.gov.cn

3. 《CHINA STATISTICAL YEARBOOK 2010》, edited by National Bureau of Statistics of China, 2010.9, First Version.

4. The amount of repayment of government debt, note: From the year of 2000,data in the table represent the Principal Payment for Debts; since 2006, as the management of bal balance has been taken, this index has no longer been in State budget again

5. Sina-Finance http://finance.sina.com.cn/mac/#nation-9-0-32-2

APPENDIX 2:

Table 1. Specification of the three-gap model

Real output: $X = GDP + M_K$ (1)

Capacity utilization: $u = \dfrac{X}{Q}$ (2)

Growth rate: $g = g_0 + ki$ $g_0 > 0$ or $g_0 < 0$; $k > 0$ 3)

Equilibrium: $i = s$ (4)

Total investment: $i = i_p + i_g$ (5)

Total saving: $s = s_p + s_g + s_f$ (6)

Private investment: $i_p = i_0 + \alpha i_g + \beta u$ $\alpha > 0$ or $\alpha < 0$; $\beta > 0$ (7)

Private saving: $s_p = \sigma_0 + \sigma_1 u$ $\sigma_0 > 0$ or $\sigma_0 < 0$; $0 < \sigma_1 < 1$ (8)

Public sector saving: $s_g = z - \zeta j^*$ $0 < \zeta < 1$ (9)

Fiscal effort: $z = z_0 + z_1 u$ $z_0 > 0$ or $z_0 < 0$; $z_1 > 0$ (10)

Public sector borrowing requirements: $\pi u = i_g - s_g$ (11)

Intermediate imports: $m_k = a_0 + a_1 u$ $a_0 > 0$ or $a_0 < 0$; $0 < a_1 < 1$ (12)

Capital goods imports: $m_z = m_0 + m_1 i$ $m_0 > 0$ or $m_0 < 0$; $0 < m_1 < 1$ (13)

Foreign saving: $s_f = m + m_k + m_z + j^* - e = \Phi = \delta + \delta g + r$ (14)

Three gap equations:

Growth-investment equation: $i_g = [\frac{1}{1+\alpha}][\frac{\bar{g} - g_0}{k} - (i_0 + \beta u)]$ (15)

Saving gap: $(1+\alpha)i_g - (\sigma_1 + z_1 - \beta)u = z_0 - \zeta j^* + \sigma_0 + \Phi - i_0$ (16)

Foreign exchange gap:

$$m_1(1+\alpha)i_g + (a_1 + m_1\beta)u = \Phi - m - j^* - m_0 - m_1 i_0 - a_0 + e$$ (17)

Fiscal gap: $i_g - (\pi + z_1)u = z_0 - \zeta j^*$ (18)

Table 2. Econometric results of the structural equations and the three-gap equations*

Private investment: $i_p = -0.120 + 2.25i_g - 0.203i_{g-1} + 0.128u$ $R^2 = 0.963$

           (-0.37) (1.07)   (-0.13)   (1.93)

Private saving: $s_p = -0.005 + 0.328u - 0.221u_{-1} + 0.751s_{p-1}$ $R^2 = 0.993$

           (-0.78)   (17.04)   (-4.91)   (7.03)

Fiscal effort: $z = -0.006 + 0.011u + 1.03z_{-1}$ $R^2 = 0.910$

           (-1.10)   (1.42)   (10.34)

Import demand:

Intermediate goods

$$m_k = 0.0001 + 0.006u + 0.002u_{-1}$$ $R^2 = 0.853$

           (0.02)   (3.13)   (0.87)

Capital goods

$$m_z = 0.005 + 0.019i - 0.453m_{z-1}$$ $R^2 = 0.877$

           (2.68)   (3.43)   (-2.91)

Three-gap equations:

Fiscal gap: $\qquad i_g = 0.199 + 0.018u$

Saving gap: $\qquad i_g = 0.083 + 0.065u$

Foreign exchange gap: $\quad i_g = 0.968 - 0.129u$

Notes:

1. t-statistics are given in parenthesis under the coefficients, and the coefficients of determination (R2) are adjusted R^2.

2. All equations were tested and corrected for auto-correlation by B-G test.

Table 3. China`s business cycles and probable causes, 1981-2009

Year	Durable Time	Probable Causes	Illustration
1981-1983	3	Unknown	Unknown
1983-1991	9	Chaos economic situation	Internal
1991-1995	5	Three years of rectification, reform aimed at establishing a joint stock system	Internal
1995-2000	5	Asian financial crises, 1997-1998	External
2000-?	?	Financial crises, 2007-2008	External

Notes: author makes Table 3.

Table 4. Projected Growth path scenarios (assumptions): 2010-2015

	Growth path scenarios				
	Average 1981-2009	Base year 2005	2009	Max 1981-2009	Socially desirable 2010-2015
	I	II	III	IV	V

Real growth rate (% period average):

Actual GDP	5.7	11.4	7.6	22.4 (2008)	7.1
Potential GDP	9.1	12.4	10.2	21.1 (2008)	9
As % of potential output (period average)					
Actual output (*u*, capacity utilization rate)	60.2	76.0	75.5	82.6 (1999)	85
Private investment	20.7	34.3	49.0	49.0 (2009)	40
Gov. investment	1.3	1.6	2.6	2.6 (2009)	1.59
Private saving	22.3	30.8	31.8	31.8 (2009)	34.6
m_z	0.006	0.011	0.008	0.012 (2006)	0.009
m_k	0.005	0.008	0.008	0.010 (2008)	0.007

Table 5. Scenario Macroeconomic data: 2010–2015

Year	GDP	X	Q	i	i_p	i_g	s_p	$z*$	m_k	m_z
2010	51,731	52, 203	70, 339	0.4159	0.400	0.0159	0.346	0.433	0.007	0.009
2011	59,028	55, 909	76, 669	0.4159	0.400	0.0159	0.346	0.561	0.007	0.009
2012	67,400	59, 879	83, 570	0.4159	0.400	0.0159	0.346	0.727	0.007	0.009
2013	77,009	64, 130	91, 091	0.4159	0.400	0.0159	0.346	0.942	0.007	0.009
2014	88,043	68, 683	99, 289	0.4159	0.400	0.0159	0.346	1.221	0.007	0.009
2015	100,719	73, 560	108, 225	0.4159	0.400	0.0159	0.346	1.583	0.007	0.009

Notes:

1. *$z=s_g$+debts paid by Gov.

2. The units of GDP and *X* and *Q* are Hundred Million US Dollars, others are defined as a percentage of potential output (*Q*)
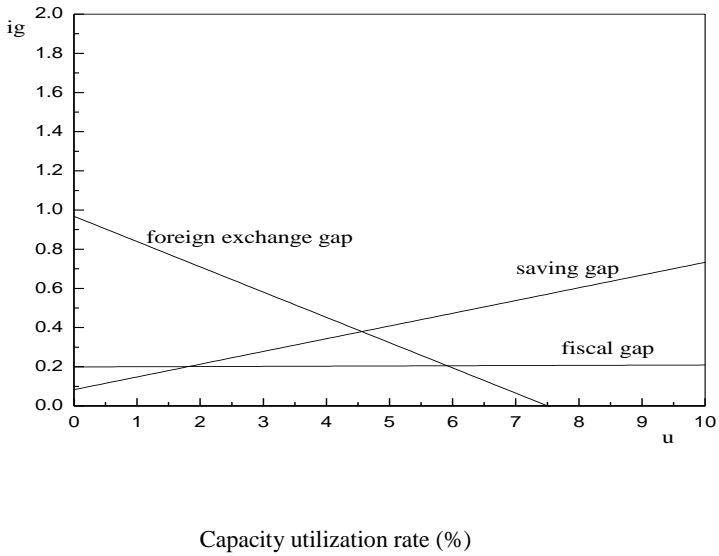
APPENDIX 3:

Govt. investment (as % of potential output)

Capacity utilization rate (%)

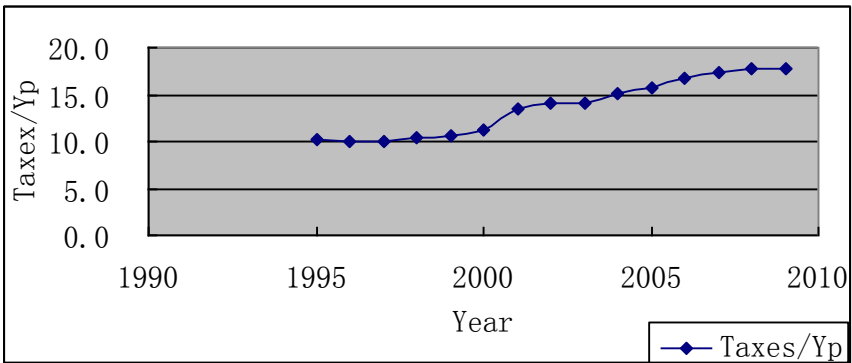**Figure 1.   Macro imbalance in China`s economy between 1981 and 2009**

Figure 2.   The Ratios of taxes in private income, 1995-2009
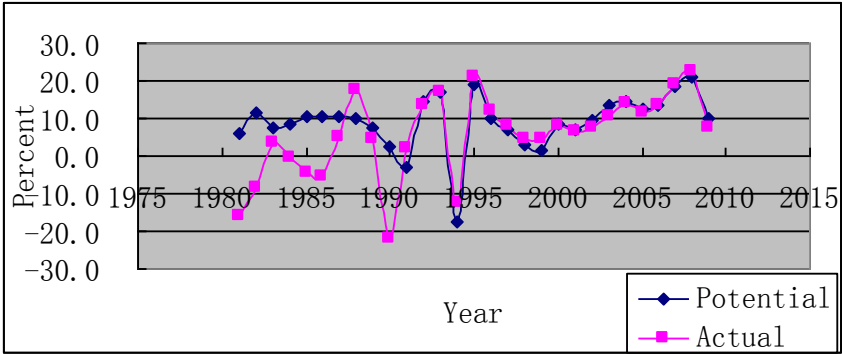
Notes:

1. Data sources see Appendix.

2. Yp indicates private income.

Figure 3. Actual and potential growth rates of GDP, 1981-2009