

Adjustment of Economic Structure in China-A Perspective on Three-Gap Analysis*

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Abstract:

Using a three-gap framework explores the contributions to macroeconomic performance of the adjustment policy reforms and external shocks. The central finding of the study is that it is very difficult for China to adjust its economic structure mainly from export-oriented economy to domestic demand due to trade revenues drawing 10-fold of non-trade revenues. The major innovations of the study are how to adjust China's economic structure and to highlight procedure with quantitative assessment of (trade balance), foreign exchange reserve and China's net direct investment, through inducing λ (between C_p and $(Y-C_g)$), η (between I_p and $(Y-C_g)$), π (between I_p and Y), γ (between R and Z) and χ (between R and TB) facing China after a simulation experiment during 1982 to 2010.

Key Words: three-gap model, economic structure adjustment, policies, sustained economic growth

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1. INTRODUCTION

After more 3 decades, especially after financial crises late in 2007 until now, 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 the paper is to study adjustment of economic structure in China based on the prospective of three-gap due to little literature in China on the topic. We mainly refer to the literature from developing countries in particular, the study tries to assess whether or not adjustment policies have had a positive impact on a number of key macroeconomic variables such as exports of goods and services, imports of goods and services, public sector revenues and investment, private savings and investment, trade balance, foreign exchange reserve, China's net direct investment and the level of output in China. Using simulation methods the study seeks to evaluate adjustment policies in terms both of the direct and of indirect effects that they may have had on these selected target variables.

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. Mwega, Mwangi & 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, Moshiri & Doudongee (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. Iqbal, James & Pyatt (2000) use a three-gap framework to explore the contributions to macroeconomic performance of the adjustment policy reforms and external shocks. Ranaweera (2003) uses a three-gap framework which focuses on the major imbalances of the economy for evaluating police choices facing Uzbekistan. 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. Sepehri and Akram-lodhi (2005) assess the significance of domestic and foreign savings for Vietnam's economic growth. Thanoon & Baharumshah (2006) develop 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. Zhang & Chen (2012) assess the significance of domestic and foreign savings for China's economic growth upon three-gap model. They find 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. Some scholars analyze China's economic structure adjustment (Cai, 2003; Zhang & Chen, 2007, 2008; Zhang and He, 2011).

We shall examine, theoretically and empirically, two questions that are critical for understanding the effects of adjustment measures on the economic performance of China's economy in reference to Iqbal et al. (2000). The first main question here is whether or not adjustment policies (such as private capital inflows, contraction in domestic credit to the public sector, reduction in public current spending, trade balance in reduction, China's foreign exchange reserve in reduction for China's outward foreign direct investment in increase which means internationalization of RMB) have had positive or negative effects on certain selected target variables. In addition, account must be taken of the external shocks to which Chinese adjustment reforms were subject during the 1982 and 2010. Therefore, the second main question posed here is whether and to what extent external factors (such as world real interest and demand in reduction, foreign petroleum price index shock, and a slowdown in economic activities in the world) have aggravated the adjustment process in China. From a policy perspective, it is obviously desirable to isolate the effects of external shocks and economic reform from adjustment policies.

The paper is structured as follows. In Section 2 a three-gap model for China is developed. Empirical results and analyses are addressed in Section 3. Then in Section 4 the effects of different adjustment policy variables and external shocks on selected macroeconomic indicators are simulated. The final section presents a summary of the main findings and relative policies.

2. A THREE-GAP MODEL

Accounting identities report the basic accounting identities that are required for the development of a three-gap framework for China. A brief description of the accounting formulations, which heavily refers to Iqbal et al. (2000) and modifies something according to China economy due to it should reduce surplus of trade balance, suitable foreign exchange reserve and internationalization of RMB in long term, is as follows. First, the formulation recognizes three types of capital transfers, viz. net foreign capital inflows to the private sector (NF_p); net domestic private capital surplus transferred to the public sector (NPC_g); and net foreign capital inflows to the public sector (NF_g). Total public revenues are divided into two main components, namely, non-trade revenues (T_{nt}) and trade revenues (T_t). Subject to capital transfers, these revenues are available to financial public consumption (C_g or G) and public investment (I_g). Aggregate imports are divided into imports of goods (M_g) and imports of factor and nonfactor services (M_{sr}). Similarly, aggregate exports are divided into exports of goods (X_g) and exports of factor and nonfactor services (X_{sr}). The implied aggregate for foreign savings is denoted NF . This, together, with private savings, S_p , and public saving, $T-C_g$, must exactly balance aggregate investment, which is denoted by I .

The accounting identities of a Three-Gap Model for China imply that

$$I_p = S_p + NF_p - NPC_g \quad (1)$$

$$I_g = T_t + T_{nt} + NPC_g + NF_g - C_g \quad (2)$$

$$NF_g + NF_p = M_g + M_{sr} - X_g - X_{sr} \quad (3)$$

$$I_g + I_p = S_p + T_{nt} + T_t + M_g + M_{sr} - X_g - X_{sr} - C_g \quad (4)$$

The above equations (1 to 4) are the fundamental equations of any three-gap model viz, the fiscal constraint (Equation 2), the foreign exchange constraint (Equation 3), and the saving constraint (Equation 4). This leaves Equation (1), which is redundant because it is implied by and, therefore, can be obtained from Equations 2 to 4.

We have developed our model from this point onwards in two stages. In the first stage we have endogenized twelve of the original variables to produce a first approximation to the final model. Specifically, we have assumed that

$$(i) M_g = \beta Y \quad \text{and} \quad M_{sr} = \zeta M_g$$

$$(ii) X_g = wY \quad \text{and} \quad X_{sr} = \varepsilon Y$$

$$(iii) T_{nt} = \alpha Y \quad \text{and} \quad T_t = \xi M_g$$

$$(iv) S_p = \sigma(Y - T) \quad \text{where } T = T_{nt} + T_t$$

$$(v) C_p = \lambda (Y - C_g)$$

$$(vi) I_p = \eta (Y - C_g)$$

$$(vii) I_g = \pi Y$$

$$(viii) R = \gamma Z$$

$$(ix) R = \chi TB, \text{ where } TB = \text{trade balance} = X - M = X_g + X_{sr} - (M_g + M_{sr}), \quad (5)$$

This introduces several new variables.

Y , which is the gross domestic product, the role of which is essentially to normalized the values of other variables.

R means foreign exchange reserve and negative R indicating it flow out of China. Z means net direct investment, indicating that FDI (foreign direct investment) minus China's outward foreign direct investment, and positive Z showing that China's outward foreign direct investment is less than FDI .

Next we define aggregate and private consumption by C and C_p , respectively, where

$$C = C_p + C_g \quad (6)$$

and

$$Y=C_p+I_p+G+TB=C_p+I_p+C_g+TB \quad (7)$$

On the demand side, domestic income is equal to the sum of consumption (both private consumption C_p , and government consumption G or C_g) and investment, plus the difference between exports and imports goods and services.

And, hence, after some standard manipulation of Equations (1) to (7), obtain a set of equations

$$Y= [\delta / \theta]C_g+[(\sigma-1)/\theta]NPC_g+(\sigma/\theta)NF_g+(1/\theta)NF_p$$

and

$$Y= [\delta / \phi]C_g+[(\sigma-1)/\phi]NPC_g+[\sigma/\phi]NF_g+[1/\phi]NF_p+[1/\phi]TB$$

or

$$Y= [\delta / \phi]C_g+[(\sigma-1)/\phi]NPC_g+[\sigma/\phi]NF_g+[1/\phi]NF_p+(1/\phi\chi)R \quad (8)$$

$$I_p=[-\eta(\sigma\pi-\psi+\mu)/\theta]C_g+[\eta(\sigma-1)/\theta]NPC_g+[\eta\sigma/\theta]NF_g+[1/\theta]NF_p$$

and

$$I_p=[-\sigma\pi\eta/\phi]C_g+[(\sigma-1)\eta/\phi]NPC_g+[\sigma\eta/\phi]NF_g+(\eta/\phi)NF_p+(\eta/\phi)TB$$

or

$$I_p=[-\sigma\pi\eta/\phi]C_g+[(\sigma-1)\eta/\phi]NPC_g+[\sigma\eta/\phi]NF_g+(\eta/\phi)NF_p+(\eta/\phi\chi)R \quad (9)$$

$$I_g=[\pi\delta/\theta]C_g+[\pi(\sigma-1)/\theta]NPC_g+[\pi\sigma/\theta]NF_g+[\pi/\theta]NF_p$$

and

$$I_g=[\pi\delta/\phi]C_g+[\pi(\sigma-1)/\phi]NPC_g+[\pi\sigma/\phi]NF_g+(\pi/\phi)NF_p+(\pi/\phi)TB$$

or

$$I_g=[\pi\delta/\phi]C_g+[\pi(\sigma-1)/\phi]NPC_g+[\pi\sigma/\phi]NF_g+(\pi/\phi)NF_p+(\pi/\phi\chi)R \quad (10)$$

$$I=[-\eta(\sigma\pi-\psi+\mu)+\pi\delta]/\theta]C_g+[(\pi+\eta)(\sigma-1)/\theta]NPC_g+$$

$$+[(\pi+\eta)\sigma/\theta]NF_g+[(1+\pi)/\theta]NF_p$$

and

$$I=[\pi(\delta-\sigma\eta)/\phi]C_g+[(\pi+\eta)(\sigma-1)/\phi]NPC_g+[(\pi+\eta)\sigma/\phi]NF_g+$$

$$+[(\pi+\eta)/\phi]NF_p+[(\pi+\eta)/\phi]TB$$

or

$$I=[\pi(\delta-\sigma\eta)/\phi]C_g+[(\pi+\eta)(\sigma-1)/\phi]NPC_g+[(\pi+\eta)\sigma/\phi]NF_g+$$

$$+[(\pi + \eta) / \phi] NF_p + [(\pi + \eta) / \phi \chi] R \quad (11)$$

$$C_p = [-\lambda (\lambda + \sigma) / \theta] C_g + [\lambda (\sigma - 1) / \theta] NPC_g + [\lambda \sigma / \theta] NF_g + [\lambda / \theta] NF_p$$

and

$$C_p = (-\lambda \sigma \pi / \phi) C_g + [\lambda (\sigma - 1) / \phi] NPC_g + [\lambda \sigma / \phi] NF_g + (\lambda / \phi) NF_p + (\lambda / \phi) TB$$

or

$$C_p = (-\lambda \sigma \pi / \phi) C_g + [\lambda (\sigma - 1) / \phi] NPC_g + [\lambda \sigma / \phi] NF_g + (\lambda / \phi) NF_p + (\lambda / \phi \chi) R \quad (12)$$

$$C = [(-\lambda (\lambda + \sigma) + \delta + \sigma \pi - \psi + \mu) / \theta] C_g +$$

$$+ [\lambda (\sigma - 1) / \theta] NPC_g + [\lambda \sigma / \theta] NF_g + [\lambda / \theta] NF_p,$$

and

$$C = [(\delta + \sigma \pi (1 - \lambda)) / \phi] C_g + [\lambda (\sigma - 1) / \phi] NPC_g + [\lambda \sigma / \phi] NF_g + (\lambda / \phi) NF_p + (\lambda / \phi) TB,$$

or

$$C = [(\delta + \sigma \pi (1 - \lambda)) / \phi] C_g + [\lambda (\sigma - 1) / \phi] NPC_g + [\lambda \sigma / \phi] NF_g + (\lambda / \phi) NF_p + (\lambda / \phi \chi) R \quad (13)$$

Where the notation

$$\mu = \beta(1 + \zeta); \psi = w + \varepsilon; \delta = 1 - \lambda - \sigma; \phi = 1 - \lambda - \sigma + \sigma \pi = \delta + \sigma \pi;$$

and

$$\theta = \delta + \sigma \pi - \psi + \mu = \phi - \psi + \mu \quad (14)$$

have been introduced to simplify the various expressions.

The variables appearing on the left-hand side of Equations (8) to (14) are the target variables for our study. Those on the right-hand side are assumed to be exogenous or policy driven. Accordingly it is to be assumed that all net capital transfers are exogenous or policy driven, as is public consumption expenditure, trade balance, and foreign exchange reserve. The simple version of our model is, therefore, to assume that the various parameters that enter into the Equations (5) [and, therefore, (14) also], are constant, from which it follows that the target variables are driven by public consumption expenditures, trade balance, foreign exchange reserve, and net capital transfers through a set of linear relationships.

To add some sophistication to this initial model we drop the assumption that each of the parameters introduced in Equations (5) and (14) are constant, and replace it with a model of how each parameter is thought to change over time. The results of doing so are shown in follow.

3. EMPIRICAL RESULTS AND SENSITIVITY ANALYSIS

3.1 Empirical results

The fourteen behavioral functions defined in follow have been estimated by ordinary least squares (OLS) using the time-series data for the period 1982-2010. These are generally satisfactory in the sense that the coefficient signs are mostly as expected. More detailed commentary on the results is offered in the following Paragraphs.

Imports of goods and services: modeling the parameters β and ζ . Assume that the variable β is mainly influenced by the import real exchange rate RER_m , total investment I , total consumption C , exports of goods and services X_g and X_{sr} . And the Variable ζ does by the import real exchange rate RER_m , the exports of goods and the real interest rate differential (defined as the America real interest rate minus China`s real interest rate).

The regression results of import demand function of goods conform to theoretical expectations. The results show that the domestic activity variables, such as total investment and exports of goods, are statistical significant determinants of import demand in China. But total consumption is insignificant because high investment, low consumption with no strong impacting on import demand function of goods. The real exchange rate is considered one of the important policy variables in structural adjustment programs in China. The estimated parameter for the real exchange rate possesses an appropriately negative sign and is statistically weak significant at the only 36-percent level, suggesting that imports of goods in China are weakly sensitive to relative import prices. Comparison of the different levels of import elasticity of the three domestic activity proxies developed reveals that the exports of goods is the highest (0.656) than the import elasticity of total investment (0.537), import elasticity of total consumption (0.607), and export elasticity of service (0.015) during the estimation period. All of the elasticity are weak due to they are less than 1.

The insignificant of import elasticity of total consumption might indicate the lower demand for imported luxurious consumer goods in China. In fact, the ratio of growth rate of Chinese government taxes income by person income is up from 1996 to 2010, meaning that government gets too much taxes and private income is lower than ever, see Figure 1.

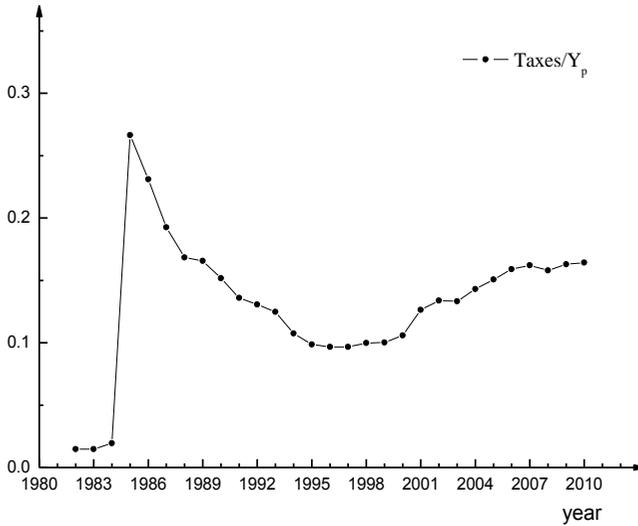


Figure 1. The ratios of taxes in private income, 1982-2010 (Data sources see Appendix; Y_p indicates private income).

The results for exports of services, mainly including exports of construction services and other commercial services exports, are consistent with *a priori* expectation. But the elasticity of exports of services is very small (0.015), seeming that the industry of exports of services, especially modern service industry, should be well developed through relative laws and policies.

$$\text{Log}(M_g/Y) = 1.796 - 0.352\text{log}(RER_m) + 0.537\text{log}(I/Y) + 0.607\text{log}(C/Y) +$$

$$t \quad \quad \quad (-0.933) \quad \quad \quad (1.692) \quad \quad \quad (0.514)$$

$$p \quad \quad \quad (0.361) \quad \quad \quad (0.104) \quad \quad \quad (0.612)$$

$$+ 0.656\text{log}(X_g/Y) + 0.015\text{log}(X_{sr}/Y), \quad R^2 = 0.918, D.W. = 1.07$$

$$t \quad (2.757) \quad (0.068)$$

$$p \quad (0.011) \quad (0.946)$$

$$\text{Log}(M_{sr}/M_g) = -0.491 - 0.354\text{log}(RER_m) + 0.983\text{log}(X_g/M_g) +$$

$$t \quad \quad \quad (-0.604) \quad \quad \quad (3.003)$$

$$p \quad \quad \quad (0.552) \quad \quad \quad (0.006)$$

$$+ 0.004\text{IRD} + [\text{AR}(1) = 0.767], R^2 = 0.785, D.W. = 2.23$$

t (0.496)

p (0.625)

The estimated import function of services also produces sensible results. The estimated parameter for the real exchange rate possesses an appropriately negative sign and is statistically significant only at the 55-percent level, suggesting that imports of services in China are not sensitive to relative import prices. The insensitivity of imports of services to the real exchange rate depreciation is not surprising, given the fact that China's economy is relatively heavily dependent upon imports of services. It seems that depreciation in the real exchange rate may not reduce the demand of imports of services, because of travel abroad and etc. The coefficient of the real interest rate differential (defined as the America real interest rate minus China's real interest rate) is statistically insignificant with a positive sign. Its estimated parameter suggests that a rising foreign interest rate relative to the domestic interest rate seems not to influence Chinese trips abroad and foreign financial services.

Exports of goods and services: modeling the parameters w and ε . Assume that the variable w is mainly influenced by the export real exchange rate RER_x , the foreign petroleum price index PPI , and the world demand W_d . And the Variable ε dose by the export real exchange rate RER_x , and the economic activity variable in the world I_d/Y_d .

$$\text{Log}(X_g/Y) = -5.770 + 0.691\log(RER_x) + 0.106\log(PPI) + 0.079\log(W_d) +$$

t (1.097) (0.805) (0.172)

p (0.284) (0.429) (0.865)

+ [AR(1) = 0.914] $R^2 = 0.942, D.W. = 2.08$

Estimation of the export supply function for goods indicates that the real exchange rate has a significant only at 28.4-percent level and positive impact on exports of goods during the estimation period, suggesting that exports of goods is not sensitive to the export price index in the world market. As a matter of fact, RMB appreciation increases China export in recent years. Regarding the petroleum price index, the results indicate an insignificant positive relationship between exports of goods and the petroleum price index, not supporting the view that the export sector in China is relatively energy intensive, and higher petroleum prices have a positive impact on the production and supply of exportable commodities. The estimated coefficient of world demand turns out to be insignificant, leaving inconclusive the question of habit formation on the part of foreigners.

$$\text{Log}(X_{sr}/Y) = -6.032 + 0.746 \log(RER_x) + 0.551\log(I_d/Y_d) +$$

t (1.564) (0.884)

p (0.131) (0.386)

$$+[AR(1)=0.885], R^2 = 0.904, D.W.= 2.11$$

The estimated function for exports of services produces sensible results. The coefficient of the real exchange rate possesses an appropriately positive sign, it remains statistically significant at only 13% level, leaving inconclusive the impact of exchange rate policy on the exports of services from China. The economic activity variable proxied by gross investments as a ratio to gross domestic products in the America is found to positively affect the export of services from China, but it remains statistically insignificant, suggesting that exports of construction services and other commercial services exports of China are underdeveloped.

Public non-trade and trade tax revenues: modeling the parameters α and ξ . Assume that the variable α is mainly influenced by the private investment. And the variable ξ does by the import real exchange rate RER_m , the exports of goods and services, X_g and X_{sr} , respectively.

The estimated coefficient of private investment as a ratio to private consumption is noteworthy in the non-trade revenues function. Its statistically insignificant coefficient only at the 32-percent level with a positive sign probably verifies that a higher tax rate on private investment, compared to consumer goods, raised the level of government revenues during the estimation period. It is also reasonable to infer from the estimated coefficient that a higher tax rate on profits over person incomes results in higher government revenues. Its positive and statistically insignificant coefficient indicates that maybe tax revenues in China are entirely dependent on circulation tax or indirect tax.

$$\text{Log}(T_{nr}/Y) = -2.110 + 0.545\text{log}(I_p/C_p) + [AR(1) = 0.573], R^2 = 0.538, D.W. = 2.08$$

$$t \quad (1.02)$$

$$p \quad (0.317)$$

$$\text{Log}(T_g/M_g) = -4.792 - 0.060\text{log}(RER_m) - 0.057\text{log}(X_g/M_g) -$$

$$t \quad (-0.100) \quad (-0.106)$$

$$p \quad (0.921) \quad (0.916)$$

$$-0.472\text{log}(X_{sr}/M_g) + [AR(1) = 0.937], R^2 = 0.952, D.W. = 1.87$$

$$t \quad (-1.071)$$

$$p \quad (0.295)$$

The regression results for the foreign trade tax revenues function show that the real exchange rate, exports of goods, export of services are weakly significant determinants of public revenues from international trade in China. Maybe the cause is export tax rebate. The Figure 2 shows that the average value of export tax rebate as a ratio to trade revenues is near 2 (1.96) from 1985 to 2010, and the largest value is 4.4 in 2009. It would be bad thing for Chinese government tries on changing export situation and keeping surplus of trade balance to use export tax rebate through influencing the policies of export prices.

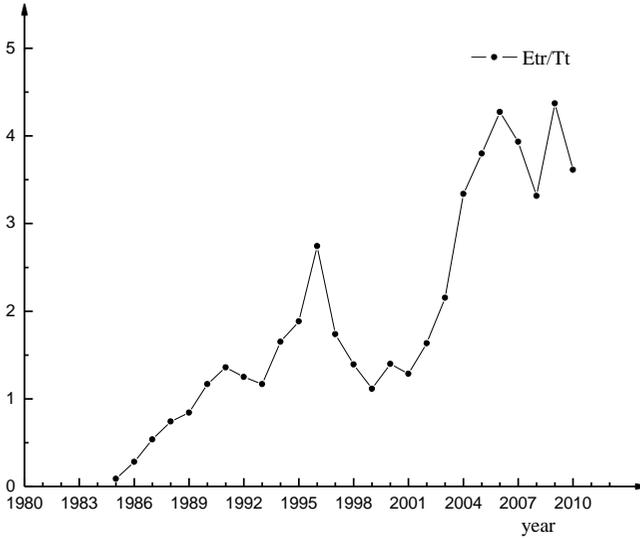


Figure 2. Export tax rebate/trade revenues, 1985-2010 (Etr indicates export tax rebate, Tt indicates trade revenues).

The estimated coefficient of the real exchange rate shows a negative and insignificant association between real exchange rate depreciation and foreign trade tax revenues.

Private savings, consumption and investment, and public investment: modeling the parameter σ, λ, η and π . Assume that the variables of σ, λ, η and π are mainly influenced by the domestic real interest rate lagged one year (IRR_{-1}).

These models treat the domestic real interest rate as one of the important policy variables. Their direct effects on private savings, consumption and investment, and public investment, thus, as well as their indirect effects on target variables, are of great interest. The inclusions of the domestic real interest rate lagged one year (IRR_{-1}) in the specification have a weakly direct impact on private savings and consumption during the period under consideration.

$$\text{Log}(S_p/Y_p) = -0.658 - 0.001 \text{ IRR}_{-1} + [\text{AR}(1) = 0.869], R^2 = 0.955, D.W. = 1.66$$

$$t \quad (-0.590)$$

$$p \quad (0.561)$$

$$\text{LOG}(C_p/(GDP - C_g)) = -0.358 + 0.001 * \text{ IRR}_{-1} + [\text{AR}(1) = 1.071], R^2 = 0.976, DW = 2.00$$

$$t \quad (1.024)$$

$$p \quad (0.316)$$

$$\text{LOG}(I_p/(GDP-C_g)) = -0.258 - 0.010 * IRR_{-1} + [AR(1) = 0.949], R^2 = 0.926, DW = 1.73$$

$$t \quad \quad \quad (-2.829)$$

$$p \quad \quad \quad (0.009)$$

$$\text{LOG}(I_g/GDP) = -3.966 - 0.011 * IRR_{-1} + [AR(1) = 0.892], R^2 = 0.866, DW = 1.21$$

$$t \quad \quad \quad (-1.358)$$

$$p \quad \quad \quad (0.187)$$

The inclusions of the domestic real interest rate lagged one year (IRR_{-1}) in the specification have a direct impact on private and public investment during the period under consideration.

Comparing the results, we may find that the marketization of the domestic real interest rate has been being realized in China.

Foreign exchange reserve and direct investment: modeling the parameter γ . Assume that the variable γ is mainly influenced by the real exchange rate of variable RMB , exports of goods and services X_g and X_{srs} , imports of goods and services M_g and M_{srs} , and the real interest rate differential (defined as the America real interest rate minus China's real interest rate).

$$R/Z = -2.732 - 0.005 * RMB - 79.540 * X_g / GDP + 191.258 * X_{srs} / GDP +$$

$$t \quad \quad \quad (-0.276) \quad \quad \quad (-2.304) \quad \quad \quad (0.450)$$

$$p \quad \quad \quad (0.786) \quad \quad \quad (0.031) \quad \quad \quad (0.657)$$

$$+ 63.730 * M_g / GDP + 58.509 * M_{srs} / GDP + 0.081 * IRD, R^2 = 0.361, D.W. = 1.42$$

$$t \quad (1.811) \quad \quad \quad (0.290) \quad \quad \quad (0.698)$$

$$p \quad (0.084) \quad \quad \quad (0.774) \quad \quad \quad (0.493)$$

The estimated function for foreign exchange reserve and direct investment produces sensible results. The coefficient of the real exchange rate of RMB possesses an appropriately positive sign (γ is negative sign), it remains statistically insignificant, meaning that China's foreign exchange reserve is not heavily influenced by wave of real exchange rate of RMB . The coefficient of the real interest rate differential is statistically insignificant with a negative sign (γ is negative sign). The results show that the domestic activity variables, such as exports of goods with a positive sign and imports of goods with a negative sign, are statistical significant determinants of foreign exchange reserve demand in China, and are consistent with *a priori* expectation. But exports of services and imports of services are statistically insignificant. The coefficient of exports of services is not consistent with *a priori* expectation, meaning that China's government would quickly develop exports of services. The coefficient of the real interest rate differential is not consistent with *a priori* expectation, seeming that the policy of China's foreign exchange reserve little pay attention to America real interest rate, and do not care about the value of foreign exchange reserve.

Foreign exchange reserve and trade balance: modeling the parameter χ . Assume that the variable χ is mainly influenced by the real exchange rate of variable *RMB*, the real interest rate differential (defined as the America real interest rate minus China's real interest rate), and investment as a ratio to *GDP* in the America (I_d/Y_a).

$$R/TB = -2.887 + 0.008 * RMB + 0.026 * IRD + 10.899 * (I_d/Y_a) + 0.027 * (R/TB)_{-1}$$

t (0.167) (0.152) (0.181) (0.198)

$$+ 0.001 * (R/TB)_{-2} + 0.007 * (R/TB)_{-3}, R^2 = 0.024$$

t (0.010) (0.072)

The estimated function for foreign exchange reserve and trade balance produces sensible results. The coefficient of the real exchange rate of *RMB* does not possess an appropriately negative sign (χ is negative sign), it remains statistically insignificant, meaning that China's foreign exchange reserve is not heavily influenced by wave of real exchange rate of *RMB*, and the more appreciation of *RMB*, the more foreign exchange reserve. The coefficient of the real interest rate differential is statistically insignificant with a negative sign (χ is negative sign), it seems that, the lower the real interest rate in the America, the more China's foreign exchange reserve. The coefficient of the economic activity in the America is statistically insignificant with a negative sign (χ is negative sign), it seems that, the lower the economic activity in the America, the more China's foreign exchange reserve. Comparing all of the coefficients we find that it is the economic activity in the America that is the most important factor impacting on China's foreign exchange reserve. In other words, China's foreign exchange reserve heavily supports the America economic development. The terms of lagged one, two and three variable with *R/TB* indicate that foreign exchange reserve keeps accumulation year by year. The results of test see Table 1.

Table 1. Breusch-Godfrey Serial Correlation LM Test (lag =2)

F-statistic	0.206451	Prob.	0.8155
Obs*R-squared	0.616523	Prob.	0.7347

3.2 Sensitivity analysis

This section outlines a range of experiments that have been made with the model described in the previous section. They reflect qualitative as well as quantitative policy measures. We have picked out for analysis some key quantifiable policy measures, which cover both demand-and supply-side effects, on the basis of their performance during the period of 2011 and 2015. Specifically, the following adjustment policy variables have been selected for

analysis: (a) the level of public current expenditure; (b) the trade balance; (c) foreign exchange reserve; (d) adjustment lending; and (e) private foreign capital outflows. These are by no means the only policy measures affecting China, but they are undoubtedly among those that are more important.

China's economy was affected along with all others by the external shocks of the 1997 of Asian financial crisis and late in 2007 until now of financial crisis. In this study, four variables have been chosen to represent external circumstances during the 2011 and 2015 that affected macroeconomic performance in China. They are: (a) the real interest rate differential (defined as the America real interest rate minus China's real interest rate) (b) the foreign petroleum price index, representing the oil price shock; (c) world demand; (d) the investment as a percentage of *GDP* in the America, representing economic activities in the World. The sensitivity experiments have been undertaken in two steps. The first predicts the values of the endogenous variables for the base year 2005, using the estimated parameters of the model and actual values of the exogenous variables. In the second step, the effects of changes in policy variables and external shocks on these same endogenous variables are computed.

The changes in policy variables that have been assumed in the sensitivity experiments are: (a) a 10-percent reduction in foreign capital inflows to the public sector (NF_g); (b) a 10-percent reduction in foreign capital inflows to the private sector (NF_p); (c) a 10-percent reduction in domestic capital transfers to the public sector (NPC_g); (d) a 10-percent reduction in public sector current expenditure (C_g); (e) a 10-percent reduction in trade balance; (f) a 10-percent reduction in R (foreign exchange reserve). Similarly, the assumed changes in external shock variables are: (a) a 1-percent reduction in the foreign real interest rate over the domestic real interest rate (IRD , quantitative easing monetary policy of Federal Reserve System in recent years); (b) a 10-percent increase in the foreign petroleum price index (PPI); (c) a 10-percent reduction in W_d ; (d) a 1-percent contraction in total investment as a ratio to *GDP* in the world (I_d/Y_d). The main results of individual sensitivity experiments are summarized in the Table 2.

They suggest that all the target variables are negatively affected by the availability of foreign capital flows out of China. It seems that China is lack of foreign capital to raise its economic development. It is paradise that, in one hand, China is the richest country in the world due to contributing its great deal of foreign exchange reserve to the America. In the other hand, China is lack of capital to raise its economic development. The main channel through which foreign transfers influence the outcome is through investment.

The results suggest that the reduction of foreign capital flows into private sector and public sector seems the same negative effects on all the target variables. The results also suggest that foreign capital flows out of the private sector tend to produce stronger effects on all the target variables (e.g., a reduction in output by 4.5 %; and in aggregate investment and aggregate consumption of 4.7 % and 2.4 %, respectively) than do foreign capital flows out of

the public sector (which yield decreases in output of 1.9 %, and of aggregate investment and aggregate consumption of 0.8% and 1.0 %, respectively). A plausible reason seems to be that private investment depends more heavily on foreign capital outflows than does government investment, or foreign capital inflows stimulate investment in recipient countries.

A reduction of domestic credit extended to the public sector and an expansion of domestic credit to the private sector so as to reduce the overall role of the public sector in the economy and to encourage the participation of the private sector in commercial and industrial activities. The results of a 10-percent contraction in domestic credit extended to the public sector are seen in Table 2 to suggest that all the target variables are positively affected by the effects, such as an increase in *GDP* 2.6 %, a rise in private investment and public investment 1.1% and 0.07%, respectively.

Our sensitivity analysis suggests that the effects of a contraction in government current spending appear to be negative of output, private and public and total investment, 0.16%, 0.02%, 0(0.004%) and 0.03%, respectively. It does positive of private and total consumption, 2.36% and 2.26%, respectively. A cut in public current spending would allow for lower inflation and weakly “crowding out” of private investment.

Our sensitivity analysis suggests that the effects of a contraction in trade balance appear to be negative of all target variables but China’s outward foreign direct investment. It is more interesting that when trade revenues are reduced by 0.02%, non trade revenues are reduced by 0.23%, the reduced amount is greater ten times than trade revenues, with the effects of a trade balance contraction being generated through two mechanisms, which can be seen in the upper part of Table 2. The first is the direct link export tax rebate, as figure 2 shown, China’s export tax rebate is too much.

The second mechanism works through the impact of a economic structure, which indicates that the relationship between non-trade revenues and exports is greater than the relationship between trade revenues and exports. China’s export-oriented economy has been shown through trade revenues drawing 10-fold of non trade revenues. To boost domestic demand, it should be done for China’s government to adjust economic structure in depth.

Our sensitivity analysis suggests that the effects of a contraction in foreign exchange reserve appear to be negative of all target variables but China’s outward foreign direct investment. The main reason is the regime of fixed exchange rate in China. The mechanics seems that: foreign exchange reserve ↓ → money supply ↓ → output ↓. Where, ↓ means reduction, and → means creation.

Moving on from sensitivity in relation to policy variables, we now consider the sensitivity of our target variables to four significant external considerations, the first of which is decrease in the international real interest rate. Table 2 reports the results of decreasing it by 1 percent above the domestic real interest rate in the considering term, considering that the America interest rate keeps lower and near zero level in order to stimulate its economic growth in

recent years after financial crisis in late 2007. This has a negative impact on all the selected macroeconomic variables, mainly because of a higher domestic real interest rate can easily induce foreign hot money into China, and push inflation due to fixed exchange rate regime of China.

An increase in the foreign petroleum price index is the second external factor. It is not surprising that our experiment shows an increase in the petroleum price index as having a positive effect on all the selected target variables in China. Because China's exports of goods are not main depend on petroleum, but on lower wage, lower price of domestic natural resources.

A third external factor, which also has a relative weak impact on is the level of economic activity in the world, which affects China through its influence on exports.

Table 2. Effects of Changes in policy variables and external shocks on selected target variables

	Changes in policy variables				Changes in external shocks					
	NF_p	NF_g	NPC_g	C_g	TB	R	IRD	PPI	W_d	I_d/Y_a
	(Percentage deviations from the base-year results)									
Endogenous variables	Regression results									
X_g	-0.850	-0.363	0.487	-0.030	-0.406	-0.109	-0.089	1.270	-0.008	-0.051
X_{sr}	-0.100	-0.043	0.057	-0.003	-0.048	-0.013	-0.010	0.149	-0.001	-0.006
M_g	-0.741	-0.316	0.425	-0.026	-0.354	-0.095	-0.077	1.110	-0.007	-0.044
M_{sr}	-0.102	-0.044	0.059	-0.004	-0.049	-0.013	-0.011	0.153	-0.001	-0.006
T_{nt}	-0.482	-0.206	0.276	-0.017	-0.230	-0.062	-0.050	0.720	-0.005	-0.029
T_t	-0.047	-0.020	0.027	-0.002	-0.022	-0.006	-0.005	0.007	0.000	-0.003
S_p	-1.715	-0.732	0.983	-0.060	-0.821	-0.221	-0.173	2.560	-0.016	-0.103
Target variables	Implied results									
Y	-4.545	-1.941	2.605	-0.159	-2.174	-0.585	-0.474	6.790	-0.043	-0.273
I_p	-4.545	-0.792	1.603	-0.024	-0.887	-0.239	-0.193	2.370	-0.015	-0.095
I_g	-0.118	-0.051	0.068	-0.004	-0.057	-0.015	-0.012	0.177	-0.001	-0.007
I	-4.663	-0.842	1.130	-0.028	-0.924	-0.248	-0.201	2.547	-0.016	-0.102
C_p	-2.445	-1.044	1.401	2.360	-1.117	-0.315	-0.255	3.120	-0.020	-0.020
C	-2.445	-1.044	1.401	2.260	-1.170	-0.315	-0.255	4.110	-0.026	-0.165
Z					-0.167	-0.045				
R					0.372		0.081			

Notes: negative Z indicates that China's outward foreign direct investment is more than FDI (foreign direct investment), and positive R means that R is reduced.

The simulated results reported in Table 2 show that a contraction in economic activity in America, as simulated by 1-percent reduction in the investment/*GDP* ratio as a fourth external factor, appears to produce relative strong contractive effects on all the target variables of China's economy. Overall, production decreases by 0.273 percent, gross investment and consumption by 0.102 percent and 0.165 percent, respectively. China's economic structure is more closer to the America than the other in the world.

4. CONCLUSIONS AND IMPLICATIONS

The purpose of this article has been to assess whether the adjustment programs of demand management have had any positive effects to date on macroeconomic performance, whether and to what extent external factors aggravated the adjustment process of China's economic growth, using annual data for the period between 1982 and 2010, a three-gap model has been formulated and estimated.

The major innovations of the study are how to adjust China's economic structure and to highlight procedure with quantitative assessment of three new variables close relating to China's economic structure adjustment and internationalization of RMB, such as *TB* (trade balance), *R* (foreign exchange reserve) and *Z* (China's net direct investment), through inducing five new approximation λ (between C_p and $(Y - C_g)$), η (between I_p and $(Y - C_g)$), π (between I_g and Y), γ (between R and Z) and χ (between R and TB) facing China after a simulation experiment during 1982 to 2010.

Firstly, it is difficulty for China to adjust its economic structure mainly from export-oriented economy to domestic demand due to trade revenues drawing 10-fold of non trade revenues! China's economic structure is more closer to the America than the other in the world.

Secondly, China's government gets too much taxes, and private income too lower. China's export tax rebate is too much. Tax revenues in China are entirely dependent on circulation tax or indirect tax.

Thirdly, the domestic real interest rate lagged one year during the period under consideration have a direct impact on private and public investment, but weakly do on private savings and consumption.

Fourthly, a rising foreign interest rate relative to the domestic interest rate seems not to influence Chinese trips abroad and foreign financial services.

Fifthly, China's export sector is not energy intensive, and higher petroleum prices have a positive impact on the production and supply of exportable commodities.

Sixthly, the imports and exports of China goods are not sensitive to the import and export price index in the world market. China's economic structure is not sensitive to world demand.

Sevently, exports of construction services and other commercial services exports of China

are underdeveloped.

Eighthly, the policy of China's foreign exchange reserve little pay attention to America real interest rate, and do not care about the value of foreign exchange reserve, and not sensitive to wave of real exchange rate of RMB.

Ninthly, withdrawal of FDI can influence China's economic development.

Tenthly, reduction in government consumption can stimulate private and total consumption, weak reduction in output.

Eleventh, the effects of a contraction in trade balance and foreign exchange reserve appear to be negative effects on all of target variables. The main reason is the regime of fixed exchange rate in China.

Twelfth, a higher domestic real interest rate can easily induce foreign hot money into China, and push inflation due to fixed exchange rate regime of China.

These findings suggest Chinese government adjustment policies as gradual adjustment in its economic relations much closer to the other in the world not the America; reduction in government consumption and domestic credit extended to the public sector in order to stimulate private and total consumption, encourage the participation of the private sector in commercial and industrial activities, and increase outcome in China; increase in the zone of RMB exchange rate float; gradual reduction in export tax rebate and circulation tax or indirect tax in order to adjust its economic structure from export-oriented economy to domestic demand, raise private income, investment and consumption; realization in direct tax system entirely on corporate and individual income tax, and increase in wage and price of domestic natural resources; acceleration in the marketization of domestic interest rate; quick development in the export of traditional and modern service industry, exports of construction services and other commercial services exports; close attention to its real value of foreign exchange reserve, and suitable reserve.

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APPENDIX

1. Development Research Center of The State council, 2011, data about revenue, expenditure, import, export and tax, DRCNET Statistical Database System.
2. National Bureau of Statistics of China, 2011, data about gross domestic product, savings of residents and fixed assets investment.
3. International Monetary Fund, 2011, data about current account, capital account and financial account.