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ABSTRACT

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Coordination of macro-economic development and employment is an essential issue for China's social development, which largely depends on economic expansion, as well as integration into the global market to create jobs. Through the literature review and empirical test, this paper analyses the relationship between macro-economic policy and employment, and discusses the impact of real exchange rate and foreign trade on employment. The research indicates that a stable and competitive exchange rate policy plays an indispensable role in employment promotion, more effective than monetary and fiscal policies, while the export growth also plays a positive role in employment promotion.

JEL Classification: E24, O23, O24

Keywords: China, employment, foreign trade, real exchange rate

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1 Introduction

Chinese labour market has been experiencing a significant transformation from an administrative system under the command economy to a market-oriented mechanism under the market economy since china's market reform in 1978. However, domestic researches (Zeng and Lu, 2008) predict that before 2020, the Chinese labour market still struggles under tough situations with the aggregate labour supply far exceeding the demands.

Frictional and structural unemployment is prominent since the 1990s, with the continuous increase of natural unemployment rate (Zeng and Yu, 2006). Moreover, following the change of economic and political environments, new challenges to employment have emerged. First, the decline of employment elasticity happens and causes high economic growth with low employment expansion. The average growth rate of real GDP[1] between 1980 and 2009 is 9.78%, but the accession rate declines from 3.26% in 1980 to 0.665% in 2009.

Second, economic dependency on international trade becomes significant, as the proportion of imports and exports in GDP increases from 12.54% in 1980 to 43.86% in 2009. However, recently, continuing expansion of double-digit surplus of Chinese current and capital accounts exerts large appreciation pressure upon RMB, the Chinese currency. Under this circumstance, RMB exchange rate against USD, falls from 8.27 on 21 July 2005 to the recent level of 6.3950 (Aug. 15th, 2011)[2]. Meanwhile, RMB keeps its appreciations against HKD and GBP. This poses dramatic influence on the Chinese economy.

Third, changes of industrial structure and upgrade of labour technology structure affect the economic growth model, which has to cope with many structural unemployment problems, such as mass layoff in state-owned enterprises (SOEs), unemployment for college students and migrant workers, shortage of skilled workers, etc. Then, improving the employability of workers becomes essential to meet the changing technology demands.

Therefore, this article studies the relationship between macroeconomic growth and change of employment by drawing the linkage among real exchange rate, foreign trade, technology development and employment in China.

[1] Real GDP is equal to nominal GDP divided by the GDP deflator (Year 1990 = 100). GDP and employment data are from *China Statistical Yearbook 2010*, and GDP deflator are from IFS database.

[2] Data source: The Website of he People's Bank of China, http://www.pbc.gov.cn/.

2 Literature and Theoretical Background

2.1 Real Exchange Rate, Macroeconomic Growth and Employment

The impact of real exchange rate fluctuations on economic growth, employment and the employment channel draws attention from both researchers and policymakers. Initiative studies (Branson and Love, 1986; Revenga, 1992) use empirical studies from developed countries, and illustrate significant relations between currency appreciation and employment. Branson and Love (1986) believes that exchange rate fluctuations can alter relative product prices and alter national competitiveness, so as to cause the rise or decline of product demands, and thereby affecting employment. Campa and Goldberg (2001) point out that in addition to export reduction or import increase, currency appreciation lowers costs of import of intermediate goods, which then affects employment. By studying the industry-level data of US in 1972-1996, they (ibid) find exchange-rate appreciation has a negative impact on employment, in terms of the number of jobs and working hours. Similarly, the researches of Dekle (1998) on Japanese manufacturing, Gourinchas (1999) on French manufacturing, and Abdulnasser and Manucheh (2006) on five French industries all present the negative influence of currency appreciation over employment. From the international comparative aspect, Burgess and Knetter (1998) examine the response of employment to exchange-rate fluctuation at the national industry level in the G7 countries, and notice that in every G7 country, there is a connection between currency appreciation and decrease of manufacturing jobs. But due to the difference of the product market and labour structure, the level of impact and speed of employment adjustment vary greatly across countries.

Studies on developing countries, however, point out that exchange-rate fluctuation leads to different effects on the labour market, because of a higher degree of external economic dependence, as well as the different product market structure and labour market characteristics. Based on the empirical studies on Argentina, Brazil, Chile and Mexico and other developing countries, Frenkel (2004) argues real exchange rate fluctuation in developing countries can affect aggregate demand (the macroeconomic channel), investment expansion and economic growth (development of channels). This influence changes the relative price of labour and alters the amount of jobs per output unit (labour intensity of channels). In developing countries, currency depreciation reduces unemployment rates.

However, Edwards (1986) believes that when developing countries require substantial import of intermediate products and have external debt, currency depreciation negatively influences employment. After studying nine Latino countries with large amounts of dollar-denominated debts, Galindo, Izquierdo and Montero (2007) find that currency devaluation is beneficial to the growth of total employment, but, in the industries with high dollar-debt, the effects of currency devaluation shows the reverse.

For the relationship between RMB exchange rate and China's employment, domestic Chinese research argues RMB appreciation inhibits manufacturing jobs. The studies (Fan and Song, 2005; Hua, 2007) illustrate that RMB appreciation is disincentive to China's manufacturing jobs in 1992-2003. Similarly, Wan and Xu (2004) notice that RMB appreciation has a rejection effect on employment, through OLS regression test between two variables, the total employment and RMB exchange rate against USD. Meantime, RMB real exchange rate has negative co-integration relations with employment in the trade sectors, while there is no stable long-term connection with employment in the non-trade sectors (Jian and Ding, 2006). Thus, real exchange rate appreciation can harm China's overall employment.

However, most existing literatures are confined to the relations between exchange rate and manufacturing jobs, or merely study the connection between the exchange rate and overall employment without considering other factors of macroeconomic policies that can also affect employment. The researches ignore the means of macroeconomic policy in the context of exchange rate fluctuations, and neglect the effectiveness of employment promotion policies. Therefore, it is necessary to integrate RMB exchange rate and China's macroeconomic policies into the analytical framework, so as to assess the effectiveness of employment promotion strategy in China.

2.2 Foreign Trade and Employment

Neo-classical trade theories emphasise comparative advantages and believes that trade plays a positive role in promoting employment in developing countries. However, the practice of developing countries does not entirely support this belief. Different researches reach different conclusions on the relations between foreign trade and employment, even when evaluating the relations in the same country.

Through trade with developing countries having relatively abundant supply of unskilled labour, developed countries usually concern about their own employment of unskilled labour. By researching on trade deficit and immigration in USA during 1980s, Borjas et al (1991) suggest that the import of labour-intensive products, along with immigration, creates oversupply unskilled labour. But, other studies (Lee and Schluter, 1999), about the effect of trade between USA and developing countries over the demand for skilled and unskilled labour during 1972-1992, argue trade is not the main factor for the changing labour demand. Although developed countries continue to increase imports of manufacturing goods from developing countries, trade only has a minor negative impact on manufacturing jobs in developed countries (Ghose, 2000).

Many developing countries in East Asia and Latin America adopt export-oriented strategy by producing huge amounts of manufactured goods. The studies (Hasan and Chen, 2004; Ghose, 2003; Goldar, 2002; Rasiah, 2002) on India, Malaysia, the Philippines and other Asian countries notice that export industries employ more

unskilled labour, and the import-competing industries employ more skilled workers. This leads to faster growth of employment of unskilled labour than skilled labour. Meanwhile, other studies (Carneiro and Arbache 2003; Revenga, 1997) about Latin American countries like Mexico and Brazil illustrate that despite the rapid export-led growth in the manufacturing sector, employment growth is very slow or even declines, with employment of unskilled labour shrinking deeper than skilled labour. Thus, even in the developing countries having comparative advantages on manufacturing, the impact of trade liberalisation on employment is far from certain.

International studies about the relations between trade and employment in China mainly analyse changes in manufacturing jobs, and assert that foreign trade creates employment opportunities for unskilled Chinese workers and solves the hidden unemployment problem in rural areas (Fu and Balasubramanyam, 2005; Woo and Ren, 2002). Meanwhile, greater integration into the international trade, such as China's WTO accession increases jobs. In the short and medium term, some industries will benefit from global competition and others may experience big loss in the long run, but aggregate employment can keep increasing (An 2005, Bhalla and Qiu, 2002).

Domestic Chinese researches (Lan, 2000; Yu, 2002) also pay great attention to trade expansion and employment creation. After China’s WTO entry in 2001, some scholars (Li et al, 2000) believe WTO entry increases employment in the long term. Based on the data of 1980-2004, Yang (2006) finds that export of industrial products plays a significant role in raising employment, and, the impact of imports on employment is not obvious.

However, as China starts to fully integrate into the global economy, the influence of import over employment can be negative. Actually, different trade patterns on employment are very different (Zhou, 2006). Change of trade structure of manufacturing products has an adverse relation with employment. Trade of service creates jobs, but the net effect of trade on service employment is slight. Trade liberalisation causes the rise of elasticity of manufacturing labour demand, which means that even if trade liberalisation does not have an obvious influence on wage and employment, it affects manufacturing jobs through the elasticity of labour demand.

This article examines the impact of import and export on employment. Actually, it is important not only to evaluate how a country uses its resources on establishing export industries, but also to conduct this research for studying a specific period of economic development and consumption levels in the country. While there are a few researches about the impact of trade on Chinese employment, the studies mainly focus on the relations between export of manufacturing products and manufacturing jobs. Although some studies discuss various trade patterns on employment, the data is limited to one year, instead of multi-year data (Zhou, 2006), so that it is difficult to disclose the tendency of trade and employment.

3 Methods and Data

To analyse macroeconomic impacts on employment, the empirical study of this article collects the data from official statistics like China Statistics Yearbook (1985-2007), China Labour Statistics Yearbook (1985-2007) and the IFS database. We take vector autoregressive (VAR) method to test the impacts of exchange rates changes, currency supply and fiscal spending on employment growth. Meantime, we estimate the impacts of foreign trade on China's employment (1978-2007) through two methods: Output Constrained Model (Greenaway et al, 1999), and, Capital Constrained Model (Castro et al, 2007).

3.1 The Impact of Real Exchange Rate on Employment

This article simplifies the aggregate demand-supply model (Kandil and Mirzaie, 2003)[3], and analyses the channel and effect of RMB exchange rate on employment. The results indicate that employment balance is determined by exchange rate, money supply, government purchase, energy price and the average price level of foreign products, which is directly nominated by the changing RMB exchange rate. Excluding the price level of foreign products, the econometric model of this article examines the relations between employment and real effective exchange rate, money supply, government purchase and the logarithm of energy prices.

Under some given conditions, VAR model can estimate the impact of the basic economic shock on other economic variables. General p-order unconstrained VAR model, denoted by VAR (P), can be expressed:

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots + A_p Y_{t-p} + \varepsilon_t, t = 1, 2, \cdots, T$$

In this model, Y is the k-dimensional vector, p is the lag order, T is the number of samples. ε is the disturbance vector. They are related in the same period, but with the variables in t-1 period. $A_1, A_2, \cdots, A_p$ are the coefficient matrix. Specifically, Y_t is represented by the vectors of five variables, which are employment, real exchange rate, money supply, government purchase and energy price.

In this study, employment refers to the aggregate employment by the end of one year[4];

[3] The model is applied to analyse the effect of exchange rate chages on domestic output and prices at the beginning see Kandil and Mirzaie (2002). In addition, Bahmani-Oskooee et al. (2007) also uses a simplified model to test the effect of exchange rate changes on U.S. manufacturing employment

[4]In theory, the employment refers to the number of employment and working hours but according to the study of Zeng Xiangquan in Beijing, Changsha and Guangzhou in 2003-2004, although the flexibility of working hours has been strengthened, the average working time per week was 44.6 hours,changing little, accorded with the requirement of 44 hours per week in"Labor Law" adopted in 1994 (see Zeng Xiang-Quan and Lu Liang, "The dual challenges of standardization and flexibility - the study of working time in Chinese enterprises in transition time "" Journal of Renmin University of China, "2006 No. 1). In addition, while the empoyment published by "China Statistical Yearbook," has a suspect of underestimated, all data after 1990 is revised through the census. Thus,

the exchange rate refers to the real effective exchange rate index[5]; real money supply is calculated as broad money supply (money plus quasi-money, M2) divided by the GDP deflator; government purchase is equal to the government expenditure divided by the GDP deflator in the year.

Considering that there is a wide gap between China's heavily regulated domestic energy market and the international market, it is unwise to use the international oil price to measure the energy price. This article uses ex-factory price index of China's oil (2000 year = 100) instead. The logarithmic forms of these variables are:

$LogL_t$, $LogR_t$, $LogM_t$, $LogG_t$ and $LogZ_t$。

Annual data in the period of 1980-2006 are used to study the impact of exchange rate on the employment. The national employment by the end of year and the ex-factory price index of the oil industry are from China Statistics Yearbook. To maintain consistency, other data, such as government purchase, money supply, real exchange rate index (Year 2000 = 100) [6] and the GDP deflator (Year 2000 = 100), are from IFS database.

Since China's market reform in 1978, the real exchange rate has experienced a process of overall depreciation (see Figure 1). Rapid depreciation happens from 1980 to1993. After 1993, the rate begins to rebound. Compared to the depreciation in the past, the range of appreciation is small. But, the real exchange rate rises quickly from 1993 to 1998, and then stabilises from 1999 to 2006. During this period, China's exchange rate system also encounters several reforms. In the early 1980s, China has the fixed exchange rate system. In 1988-1993, China adopts the dual exchange rate system, which hosts the official exchange rate and market exchange rate. Since 1994, the dual system has been abandoned and the controlled floating system is introduced.

(Insert Figure 1)

3.2 The Impact of Foreign Trade on Employment

Output Constrained Model (Greenaway et al, 1999) and Capital Constrained Model (Castro et al, 2007) are used, and the two models start with Cobb-Douglas production function:

$$Q_t = Ak_t^{\alpha} L_t^{\beta} \qquad (1)$$

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employment by the end of the year basically reflects the changes in China's employment growth trends and has little impact on the conclusions of this research.

[5] Real effective exchange rate not only takes into account of the relative changes of the bilateral nominal exchange rates of all trading partners but also excludes the impact of inflation on the value of the currency itself so it can reflect the national currency's external value and international competitiveness of trade goods.

[6] The index uses indirect method of the exchange rate: increase indicates the appreciation, decrease indicates the depreciation

Q represents GDP, A represents skill level, i.e. elements in which economic growth cannot be explained by capital and labour including the management level, the introduction of advanced technology, etc, often referred to 'total factor productivity'. K represents capital, L represents labour, α and β represent capital-output elasticity and labour-output elasticity.

The approach developed by Greenaway et al (1999) to build the model is based on the principle of profit maximising of company element mobilisation:

$$MRPL = MPL \cdot MR = w \quad (2)$$

$$MRPK = MPK \cdot MR = c \quad (3)$$

Namely, the marginal revenue product of labour (*MRPL*) is equal to wages (w) and the marginal revenue product of capital (*MRPK*) is equal to the cost (*c*), while substituting these two equations into the equation (1):

$$Q_t = A\left(\frac{\alpha L_t}{\beta}\frac{w}{c}\right)^{\alpha} N_t^{\beta} \quad (4)$$

The assumption is that as time goes by, technology improves continuously and technology progress is relevant to trade, so that the parameter *A* is expressed as:

$$A_t = e^{\tau_0 T} M_t^{\tau_1} X_t^{\tau_2} \qquad \tau_0,\ \tau_1,\ \tau_2 > 0 \quad (5)$$

Here, T represents the time trend, M represents import penetration, X represents exports/consumption.

Then, we substitute (5) into (4), and take logarithm on both sides of the equation:

$$\ln L_t = \phi_0 - \mu_0 T - \mu_1 \ln M_t - \mu_2 \ln X_t + \phi_1 \ln(w/c) + \phi_2 \ln Q_t \quad (6)$$

The approach developed by Castro et al (2007) to build the model is to first deform the condition of the use of the labour factor in profit-maximising firms:

$$L_t = \beta P_t Q_t / w_t \quad (7)$$

Here, *P* represents the domestic price of goods.

Then, we substitute (1) into (7):

$$L_t = \beta P_t \left(A K_t^{\alpha} L_t^{\beta}\right) / w_t \quad (8)$$

Meanwhile, $A_t P_t$ acts as the function of t exports/consumption and import penetration:

$$AP_t = e^{(\lambda_0 T_i)} M_t^{(\lambda_1 + (1/\eta^M))} X_t^{(\lambda_2 + (1/\eta^X))} \quad (9)$$

Here, T represents time trend, η^M represents the import demand elasticity, η^X represents the export demand elasticity, λ_0 reflects the trend of total factor productivity (TFP) over time, λ_1 represents the TFP elasticity of imports, and λ_2 represents TFP elasticity of exports.

Then, we substitute (9) into (8), and take logarithm on both sides of the equation:

$$\ln L_t = \alpha_0 + \alpha_1 \ln K_t + \alpha_2 \ln w_t + \alpha_3 \ln M_t + \alpha_4 \ln X_t + \alpha_5 T + \varepsilon \quad (10)$$

We compare equation (6) with (10), and find that the exports/consumption and import penetration affect employment only through the change of total factor productivity in the former equation. The latter allows exports/consumption and import penetration to influence employment through two channels of TFP and price, i.e., the price of domestic goods subjects to import, and, export commodity price. The commodity price influences output, and thereby affects labour demand. Meanwhile, the explanatory variables of the Capital-Constrained Model include capital variable, so it can measure the impact of imports and exports on employment, as well as the impact of capital. We also concern China's factor endowment, characterized by relatively abundant labour force, relatively scarce capital and the impact of the capital stock on employment. For comparison, we estimate on both Output-Constrained Model and Capital-Constrained Model.

3.3 Data Analysis

The Output-Constrained Model involves variables including employment, capital, wage, import penetration and exports/consumption. The accurate measurement of the variables has a certain effect on the estimated results. Therefore, we process the measurement methods of each variable and the corresponding data. The following are the measurement methods of each variable and data sources:

(1) Employment

We select the indicator ‘employed persons’ on China Labour Statistics Yearbook and China Statistics Yearbook to reflect aggregate employment. This indicator includes ‘the persons at or over the age of 16 years, engaging in some kind of social occupations and obtaining payment for labour or business incomes’. However, since the statistics only measures ‘the number of employed persons in end of the year’, we take the average of the number of employed persons in the end of one year and that of the previous year as the number of employed persons for this year.

(2) Capital

We use perpetual inventory method (PIM) to measure capital stock. This requires four types of data: investment data sequence, investment price index, depreciation rate of capital goods, and capital stock in base period.

(2.1) Determination of Data of Investment

To estimate China's fixed asset stock, we use two types of data: 'total investment in fixed assets' and 'gross fixed capital formation'. However, the statistical collection standard changes a lot during the period. Before 1997, the starting sum for statistical collection of infrastructure, renovation and other fixed assets investment is RMB 5 million. After 1997, this sum increases to RMB 50 million under 'total investment in fixed assets', while 'gross fixed capital formation', a separate item, includes investment in fixed assets less than RMB 50 million. So, in this paper, we select 'gross fixed capital formation' as the investment data.

(2.2) Investment Price Index

We take gross fixed capital formation index as investment price index, which puts 'China's Historical Data of GDP Accounts: 1952-2004' as gross fixed capital formation index of the year 1952-2004, and the data of recent years is obtained from China Statistics Yearbook.

(2.3) Depreciation Rate of Capital Goods

The depreciation rate of capital goods is a measurement method (Shan, 2008). It uses the average of proportion of construction, engineering installation and purchase of equipment/instruments in the fixed asset investment in 1978-2007 as weight. Construction and engineering installation is 72%, and purchase of equipment/instruments is 28%. Using this method, we calculate the depreciation rate of gross fixed capital formation is 10.5%.

(2.4) Capital Stock in Base Period

The estimate of capital stock in the base period has greater impact on the estimate of capital stock of the following year. We assume that under steady economy, capital stock growth rate is equal to investment growth rate, then:

$$K_0 = \frac{I_0}{g + \delta} \qquad (12)$$

Here, g represents the investment growth rate in adjacent periods.

Using this method, we estimate that the capital stock of 1978 (1978 price) is RMB 593.315 billion, which is similar with RMB 582.166 billion (Huang et al, 2002).

(3) Wage

Official statistics uses 'Average Wage of Staff and Workers' to contain data on the

average wage. Accordingly, to calculate real wage, we use 'Urban Residents Consumer Price Index' to reduce the 'Average Wage of Staff and Workers'.

(4) Exports/Consumption and Import Penetration

We define import exports/consumption and import penetration as:

$$M_t^m = \frac{IM_t}{Q_t - EX_t + IM_t} \tag{13}$$

$$X_t^x = \frac{EX_t}{Q_t - EX_t + IM_t} \tag{14}$$

Here, *IM* represents import, and *EX* represents export.

Meanwhile, we use GDP index to reduce the current price GDP of 1978-2007 to the constant price GDP based on 1978 price. The reduction of import and export data should use import goods price index and export goods price index, but only until 2005 did China formally release 'foreign trade index'. In absence of the data, we select the commodity retail price index as an alternative to reduce the total imports and exports (See Table 1 for the data processing results).

(Insert Table 1)

4 Results

4.1 The Impact of Exchange Rate Changes on the Employment

(1) VAR Test Result

First, using ADF (Augrnented Diekey-Fuller) test and PP (Phillips-Perron) test, we proceed with unit root test with all series and their first-differenced series (the original variables added "D"). The result indicates that all series have unit roots, but the first-differenced series are stationary (see Table 2), so we use the first-differentiated form of these variables for analysis.

(Insert Table 2 & Table 3)

Second, the choice of the lag order of VAR (p) model is important. Using Eviews 5.0, we select 2 as the lag order of the model, according to AIC, SC and HQ criteria. The result of VAR Lag Structure Tests indicates that all the roots of the estimated VAR (2) model are within the unit circle. The result of VAR Granger causality test (Block Exogeneity test) indicates: at the significance level of 1%, we cannot accept that DlogR is not the Granger-cause of DLogL, which means acceptance of the real

exchange rate is the Granger-cause of employment at the corresponding significance level.

The results illustrate that VAR (2) model is stationary. Estimation result is shown on Table 3. The regression result shows that the single model of VAR (2) and the overall model have good fitting results.

Next, using the impulse response function, we deduce the implications of the VAR model and the dynamic relation between variables further.

(2) Impulse Response Function

The generalized impulse response function (Pesaran and Shin, 1998) does not depend on the order of variables in the VAR model. Therefore, this article chooses general impulse response the function and describes the response of employment growth to the general standard deviation shock of each variable. The horizontal axis of Figure 2, 3, 4, 5 indicates the delayed years of shocks. The vertical axis indicates employment (first-differenced form of the logarithmic employment, DlogL). The solid line represents the impulse response function, indicating the response of employment growth to a general standard deviation shock of the corresponding variable. Dashed line is the confidence interval.

Figure 2 is the impulse response function figure, which shows the change of employment growth caused by RMB real exchange rate shock. After the channels, via which the exchange rate has an impact on the employment, transmit the positive impact of the current real exchange rate, the current employment has a negative response (see Figure 6). In the second year, there is a turn. A positive response is seen. After the third year, employment turns back into negative response and reaches the maximum negative value of -1.101% in the third year.

(Insert Figure 2)

In terms of the dynamic relations between exchange rate and employment, we conclude China hosts several channels for the exchange rate to affect both the demand and supply of employment. However, as consumers make adjustments based on price change over the period, the demand channel can be influenced immediately. In a longer period, a time lag exists in the impact of exchange rates changes on the employment via supply.

In addition, despite the dismissal cost, it is easier for the company to dismiss than to hire a person, namely, job creation and job loss response to the change of exchange rate in different speeds. Thus, in the first year, the positive shock of exchange rate mainly exercises a negative effect on the employment by reducing domestic demand (increasing demand for imported products) via the demand channel. But in the second

year, the effect of the supply channel takes a dominant position. Companies employ more, due to the relative cost decrease of imported intermediate goods, and positively influence employment.

In terms of the cumulative response (see Figure 6), the positive influence of exchange rate exerts an overall negative effect on the aggregate employment. The cumulative response is stationary at -0.866%. This shows that as a whole, the demand channel accounts for a dominant position. The positive effect of the relative cost decrease of imported intermediate goods is insufficient to offset the negative effect of the appreciation of exchange-rate on the product demand, as well as employment.

(Insert Figure 3 and Figure 4)

Figure 3 is the impulse response function diagram, which shows the changes in employment growth caused by money supply. If real money supply changes in the current period, employment has a positive response in the first phase. Although there is a negative shock in the third year, it then immediately returns to the positive response. As a whole, the overall impact of positive money supply shocks on the employment is positive, with the cumulative response at 7.11%.

Figure 4 is the impulse response function diagram of employment to government purchase. Employment has a negative response to the positive shock of government purchase in the first year. Although it is a positive response in the second year, it responds negatively in the following two years and then fluctuates to zero. As a whole, expansion of government purchase has a negative effect on employment, with the cumulative response at -0.962%.

This empirical finding is inconsistent with the general expectations, because of two reasons. On the one hand, government purchase inhibits the growth of household consumption expenditure of the society (Shen and Ma, 2007). On the other hand, the large part of government spending is on national defence, social security, education and administrative costs. For example, in 2006, these three expenditures accounted for 53% of the fiscal budget, but the ability of creating jobs in the areas is quite limited.

Figure 5 is the impulse response function figure of employment to energy price. If the energy price increases, employment growth is negative affected in the current and following period. Although the impact of energy price shocks on employment growth in each period is relatively small, the cumulative response is significantly at -2.877%.

(Insert Figure 5 and Figure 6)

(3) Variance Decomposition

Impulse response function analyses the responses of employment to the positive

shocks of all variables. Here, we use the Cholesky variance decomposition method in EViews5.0 to measure contribution rate of the shock of each variable to employment.

As shown on Figure 7, the horizontal axis indicates the number of lag years, and the vertical axis indicates the percentage of employment change. Excluding contribution rate of employment itself, the contribution of real exchange rate to employment is the greatest and reaches the maximum of 28.36% in the third period, over twice more than money supply (12.71% in the eighth period), which is followed by energy price (8.23%) and government purchase (6.18%).

(Insert Figure 7)

Several reasons lead to the larger influence of exchange rate on employment: First, China has an export-oriented economy and depends on external economies. Second, as is analysed above, government purchase pushes out household consumption, and government investment prefer less labour-intensive projects. In addition, because of the imperfect domestic financial market, it is difficult for small-and-medium sized enterprises (SMEs), which usually contribute a large percentage of employment, to obtain bank loans, so that macroeconomic policy has an unexpected low effect on employment growth. Thus, excluding the increase of natural unemployment (Zeng, Yu, 2006; Cai, 2007), RMB appreciation since 1993 declines employment elasticity. This explains the reason for the Chinese government to emphasize on stable exchange rate policy, instead of introduce the free-exchange one.

4.2 The Impact of Foreign Trade on Employment

We estimate the impact of foreign trade on employment during 1978-2007, and then estimate it under two periods, 1978-1992 and 1993-2007. There is serial correlation in the model, and we further define the autocorrelation by regression test, which use CO (Cochrane-Orcutt) iteration to make DW test. Estimation results show that each time equation fitting degree is higher. Analysis results are shown on Table 4.

(Insert Table 4)

The results of 1978-2007 show that capital stock, wage and exports/consumption have a significant impact on employment. Import penetration has no effect. With the increase of capital stock by 1%, employment increases 0.38%. If wage rises by 1%, employment goes down by 0.37%. Employment increases at 0.09%, when there is a 1% increase of exports/consumption.

The impact of exports/consumption on employment in Capital-Constrained Model is larger than that in Output-Constrained Model, which is consistent with the construction of Capital-Constrained Model. The results indicate that during the entire period, the export price rise follows the international price increase, and then creates

employment demand through the increase of output. However, this influence is not large in China, whose employment raises 48% following the 91% increase of exports/consumption. If average employment goes down by 0.074% as a result of the 1% increase of exports/consumption, exports/consumption growth contributes 6.7% to employment growth. In another word, exports/consumption growth can only explain 14% of China's employment increase.

The results of 1978-1992 and 1993-2007 reveal the relations of exports/consumption on employment changes from positive in 1978-1992 to negative in 1993-2007. In 1978-1992, export has a bigger role in employment promotion, with the contribution rate of 13.2%, and exports/consumption growth explains 33.4% of employment growth. During that period, China's export concentrates on agricultural and labour-intensive manufacturing products. In 1993-2007, exports/consumption has a significant negative impact on employment. During this period, China's trade structure changes, with the proportion of labour-intensive products declining and capital-intensive products increasing on export. The restructure negatively influences employment. A downward trend of capital on employment is seen. Meanwhile, the influence of GDP on employment also experiences a downward trend. This indicates productivity increase reduces employment incentives.

5 Conclusion

Exchange-rate policy and foreign trade contribute significantly to employment growth in China. A competitive exchange rate is critical for employment growth, and its effect larger than monetary and fiscal policies.

Based on the AD-AS model, we analyse the dynamic relations between employment and RMB exchange rate, and between currency supply and consumer spending, in 1980-2006 through VAR method. Three findings are retrieved:

- RMB devaluation promotes employment, while its appreciation does the opposite;
- Expansionary monetary policy facilitates employment, but government spending hurts employment. Thus, unlike the monetary policy, China's investment-driven rather than demand-driven economic growth mode and incomplete floating exchange rate system[7] negative influence employment;
- The impact of real exchange rate on employment is larger than money supply and government purchase.

Moreover, export growth plays a positive role in employment promotion in China. Using Capital-Constrained Model and Output-Constrained Model, we notice the contribution rate of export to employment growth is 6.7%, and China's exportation accounts for 14% of its employment growth.

[7] According to the macroeconomic theory, the fiscal policy effects under floating exchange rate system are better than those under fixed exchange rate system.

In the recent years, RMB appreciation and volatility of the international economy pose more uncertainty to employment in China. Furthermore, the restructure of export products result in the fall of labour-intensive goods and rise of capital-intensive products. Effectiveness of export on employment growth decline, so that it is difficult for China's export-oriented economic development model to hasten employment growth in the short-medium term.

Actually, economic growth and employment growth in China illustrate little coherence, due to the decline of employment elasticity (Cai and Lin, 2004). Meantime, the capacity of economic growth to expand employment is insufficient. Therefore, China is likely to encounter employment challenges, following the shift from export-oriented to domestic-demand driven economic growth.

On account of the apparent impact of macro-economy on employment, the effectiveness of any prospective economic stimulus strategy of the Chinese government needs to be assessed through its job creation capability, so as to judge the sustainability of economic growth in China.

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Tables and Figures

Table 1 Data Processing Results (1978 price)

Year	Employment (ten thousands persons)	Capital stock （hundred million Yuan）	Workers' average actual wages （Yuan）	Exports /Consumption	Import Penetration	GDP （hundred million Yuan）
1978	39764.5	5933.1	615.0	4.6	5.1	3645.2
1979	40588.0	6438.8	655.5	5.3	6.0	3922.2
1980	41692.5	7019.2	695.9	5.9	6.5	4228.7
1981	43043.0	7515.0	688.1	7.5	7.5	4450.4
1982	44510.0	8078.0	697.6	7.6	6.6	4853.5
1983	45865.5	8742.9	707.8	7.1	6.9	5380.3
1984	47316.5	9636.6	812.3	7.9	8.5	6196.8
1985	49035.0	10728.5	855.4	8.6	13.3	7031.2
1986	50577.5	11924.9	925.5	10.0	13.9	7653.3
1987	52032.5	13343.6	934.1	11.7	12.8	8539.8
1988	53558.5	14853.8	926.8	10.6	12.3	9503.1
1989	54831.5	15815.7	882.8	9.6	10.8	9889.2
1990	60039.0	16767.8	964.0	14.3	12.3	10268.9
1991	65120.0	18035.6	1003.0	16.3	14.4	11211.4
1992	65821.5	19900.5	1069.9	16.3	15.5	12808.0
1993	66480.0	22509.3	1145.8	13.9	15.8	14596.6
1994	67131.5	25685.0	1233.8	20.5	19.6	16505.9
1995	67760.0	29291.9	1280.3	19.5	17.3	18309.2
1996	68507.5	33200.9	1328.6	16.8	15.4	20141.7
1997	69385.0	37132.2	1342.6	18.8	14.7	22014.2
1998	70228.5	41392.8	1561.4	18.0	13.8	23738.7
1999	71015.5	45802.1	1765.2	18.1	15.3	25547.5
2000	71739.5	50597.8	1966.2	21.5	19.4	27701.5
2001	72555.0	55956.4	2265.1	21.3	19.5	30000.8
2002	73382.5	62384.6	2614.6	24.3	22.0	32725.5
2003	74086.0	70586.4	2928.7	29.6	27.9	36006.4
2004	74816.0	80081.2	3235.9	35.4	33.5	39637.7
2005	75512.5	88849.6	3650.2	42.1	36.4	43773.0
2006	76112.5	96955.0	4113.0	47.6	38.8	48871.2
2007	76695.0	104889.2	4672.4	50.3	39.4	54703.5

Data source: Calculated by the authors based on relevant data from "China Statistical Yearbook" (various years),"China Trade & Foreign Economic Statistical Yearbook" (various years), "China Labour Statistical Yearbook" (various years), "China's Historical Data of GDP accounts: 1952-2004", and "China's Fixed Assets Investment Statistics (1950-2002) ".

Table 2 The Result of Unit Root Test

series	（C,T,P）	ADFtest	PP	series	（C,T,P）	ADF test	PP test
LogL	(c,0,0)	-2.3779	-2.5477	DLogL	(c,0,0)	-4.5575***	-4.5550***
LogR	(c,0,1)	-2.2329	-2.4880	DLogR	(0,0,0)	-2.9217***	-2.9532***
LogM	(c,0,0)	-2.1451	-1.8973	DLogM	(c,T,3)	-4.7953***	-3.4207*
LogG	(c,T,4)	-2.9233	-2.4386	DLogG	(c,0,3)	-5.0467***	-4.3157***
LogZ	(c,0,1)	-2.5854	-2.1993	DLogZ	(c,0,0)	-3.2363**	-3.1702**

Notes：①C，T，P respectively donate the intercept, time trend and the lag order in the ADF test（determined by SIC）。

② *,**,*** respectively imply rejecting the hypothesis at the significance level of 10%, 5% and 1%, that is the variables are stationary at the corresponding level of significance.

Table 3 The Result of VAR(2)

	$DLogL_t$	$DLogR_t$	$DLogM_t$	$DLogG_t$	$DLogZ_t$
$DLogL_{t-1}$	0.3016	-1.0059	0.2688	0.2926	-0.4855
$DLogL_{t-2}$	-0.0479	-0.7446	0.5609	0.8293	-0.8584
$DLogR_{t-1}$	0.1781	-0.1866	0.0626	-0.0078	-0.5993
$DLogR_{t-2}$	-0.2272	0.5257	-0.0270	0.2273	0.0405
$DLogM_{t-1}$	0.1602	-0.9976	0.3972	0.0051	-0.2223
$DLogM_{t-2}$	-0.1756	0.2325	-0.2859	-0.1468	-1.0270
$DLogG_{t-1}$	0.0506	-0.0840	0.4082	-0.0167	0.8731
$DLogG_{t-2}$	-0.0281	-0.7389	0.1194	0.2476	0.6472
$DLogZ_{t-1}$	-0.0198	0.3739	-0.1558	0.0516	0.3716
$DLogZ_{t-2}$	-0.0438	0.0643	0.1167	-0.1041	-0.0616
C	0.0205	0.1590	0.0739	0.0834	0.1487
R^2	0.6105	0.7663	0.6257	0.5970	0.3226
log-likelihood ratio	64.0016	36.9889	49.8859	52.0517	18.2374
AIC	-4.4168	-2.1657	-3.2405	-3.4210	-0.6031
SC	-3.8769	-1.6258	-2.7006	-2.8810	-0.0632
log-likelihood ratio of model					229.1702
AIC of model					-14.5142
SC of model					-11.8145

Table 4 Quantitative Analysis Results

	Capital-Constrained Model			Output-Constrained Model		
	1978-2007	1978-1992	1993-2007	1978-2007	1978-1992	1993-2007
LNK	0.376 (0.045)***	0.322 (0.073)***	0.086 (0.008)***			
LNW	-0.366 (0.066)***	-0.085 (0.203)	0.021 (0.010)*	-0.135 (0.074)*	-0.173 (0.216)	0.011 (0.027)
LNX	0.086 (0.048)*	0.164 (0.059)**	-0.017 (0.006)**	0.062 (0.034)*	0.203 (0.058) ***	-0.043 (0.018)**

LNM	0.052 (0.048)	-0.006 (0.059)	0.003 (0.007)	-0.008 (0.039)	-0.020 (0.059)	0.022 (0.021)
LNGDP				0.276 (0.061)***	0.318 (0.073)***	0.126 (0.029)***
R^2	0.941	0.954	0.999	0.812	0.953	0.996
Adjusted R^2	0.931	0.933	0.999	0.779	0.932	0.995
S	0.025	0.022	0.002	0.020	0.022	0.003
DW	1.243	1.296	2.080	1.358	1.434	1.538

Note: In the table the data of the top of each column represent variable coefficient, the data in parentheses represent the standard deviation of indicated, * indicates P <0.1, ** indicates P <0.05, *** indicates P <0.01. Estimation Results of constant and time-dummy variables are not listed in the table.

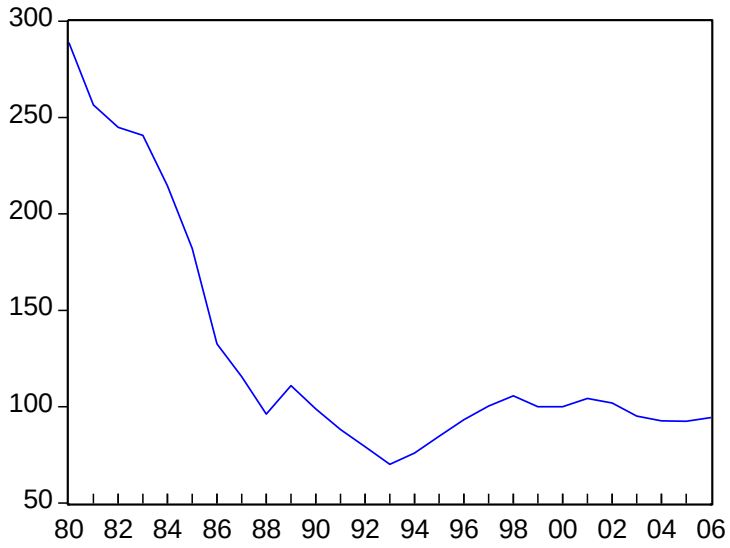

Figure 1 The real effective exchange rate in 1980–2006

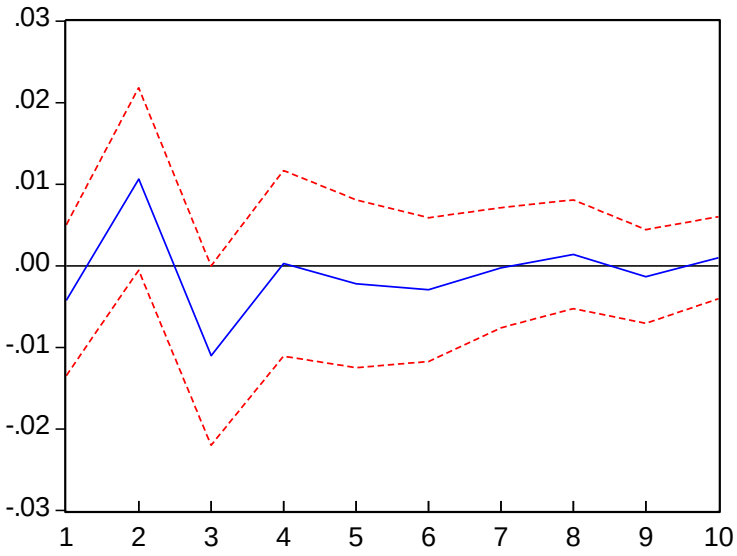

Figure 2 The impact of real effective exchange rate shock on the employment

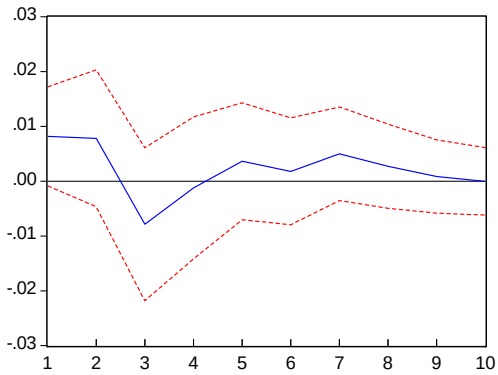

Figure3 The effect of money supply shocks on the employment

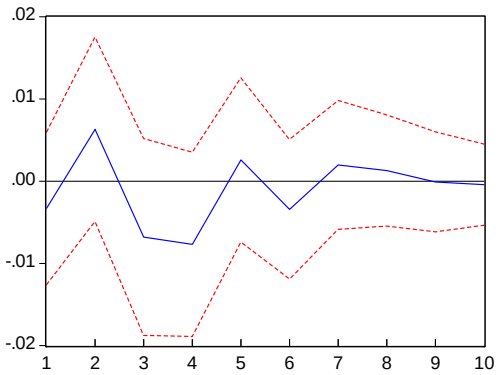

Figure4 The effect of the real government consumption expenditure shocks on the employment

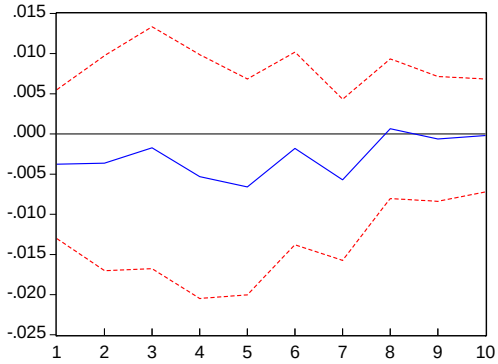

Figure 5 The effect of energy price shocks on the employment

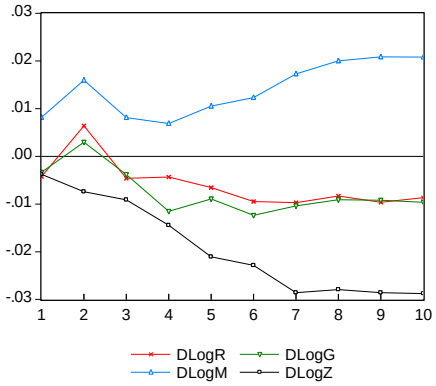

Figure 6 Cumulative response of employment to all the shocks

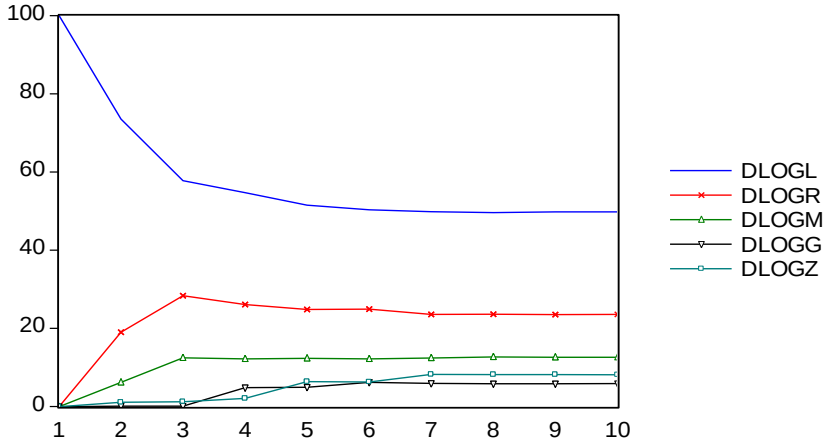

Figure 7 The contributing rate of each variable to employment growth