Black Market Exchange Rate versus Official Exchange Rate:

Which One Better Reflects Economic Fundamentals?

An Examination of the Balassa-Samuelson Effect in China

by

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Abstract

China is an economy where its exchange rate system has been under-developed. We suspect that when people carry out China studies, the ability to test certain economic theories might be hindered under such circumstances. One observation that attracts our attention is that the RMB official exchange rates underwent several devaluations during the period of rapid economic growth, effectively violating the predictions of the Balassa-Samuelson hypothesis. It is our intention to test formally whether the Chinese data are consistent with the theory. If the data are found not conforming to the theory, then the Chinese official exchange rate may not be informative, as it does not reflect the economic fundamentals, in this case, the relative price movement or the relative productivity changes.

In many developing countries the transaction volume in black market is much larger than that in the official market. We argue that in emerging markets the black market exchange rates reflect economic fundamentals much better than the official rates. In China, the foreign exchange official and black market co-exist for almost half a century with the latter having been an important factor of economic activity.

We, thereby, raise our main hypothesis: when carrying out developing countries' studies, the black market exchange rates are more relevant than the official ones in testing economic theory. We partially justify such a claim by providing evidence that the two rates do not have a long run relationship in the case of China. We go on to test it within the Balassa-Samuelson framework. The results point out strongly that the theory receives support when the black market rates are used as the proxy for the real exchange rates. The theory, however, does not appear to hold well with the official rates.

Acknowledgment

My major intellectual debts are to Professor Steve Hall who gave me tremendous and valuable help throughout the time-absorbing process in completing my PhD thesis. I particularly wish to thank K M Wong, R MacCulloch, D Leveque, R Miller, K N Weng, and J Paranics for their advice and help in many ways. Thanks also to my parents for their love.

The work is my own and I also appropriately acknowledge the work of others.

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Part I Introduction

Chapter 1 Introduction

Recent studies have suggested that for planned economies where the nominal exchange rate is either pegged, state-determined, or officially corrected, the black market-based real exchange rates are shown to provide stronger relationship with the Purchasing Power Parity (PPP) exchange rates than the official exchange rates. In their studies of the Pacific Basin currencies, the Greek drachma, the Indian rupee, the Iranian rial, and a panel of 16 African currencies respectively, Phylaktis and Kassimatis (1994), Kouretas and Zarangas (1998), Baghestani (1997), Bahmani-Oskooee (1993) and Nagayasu (1998) have shown that the PPP theory does not hold well when official exchange rate data are used; however, it receives empirical support when black market exchange rates are used.

Nagayasu (1998) argues that 'the ability to test for the PPP hypothesis for developing countries has been hindered by the frequent changes in these countries' exchange rate arrangements, often resulting in long periods of fixed or adjustable official exchange rates.' An example under Nagayasu (1998) study is that many African countries have shifted their exchange rate regimes more than five times over the 14 years' period – these changes in exchange rate arrangements might well make it difficult to apply the time series method to individual countries. He asserts that in order to avoid such a problem people should instead focus on the black market rates which, by definition, are 'more likely to move freely with market forces than the official exchange rates.'

China is an example where there exists heavy official correction of the overvalued exchange rate during the period when the country rapidly transformed from a closed, planned economy to an open economy. In fact, RMB was overvalued persistently for decades through the late 1980's (see Figure 1.1).

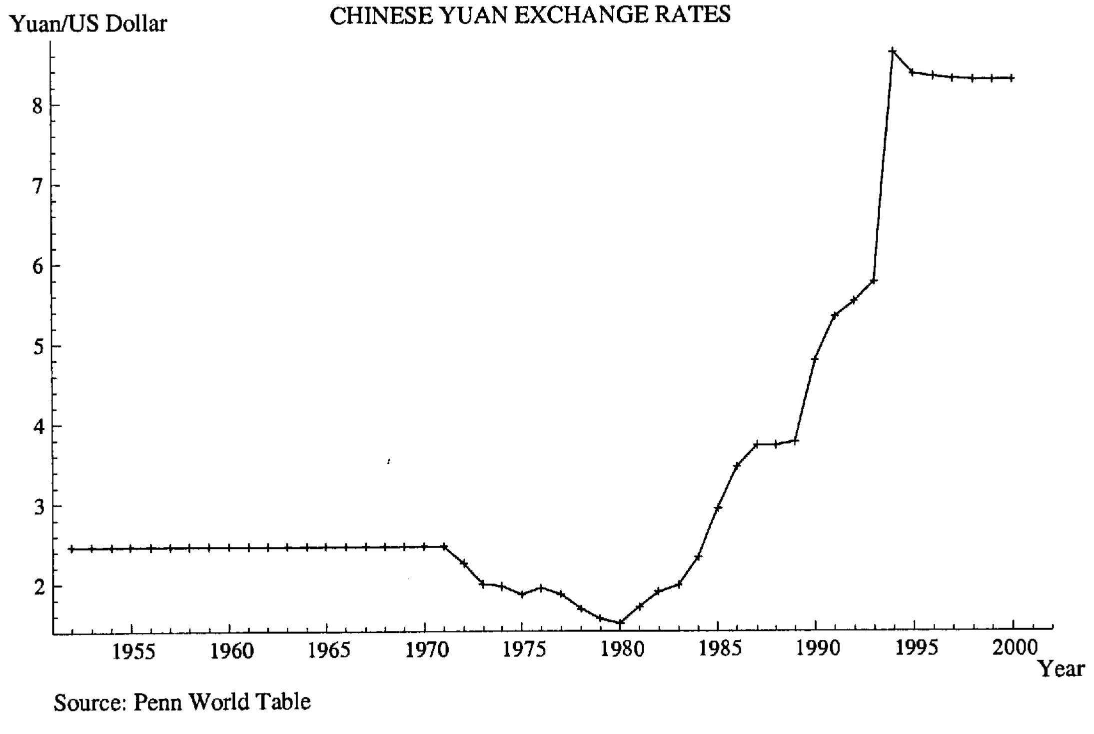

Figure 1.1

According to Chou and Shin (1998) 'the official rate was first devalued from 3.2 yuan per dollar in the fourth quarter of 1985 to 3.72 yuan in the fourth quarter of 1986. In the fourth quarter of 1989, the rate was devalued again to 4.72 yuan per dollar. The rate was further devalued to 5.22 yuan per dollar in the fourth quarter of 1990 … and then 5.80 yuan per dollar in 1993.' In January 1994, the official rate was unified with the swap rate and was devalued greatly to 8.70 yuan per dollar.

In terms of the exchange rate regime, a fixed exchange rate regime co-existed with a flexible one during the period from 1979 to 1993. A managed floating system[1] has come into effect since 1994. The representative state rate throughout the period 1988 to 1993 was the market swap rate[2] which then unified with the official rate with the latter becoming the state rate instead.

To conclude, China is an example where the nominal exchange rate is influenced heavily by the national authority. It is also an example where there exist frequent exchange rate regime shifts. As a result, when people carry out Chinese studies the ability to test for certain economic theory might be hindered by the exchange rate data and by the type of exchange rate arrangements.

One example which attracts our attention is that we observe that the RMB official real exchange rates underwent several devaluations during the period of rapid economic growth (see Figure 1.2, 1.3 and 1.4), effectively violating the predictions of the Balassa-Samuelson hypothesis[3] that demonstrates a positive relationship between growth and real appreciation[4].

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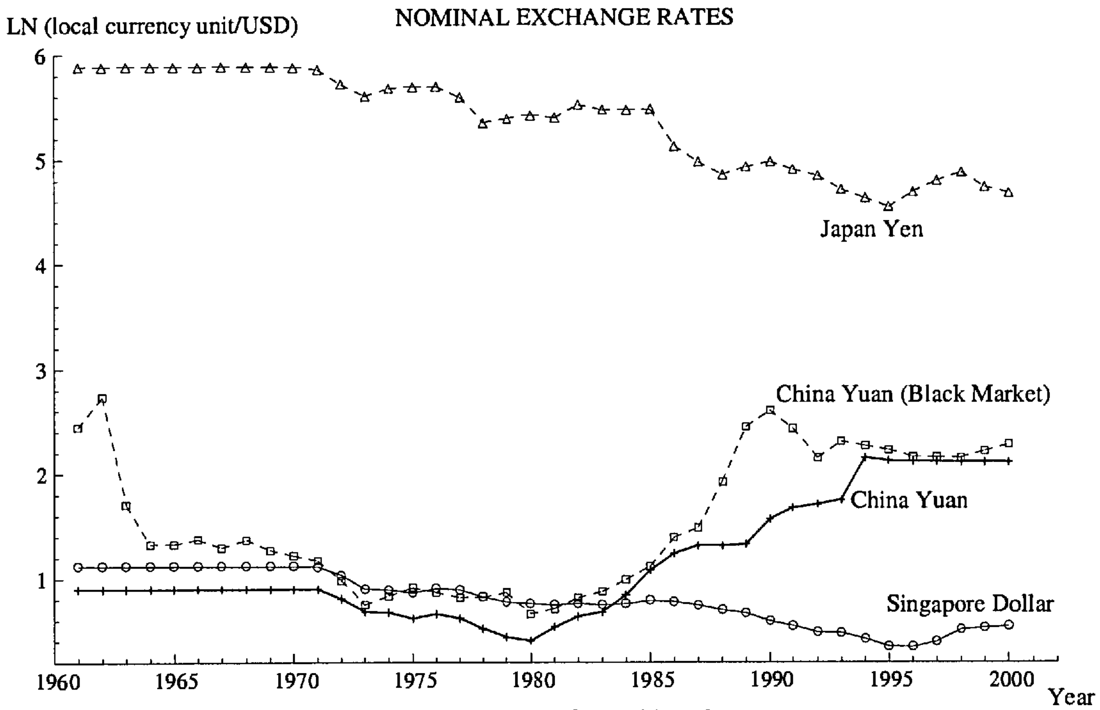
[1] The rate was allowed to fluctuate within a small range according to the market force.

[2] The swap rate was for non-state-planned trade transactions, and was used by the Chinese firms to swap their foreign exchange quotas and/or foreign currencies at a fixed rate, see Phylatis and Girardin, 2001 for details.

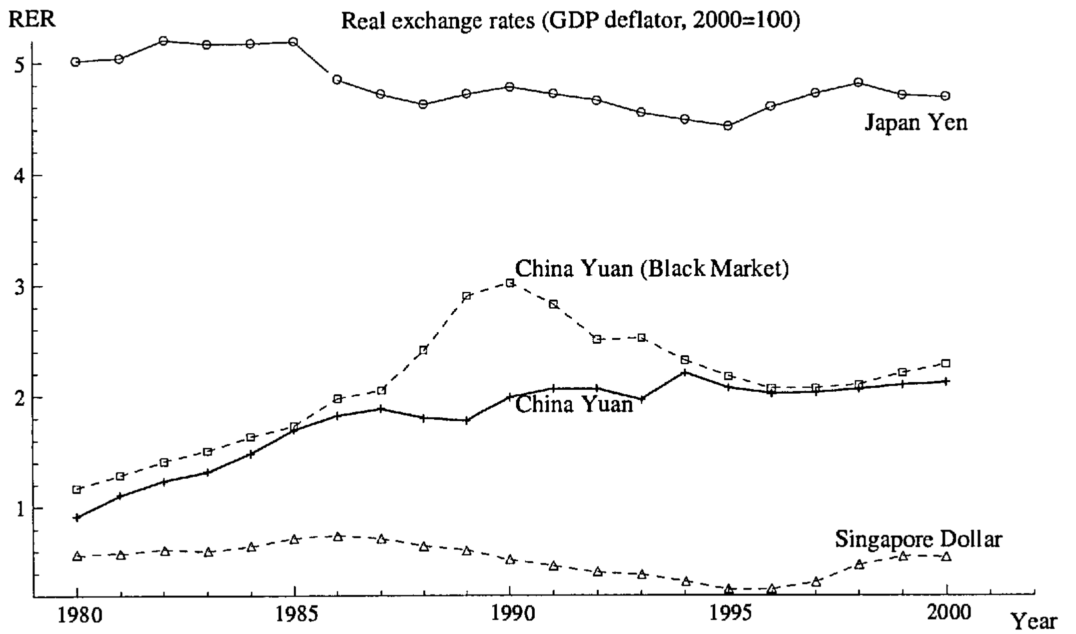
[3] According to the Balassa-Samuelson effect (Balassa, 1964; Samuelson, 1964), when an increase in labour productivity in the tradable sector relative to the non-tradable sector in country A is higher than in country B, the real exchange rate of country A relative to B will appreciate.

[4] The positive relationship between growth and real exchange rate is a typical feature of the Balassa-Samuelson hypothesis. The faster an economy grows, the greater the increase in labour productivity in the tradable sector; whereas due to the existence of some particular characteristics (e.g. fixed proportion) of the non-tradable sector, the increase in labour productivity within such sector is usually inert even during rapid economic growth. Hence, when an economy is experiencing rapid economic growth, its real exchange rate will appreciate.



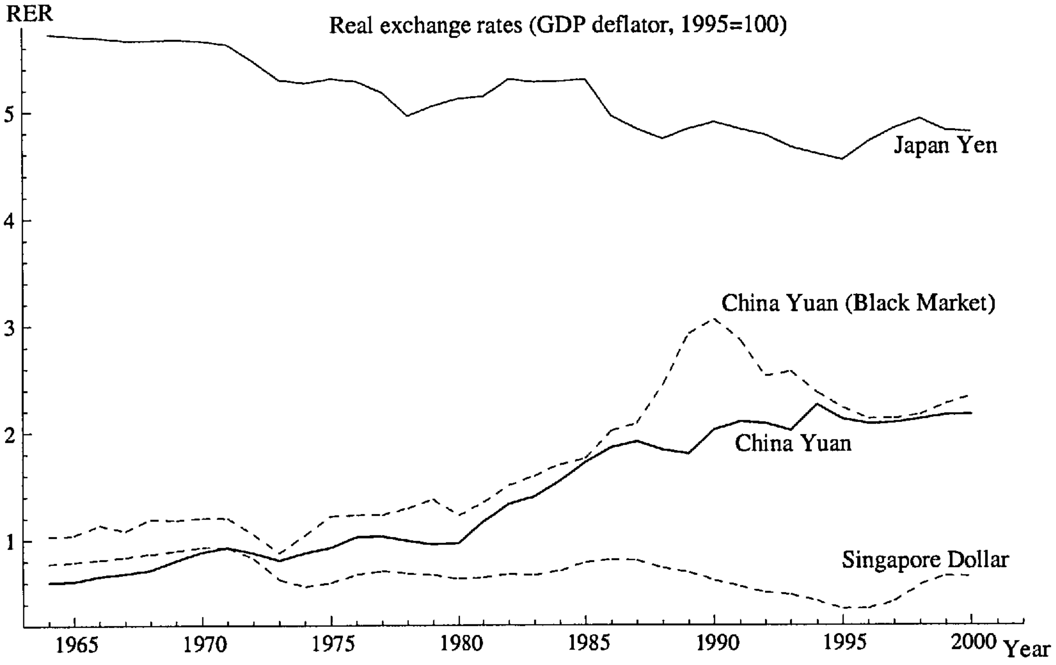
Source: Penn World Table, World Currency Yearbook, World Bank

Figure 1.2



Source:
Nominal exchange rate: Penn World Table, World Currency Yearbook and World Bank
GDP deflator: IFS

Figure 1.3

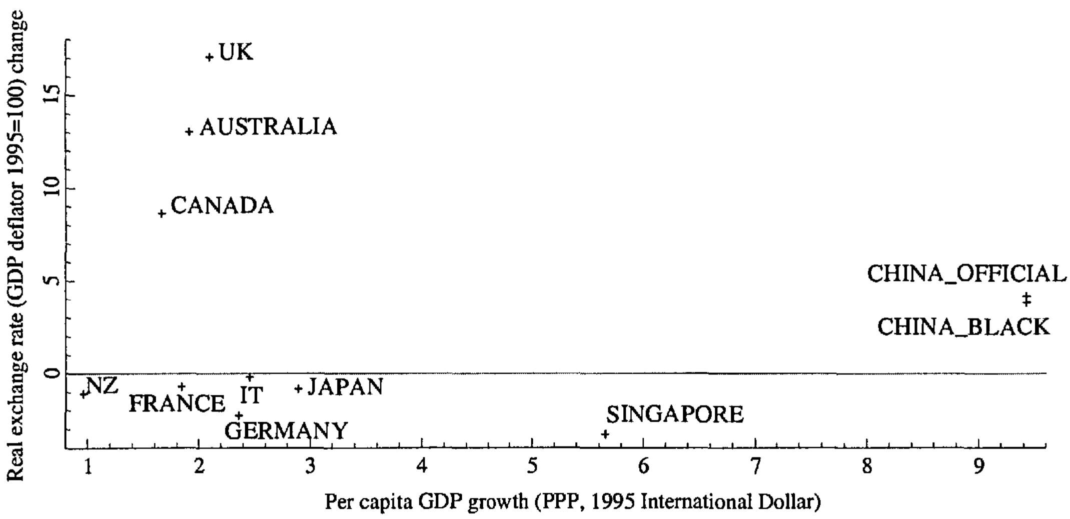


Source:
Nominal exchange rate: Penn World Table, World Currency Yearbook and World Bank

Figure 1.4

On the other hand, for countries with developed exchange rate system, for example, Singapore and Japan, the real exchange rates tend to appreciate at the time of rapid growth (see Figures 1.2, 1.3 and 1.4). It is also true that when we look at average real exchange rate changes and average per capita growth over the period 1973 to 1995 (see Figure 1.5).

PER CAPITA GROWTH VS REAL EXCHANGE RATE CHANGE, 1973-1995

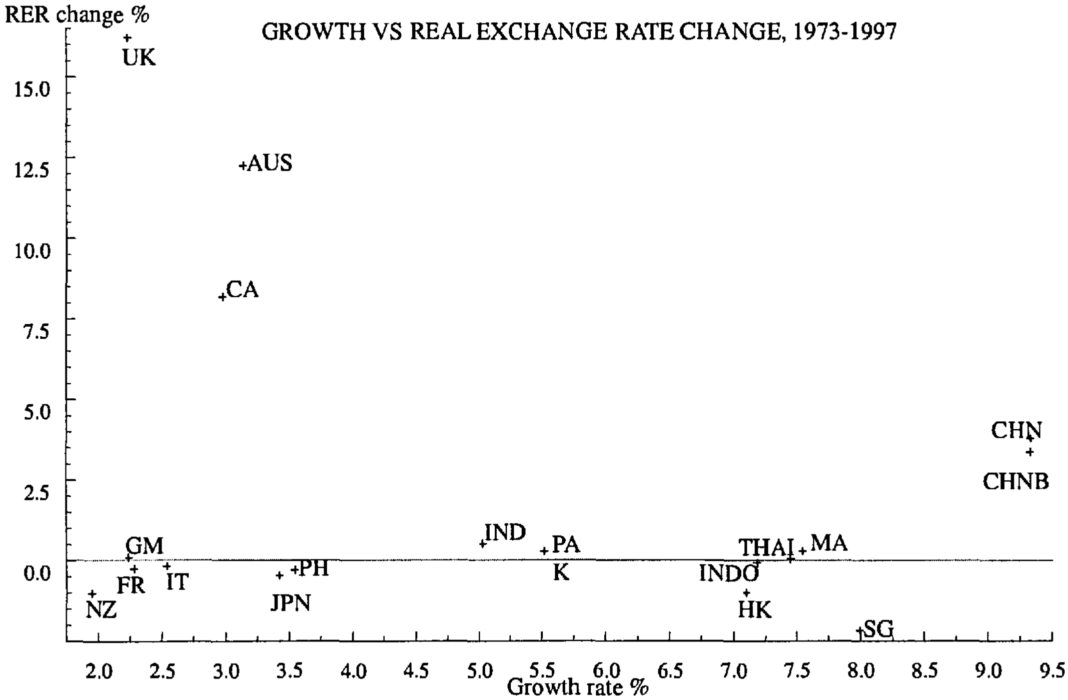


Source:
Growth rate: World Bank World Development Indicators
RER: Penn World Table, World Bank and World Currency Yearbook

Figure 1.5

The Balassa-Samuelson effect is found to hold well in Japan and Singapore and, to a much lesser extent, in Italy. China, another high-growth country, experienced a large depreciation.

Figure 1.6 specifies the relationship between average changes in real exchange rate and average growth rate from 1973 to 1997. The positive relationship between growth and real appreciation is found in Singapore, Hong Kong, New Zealand and Japan and, to a much lesser extent, in France, Italy, the Philippines and Indonesia. UK, Australia, Canada, China and India experienced high growth with large depreciation, thus appearing to violate the Balassa-Samuelson prediction. Pakistan, Thailand, Malaysia and Germany also experienced high growth with real depreciation; however, the extent of depreciation was small.



Source:
Growth rate: World Bank World Development Indiciator
RER: Penn World Tables, IFS and World Currency Yearbook
All other RER series use the GDP deflator 1995=100 except Malaysia, Hong Kong, Philippines, India Pakistan, Thailand and Indonesia, which use 2000 price deflators

Figure 1.6

'China's depreciation can be understood as an outlier, in that the country rapidly transformed from a closed, planned economy to an open economy. The opening also meant the correction of the overvalued exchange rate.' (Ito, Isard, and Symansky, 1997) Thus, it is our intention to test formally whether the Chinese official exchange rate data are consistent with the traditional Balassa-Samuelson theory. If the data are found not to conform to the predictions of the theory, then perhaps the Chinese official exchange rate may not be informative, as it does not reflect well the economic fundamentals; in this case, the relative price movement or the relative productivity changes.

On the other hand, in China, the black market transactions have been a keystone of economic activity for over half a century (Phylaktis and Girardin 2001). The importance of such a market in the Chinese economy is reflected by the considerable size of the black market premium and the substantive volume of transactions on the market.

The size of the black market premium

According to Kiguel and O'Connell (1994), the world-wide observed pattern on the size of the average premium throughout the period of 1970 to 1990 is, as follows: For most Asian (except China) and few industrialized countries the premium is low, less than 10%. In many African and Latin American countries, the premium exceeds 50% and is considered very large. Yin and Stoever (1994) have studied the Chinese black market premium and on the basis of their study we find that the size of the premium is moderate to high, reflecting well the pressure of excess demand for official foreign exchange and, consequently, the important role of the black market in the economy. According to Yin and Stoever (1994), the premium started to climb in 1975 and averaged 38.2% in 1978, 52.7% in 1979 and reached a peak of 86% in 1980 as a result of the nation's liberalizing economic policies and rising incomes (and so rising demand for foreign goods). Throughout the 1980's, in spite of several policy measures attempting to repress the black market for currency stability, namely the introduction of the Foreign Exchange Certificate in 1980, the massive government purchase of foreign consumer goods using foreign reserves in 1984 and the establishment of the Foreign Exchange Adjustment Centers in 1986, on average, the black market premium still remained considerably high. In 1988, stimulated partly by the hyperinflation, speculation about the devaluation of the official rate during negotiations between China and GATT (General Agreement on Tariffs and Trade) and political upheaval of the democracy movement, the black market premium increased substantially and reached a peak of more than 100% in mid-1989. In recent years, with the government's increasing effort to suppress the foreign exchange black market for monetary stability the dollar exchange rate has become fairly close to the official one (see Figure 1.2). In 1995, the premium fell to only 10%, and remaining at that level.

<u>The volume of transactions</u>

The estimated figures suggest that the volumes of transactions on the Chinese black market exchange are substantive. In 1994, the volume of smuggling via the state-owned enterprises is estimated to be 1.22 billion yuan (General Administration of Customs). In addition, according to the Direction of Trade Statistics, IMF, nearly 33% of the Chinese export receipts are not officially reported. Another indication of the potential capacity of the Chinese foreign exchange black market is the foreign currency deposits made by the Chinese citizens, which were worth U.S.$11 billion at the end of March 1994 (Ma 1995), equivalent to the foreign reserves (U.S.$11.7 billion) held by the state in 1990 (Jianping 1998).

On the basis of the above facts, we raise our main hypothesis, as follows: When carrying out developing countries studies, the official exchange rate may be irrelevant whereas the black market exchange rate, which is perceived as a proxy of the developing countries' floating rate, is more relevant in testing for economic theory. We partially justify such a claim by providing evidence that in the presence of a parallel market for dollars, the official rate is irrelevant, merely a government bookkeeping convention and unrelated to the parallel rate (Kouretas and Zarangas 1998). We then go on to test it within the Balassa-Samuelson framework. The results suggest that the theory receives empirical support when black market exchange rates are used. The theory, however, does not appear to hold well with the official rates. Such a conclusion is insensitive to the choice of theoretical set-up. That is, it holds well whenever we choose the relative prices or the relative labour productivity to form the basis of our tests. Finally, we find out that equation (I) of the extended Asea and Mendoza (1994) model is a good representation of the Chinese Balassa-Samuelson effect.

The thesis is organized, as follows: Part I is the introduction part, which involves the economics of the black market exchange rate in developing countries. At the same time, we discuss the Balassa-Samuelson effect and the general equilibrium model that will motivate our empirical tests in Part III. Part II is the part for data discussion. Part III is the empirical evidence part, which explains the results from examining the long-run relationship between the two exchange rates, from testing the size of, and modelling the Chinese Balassa-Samuelson effect. Part IV concludes.

Chapter 2 The Economics of the Black Market Exchange Rates in Developing Countries

2.1 The emergence of the black market in developing countries

When foreign exchange control takes place the foreign exchange black market would inevitably develop. When a central bank is unable to meet all the demand for foreign currencies at its official exchange rate, those whose demand is price inelastic would accept a price higher than the official rate, which, in turn, generates the incentive for foreign exchange holders to sell on the black market rather than to the bank, as long as the costs of being caught are not prohibitive (Nowak 1985). The demand for foreign exchange in the black market mainly comes from uses which the controls are trying to restrict whereas the supply of the foreign exchange mainly comes from sources of foreign exchange where evasion of the law is easier (Nowak 1985).

According to Kiguel and O'Connell (1994), the typical pattern is 'one where the economy faces a gradual worsening in the balance of payments (BOP) as a result of expansive monetary and fiscal policies that raise inflation and lead to overvaluation of the official exchange rate. As the government fails to correct this imbalance through a tightening of macroeconomic policies or devaluations of the official rate, it is forced to increase restrictions on the private sector's access to foreign exchange at the official exchange rate.' In what follows we use the IS/LM approach to illustrate such a distinctive pattern.

Imagine that an expansionary fiscal policy aimed at support ambitious economic development programs cause the IS schedule and thus the aggregate demand (AD) function to shift to the right.

Firms, as they attempt to increase output after demand is stimulated, will face higher costs. With these higher costs, the marginal cost (MC) of individual firms rise – and given that the MC function of a firm is, effectively, its supply curve, on aggregate the supply function in the economy, namely the short run aggregate supply function (SAS), begins to shift to the left. Thus, just as the classical or neo-classical school of thoughts predicts, stimulating demand will cause inflation.

The outward shift of the IS schedule causes a rise in the real interest rate, which is above the world level, inducing massive capital inflow into the economy, as foreign citizens seek to move their wealth to the domestic economy to take advantage of the higher rate of return.

The excess demand for local currency causes the currency to appreciate, which means that goods abroad have become less expensive relative to goods at home country. This dampens foreigners' demand for exports while simultaneously the demand for imports will increase, as they are now relatively cheaper.

At the same time, higher domestic prices would also drive exports down and raise imports.

Consequently the economy will incur a BOP deficit as the payment made for imports exceeds the payment received from exports.

As local people want to buy more foreign goods or services, there is an increase in domestic demand for foreign currency. Since local people are paying local currency for this foreign currency, the supply of local currency in the international market would increase.

The Central Bank is committed to buy back the excess supply of domestic currency at some fixed rate, and will begin to run down its foreign reserves.

Doing so indefinitely will lead to a foreign reserves crisis, as the rising demand for import (and so the foreign currency) will continue so long as the currency is overvalued and/or inflation persists.

The nation could devalue – which would boost competitiveness and hence exports, and cause the IS to shift to the right. As we illustrated above, however, the attempt to increase output would cause inflation. Devaluation may have unpalatable consequences for inflation or real wages that governments would like to minimize (although such concern is not necessarily warranted). It may not be politically acceptable, as Harold Wilson discovered in 1967 and John Major in 1992.

To avoid being forced to devalue the currency – the government may be forced to reverse its initial fiscal stance – i.e. it has to reduce income to a level where the economy once again has a balance of payments which is in equilibrium.

However, when a nation fails to do so it is forced to increase restrictions on the private sector's access to foreign exchange at the official exchange rate. In fact, for many developing countries foreign exchange controls may appear to 'provide a solution which has immediate and direct effects on BOPs and is less troublesome in terms of its social and economic costs... even though controls do nothing to address the underlying cause of external imbalances' (Nowak 1985).

2.2 The determinants of the black market exchange rates

The black market for foreign exchange has been analyzed from a number of different perspectives. In this section, we first examine the real trade model of the black market, and then focus on the portfolio-balance approach and monetary approach, and finally discuss the Kamin (1993) non-monetary model, which will motivate our empirical work.

2.2.1 Real Trade Model

The real trade model emphasizes 'the impact of high trade taxes on smuggling activities and illegal currency transactions' (Agenor, 1992). An economic agent will deal in foreign currency for illegal imports if the import tariff is so high that he has to purchase foreign exchange at a premium in the parallel market (de Macedo 1987; Branson and de Macedo, 1989). However, such a model assumes that the only reason to demand foreign currency is to buy illegal imports and so discounts the portfolio motive that has been identified as a critical contributor to the demand for foreign currency (Agenor, 1992).

2.2.2 The Portfolio-Balance Model

The typical feature of the portfolio-balance model is that the parallel premium is determined by the portfolio conditions in short-run and by the trade conditions in long-run. The portfolio conditions refer to real money balances and official interest rates parity deviation. According to the model, the black market premium will rise if there is an unexpected expansion in the money supply. An increase in the interest parity differential in favour of the foreign assets raises the premium in the short-run. The trade conditions refer to the real official exchange rates, terms of trade, export tax trade, and import tariff rate. The model implies that a real appreciation of the official exchange rate or a tightening of import restrictions raises the premium in long- run (Kiguel and O'Connell, 1994).

Overall the Portfolio-Balance Models are well confirmed by real world data (Kiguel and O'Connell, 1994). Phylaktis (1996) concludes that 'the depreciation adjusted interest rate differential, as well as the intensity of capital restrictions in the case of Chile, and the dollar value of local assets valued at the official rate, are found to affect the short-run behaviour of the premium, whereas the real exchange rate is found to affect the long-run behaviour of the premium.' Ghei and Kiguel (1992) find that the portfolio variables and the real exchange rate explain a large degree of the variability in the premium.

However, according to Phylaktis (1996), the model might not be applicable for countries where access to credit is controlled. Yin and Stoever (1994) applied the model to China over 1975 to 1992 by incorporating three additional dummy variables in order to find out the effect of government interventions on the black market. Data partially confirm the model that the black market premium is inversely related to the real official exchange rate. Data also suggest that the government policy is significantly related to major changes in the black market premium. However, interest rate differential is found statistically insignificant, effectively violating the model. Such a result suggests that interest rate arbitrage is not a major motivation for the Chinese black market.

Jianping (1998) attempts to model the real black market rate as a function of the difference between Ml/nominal GNP ratio of China and US, real interest rate differential between China and US, and asset adjustments. All three variables are found to be statistically significant and only the asset adjustments variable is found negatively correlated with the real black market rate. Other variables, such as the balance of trade, do not explain the Chinese black market rate. The technical problem for Jianping (1998) again lies in the fact that the cointegration tests were not performed and so we cannot know whether a valid ECM exists and consequently whether the spurious regression problems might occur.

2.2.3 The Monetary Model

According to Blejer (1978), the black market exchange rates are determined by the market equilibrium. The demand for the black market foreign currency is positively related to the expected rate of appreciation of the foreign currency in the black market. The supply of foreign currency to the black market is the determined by the differential between the official and parallel rates. The resulting equilibrium condition generates a premium that is a function of the differential between the domestic and foreign prices.

A weakness of the monetary approach, according to Phylaktis (1996), is that 'the public buy foreign exchange on the black market for the purpose of altering their portfolio of financial assets and not for the purpose of buying commodities.'

The importance of the monetary factors on the behaviour of the black market rate has been confirmed by several empirical studies. For example, Phylaktis and Girardin

(2001) test the monetary model under the reasonable assumption of no interest-bearing assets in China. They go beyond the model by incorporating the relative money supply, the relative inflation, Chinese output and US output as additional explanatory variables. The black market exchange rate is found to be positively related to the market swap rate, relative money supply and US output and negatively related to the Chinese output. Relative inflation, however, is found not affecting the black market rate in long-run, effectively violating the Blejer (1978) model.

2.2.4 Kamin (1993) Model

Kamin (1993) proposes the model of the demand for black market currency, which is a derived demand for imported goods. We consider it appropriate in analyzing the Chinese black market exchange rate dynamics, because in China, the demand for black dollars largely comes from the purchasing of raw materials from abroad by the industry due to foreign exchange control.

The basic set-up of the Kamin (1993) model is, as follows: Producer employs both labour and intermediate inputs that must be imported to produce the final goods. Let D denote the quantity demanded for imported goods, N denote the quantity of the goods produced, P_N denote the price of the goods, e_b denote the nominal black market exchange rate. Arbitrage ensures that the price of the import will be the same, and equal to its marginal cost, the black market rate e_b. The demand for imports or dollars is derived from maximizing producers' profit subject to the constant-returns-to-scale Cobb-Douglas production function:

Max: $P_N N - e_b D - P_N L$

s.t. $N = D^{\alpha} L^{1-\alpha}$ $(0<\alpha<1)$

Then: $D = [\alpha / (1-\alpha)]^{1-\alpha} N (e_b / P_N)^{\alpha-1}$, $(\partial D/\partial E_b < 0$, where $E_b = e_b / P_N)$

$\log D_b = b_0 + \log N + b_1 \log e_b - b_1 \log P_N$

where $b_0 = (1-\alpha) \log [\alpha / (1-\alpha)]$; $b_1 = \alpha - 1$.

This demand equation indicates that a real black market depreciation causes a substitution toward increased labour used and hence reduces the demand for dollars (Kamin 1993).

On the other hand, since the major determinant of supply of dollars to the black market is the differential between the official and black market rate, thus, the supply function of foreign exchange to the black market is:

$\log S_b = a_0 + a_1 (\log e_b - \log e_o)$

where: e_b is the black market exchange rate;

e_o is the official exchange rate.

Equating demand to supply yields:

$a_0 + a_1 (\log e_b - \log e_o) = b_0 + \log N + b_1 \log e_b - b_1 \log P_N.$

Rearrange we have:

$$\log e_b = \beta_1 + \beta_2 \log e_o + \beta_3 \log N + \beta_4 \log P_N,$$

where: $\beta_1 = (b_0 - a_0) / (a_1 - b_1);$

$\beta_2 = a_1 / (a1 - b_1);$

$\beta_3 = 1 / (a1 - b_1);$

$\beta_4 = b_1 / (b1 - a_1);$

$\beta_2 + \beta_4 = 1.$

To enrich our dynamics, we incorporate some additional explanatory variables, including US interest rate, and real consumption expenditure (see Data 6.1). When US raises interest rate and hence savings, there will be less supply of dollars in the international market. This would cause the Chinese black market rate for dollars to appreciate. During our sample period, there were lots of Friendship Stores in China, especially in big cities, where people could purchase imported cigarettes, wines and electronic appliances etc. using foreign currencies. This is due to the nation's liberalizing economic policies and rising incomes (and so rising demand for foreign goods). Hence, it is reasonable to assume that consumption expenditure has an impact on the black market rate.

Chapter 3 Real exchange rate and the Balassa-Samuelson Effect

3.1 Real exchange rate

We assume that the world consists of two countries, foreign (China) and domestic (US), where consumers only consume two goods, the tradable goods (T) and the non-tradable ones (NT). We also assume that the price equation is characterized by the Cobb-Douglas utility function, which takes the form of:

$$P = P_T^{\alpha} P_N^{1-\alpha} = P_T \left(\frac{P_N}{P_T} \right)^{1-\alpha} ,$$

where consumers spend a share α of their income on T goods and a share (1-α) on N goods.

If we define the nominal exchange rate E as the number of units of foreign currency per unit of domestic currency (e.g. E = 8.70 RMB / USD) the real exchange rate e reads as

$$e = \frac{EP^*}{P} = E \frac{P_T^*}{P_T} \frac{(\frac{P_N^*}{P_T^*})^{1-\beta}}{(\frac{P_N}{P_T})^{1-\alpha}} ,$$

where * represent the domestic country (US).

Thus the real exchange rates depend on the real exchange rates for tradable goods

($\frac{EP_T^*}{P_T}$), the relative price of non-tradables for foreign country ($\frac{P_N}{P_T}$), and the relative price of non-tradables for domestic country ($\frac{P_N^*}{P_T^*}$).

The real exchange rate measures a country's competitiveness in international trade. A fall in the real exchange rate, in other words, a real appreciation of the RMB, means that the domestic (US) goods have become less expensive relative to goods from foreign country (China). This implies that people in US are now likely to start buying less Chinese goods as they have become relatively more expensive to them. China has decreased its competitiveness. On the other hand, a rise in the real exchange rate or a real depreciation of the RMB means that China has increased its competitiveness, because goods abroad have become more expensive relative to goods in China, so that the US demand for Chinese exports increases.

3.2 The Balassa-Samuelson Hypothesis

The main proposition of the Balassa-Samuelson effect is that high productivity growth of the tradable sector comparing to the non-tradable sector leads to a rise in the relative price of non-tradable, which puts upward pressure on a country's real exchange rate.

The intuition is straightforward. An increase in productivity of the tradable sector leads to an increase in the wage rate in the tradable sector. Seeing higher wages in the tradable sector, labour move from the non-tradable sector to the tradable sector. This increases the supply of the tradable goods in the market and consequently drives down the tradable prices. On the other hand, the supply of the non-tradable goods would shrink because of the decrease in labour supply in that sector. So the non-tradable prices would go up. As a result, the relative prices of non-tradables would increase. Recall that the real exchange rate expression is a ratio between the two countries' relative prices of non-tradables, having assumed that the PPP holds for the tradables. Thus, when an increase in the relative prices of non-tradables in country A is higher than that in country B, the real exchange rate of country A relative to B would appreciate.

The Balassa-Samuelson effect has been illustrated in various different forms among which we choose the Kravis, Heston, and Summer (1983) approach as a formal statement of the Balassa-Samuelson effect.

Kravis, Heston, and Summer (1983) assume that the world consists of two countries, the rich and the poor. Each of them uses only labour to produce two goods, the tradable goods T and the non-tradable ones N. We use the lower case and upper case letters to denote the poor and rich country respectively. Thus the production function reads as:

$$q^T = k^T l^T$$

$$q^N = k^N l^N$$

$$Q^T = K^T L^T$$

$$Q^N = K^N L^N,$$

where

q (Q) is the quantity of the goods produced;

k (K) is the average (and marginal) products of labour;

l (L) is the flow of labour hours.

Thus, the non-tradable price of the poor country p^N is defined as the profits from selling those goods divided by the quantity of the goods:

$$p^N = \frac{l^N w}{q^N}(1+\mu)$$

where

w is the wage rate;

μ is the markup.

Then

$$p^N = \frac{l^N w}{k^N l^N}(1+\mu)$$

$$= \frac{w}{k^N}(1+\mu)$$

By the same reasoning,

$$P^N = \frac{W}{K^N}(1+\mu)$$

To express poor country's prices in rich country's currency by conversion at the exchange rate XR, we have:

$$\frac{p^N}{XR} = \frac{w(1+\mu)}{k^N XR}$$

Divide $\frac{p^N}{XR}$ by P^N yields

$$\frac{\frac{p^N}{XR}}{P^N} = \frac{\frac{w(1+\mu)}{k^N XR}}{\frac{W(1+\mu)}{K^N}}$$

$$= \frac{wK^N}{k^N XRW}$$

Since labor is paid its marginal product under the assumption of perfectly competitive labor market where price equals marginal cost, and the wage level in T sector determines wages in both sectors, we have $\frac{\frac{w}{XR}}{W} = \frac{k^T}{K^T}$.

Thus we have

$$\frac{\frac{p^N}{XR}}{P^N} = \frac{K^N}{k^N}\frac{k^T}{K^T}$$

Productivity differential is greater in the production of the tradables than that in the production of the non-tradables:

$$\frac{K^T}{k^T} > \frac{K^N}{k^N}$$

Thus:

$$\frac{p^N}{XR} < P^N$$

Finally, because the price of tradables of the poor country is assumed to be the same as that of the rich country, and the non-tradable prices are much lower in a poor country than in rich countries (Kravis, Heston, and Summer, 1983), this implies a tendency for the ratio of the non-tradable to the tradable price to increase with the level of per capita income: $\frac{\frac{p^N}{XR}}{\frac{p^T}{XR}} < \frac{P^N}{P^T}$.

What Kravis, Heston, and Summer (1983) has obtained from above derivation are, as follows: That international productivity differentials are greater in the production of tradable goods than non-tradable goods allows one to derive the proposition that the relative price of non-tradable goods tends to rise in fast growing economies. Suppose the economy consists of two countries with high and low level of productivity respectively. Under the assumption that labour is paid its marginal revenue products and that the internal mobility of labour equalizes the wages in two sectors within each country, inter-country wage differences will correspond to productivity differentials in the sector of traded goods, if the wage level in the tradable sector determines the wage rate in both sectors.

If we further assume that international differences in productivity are greater in the sector of traded goods than in the non-traded goods, we could obtain a proposition that the price of non-traded goods is in line with the level of productivity, for example, it is lower in country with low level of productivity than in the other.

Since we assume that prices of traded goods are equalized in the two countries through international exchange, the lower price of non-traded goods in the country with low productivity implies a higher relative price of non-traded goods in the country with high level of productivity than in the other. Thus the real exchange rate of the country with high productivity level will appear to be overvalued.

The Balassa-Samuelson effect is strictly established on a set of assumptions, for example, perfect international mobility of capital stock, PPP holds for traded goods, perfect mobility of domestic labour market, etc. However, they are often inconsistent with the real world situation. For example, Obstfeld and Rogoff (1996) argue that the imperfect international mobility of capital stock would cause the demand side of the economy to influence the real exchange rates (whereas Balassa-Samuelson effect supports the view that the supply side of the economy, i.e. the production function, causes the change in the real exchange rates). Kravis (1982) argues that in some less developed countries the PPP for traded goods often does not hold.

Chapter 4 Literature Review of the Balassa-Samuelson Effect

Since the thesis is mainly concerned with the tests on the size of the Balassa-Samuelson effect for the Chinese real exchange rates, previous literatures on productivity-based models of the real exchange rates and the econometric methods involved in testing the model are the two major topics of the literature review.

4.1 Models and Empirical Results

Previous analysis of productivity-based models of the real exchange rates can be broken into three major groups.

The first group focuses on the link between the relative prices of non-tradables and the relative productivities in the tradable and non-tradable sectors. High productivity growth of the tradable sector comparing to the non-tradable sector leads to a rise in the relative price of non-tradables (see p.26-27 for the intuition behind this proposition).

The second group starts from the definition of the real exchange rates we described in Chapter 3. So the log foreign price equation is:

$$p_t = (1-\alpha)p_t^T + \alpha p_t^N,$$

and the log domestic price equation is:

$$p_{t*} = (1-\beta)p_t^{T*} + \beta p_t^{N*}.$$

Thus, the log real exchange rate expression, assuming PPP holds for tradable goods, reads as:

$$\begin{aligned} q_t &= s_t + p_{t*} - p_t \\ &= -\alpha(p_t^{N} - p_t^{T}) + \alpha(p_t^{N*} - p_t^{T*}) \qquad \text{(assuming } \alpha = \beta\text{)} \end{aligned}$$

How the Balassa-Samuelson works through the price effect is as follows. The main proposition of the B-S effect is that high productivity growth of the tradable sector comparing to the non-tradable sector leads to a rise in the relative price of non-tradables (see p.26-27 for the intuition behind this proposition). Recall that the real exchange rate expression, which is a ratio between the two countries' relative prices of non-tradable goods (see p.25-26), having assumed that the PPP holds for tradable goods. Then, when an increase in the relative prices in country A is higher than that in country B, the real exchange rate of country A relative to B will appreciate.

The third groups adopts the Asea and Corden (1994) productivity approach in which case

$$\begin{aligned} q_t &= \alpha[(\theta^{N*}/\theta^{T*})a_t^{T*} - a_t^{N*})] - \alpha[(\theta^{N}/\theta^{T})a_t^{T} - a_t^{N})] \\ &= -\alpha(a_t^{T} - a_t^{N}) + \alpha(a_t^{T*} - a_t^{N*}) \qquad \text{(assume } \theta\text{s are same)} \end{aligned}$$

where θ is the labour coefficient in a Cobb-Douglas production function and a *is* log-total factor productivity.

Different from the above price approach to the Balassa-Samuelson effect, such an illustration of the Balassa-Samuelson effect starts from the assumption such that the international differences in productivity are greater in the sector of tradable goods than in the non-tradable goods, which in turn generates a proposition that the price of non-tradable goods is in line with the level of productivity, for example, it is lower in country with low level of productivity than in the other (Kravis, Heston and Summer 1983). Since we assume that prices of tradable goods are equalized in the two countries, the lower price of non-tradable goods in the country with low productivity implies a higher relative price of non-tradable goods in the country with high level of productivity than in the other (Kravis, Heston and Summer 1983). Thus the real exchange rate of the country with high productivity level will appear to be overvalued.

All three regression equations have been exploited extensively. The first approach has been examined by Canzoneri (1999), Drine and Rault (2002), and various other studies. The second model has been examined by Chinn (2000), Kakkar Vikas and Masao Ogaki (1994), etc. The third approach[5] has been estimated by Drine and Rault (2003), Marston (1990), Micossi and Milesi-Ferretti (1994), Strauss (1995), etc.

Canzoneri (1999) regresses the relative prices of non-tradables on relative productivities in the traded and non-traded sectors. Regression evidence from a panel of 13 OECD countries suggests that the two variables are cointegrated and that the

[5] Chinn (1996) has provided us an extensive review of the empirical literature on the basis of the third approach (see Chinn, 1996, p 4-5).

slope of the cointegrating relationship is generally close to 1.0. Thus the Balassa-Samuelson model well explains the behaviour of the real exchange rates.

Drine and Rault (2002) estimate the same regression equation for 6 Asian countries, namely, India, Indonesia, Korea, the Philippines, Singapore, and Thailand, from 1983 to 1998. The expected positive long run relationship between relative prices of non-traded goods and productivity differentials is rejected at the 5% level of significance.

According to Chinn (2000) who focuses on China, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, Thailand, Taiwan, and the US, for the period 1970 to 1992, 'Regressing the real exchange rate on relative price indicates a role for relative prices for Indonesia, Japan and Korea. When examining real exchange rates and relative productivity differentials, one finds a relationship for Japan, Malaysia, and the Philippines.'

Drine and Rault (2003) also examine the real exchange rate-productivity differential relationship using annual data for 20 Latin American countries. The standard time series approach rejects the Balassa-Samuelson hypothesis for 11 countries out of 20; whereas the panel cointegration test confirms the hypothesis for all Latin American countries.

In Marston (1990) the same equation is estimated over the cross section of eleven sectors of manufacturing. There are five equations. In the first four equations, the United States is compared with other G-5 countries, while in the last equation France is compared with Germany. In each case, the coefficient of the productivity growth term is insignificantly different from -1 at the 5% level of significance and is much higher.

Micossi and Milesi-Ferretti (1994) regress not only the multilateral real exchange rates on the productivity growth differentials but also the real exchange rates measured with unit labour costs in manufacturing. They find that all the coefficients have the expected negative sign except the case of Denmark where productivity differentials do not explain the different behaviour of the two real exchange rate indicators.

Strauss (1995) estimates a cointegrating relationship between the real exchange rate and relative productivity for a group of 14 OECD countries with Deutschemark as the benchmark. He finds that eight cases are cointegrated at the 10% marginal significance level. However, parameter estimates obtained from the Johansen (1988) cointegration procedure are not reported, so it is difficult to evaluate the conformity of the results with the Balassa-Samuelson model.

4.2 Econometric Methods

Previous econometric methods used to test the size of the Balassa-Samuelson effect can be broadly classified into two groups. The first group adopts the time series regression technique whereas the second group uses the cross-sectional one.

The strand of literature using time series data includes Hsieh (1982), Bahmani-Oskooee (1992), Bahmani-Oskooee and Rhee (1996) and DeLoach (2001).

Hsieh (1982) argues that one problem with cross-sectional technique is that they do not account for country-specific factors (e.g. tastes that are different across countries). When differences in those country-specific factors are large, cross-sectional regression leads to poor performance. On the basis of the alternative OLS and IV regression, Hsieh (1982) suggests a more favourable confirmation of the productivity differential model and so concludes that the time series regression is able to explain the variation of the real exchange rate better than cross-section regression.

Likewise, Bahmani-Oskooee (1992) argues that among the time series studies there is general support for the Balassa-Samuelson hypothesis. He employs the Engle-Granger cointegration analysis and estimates the productivity differential model for six countries. The results show that the real exchange rate and the productivity ratio are cointegrated in three of the six countries.

Bahmani-Oskooee and Rhee (1996) adopts the same model to estimate the determinants of the multilateral exchange rates for Korea using the maximum likelihood estimation. The results show that in all cases the deviation of PPP from the equilibrium exchange rate cointegrate with the relative productivity, supporting the Balassa-Samuelson notion.

DeLoach (2001) again uses the Johansen cointegration technique and provides additional confirmation of the Balassa-Samuelson hypothesis.

Another strand of literature argues that conventional time series cointegration tests have low power against stationarity alternatives in small samples (Drine and Rault 2003). A good way of improving the power of those tests is by introducing cross-section variation (Drine and Rault, 2002). However, unlike the time series regression case, empirical results from cross-sectional regression are mixed. They differ by samples and other specifications.

Officer (1976) estimates the same equation as Hsieh (1982) does. The model is estimated for each year from 1950 to 1973 using cross-sectional data from 15 industrial countries. In none of these years does Balassa-Samuelson hypothesis receive empirical support - productivity differential does not explain much of the variation of the real exchange rates across countries.

Drine and Rault (2003) adopt both the panel cointegration tests (Pedroni, 1995) and the Johansen (1988) cointegration tests. Results from the panel tests suggests that for all 20 countries under consideration, the long-run relationship between real exchange rate and per capita GDP is largely confirmed, and also all coefficients have the expected sign in all cases. However, results generated by the time series tests show that for 11 out of 20 countries, the null hypothesis of no cointegration cannot be rejected at a 5% level of significance.

According to Chinn (2000), 'panel regression results are slightly more supportive of a relative price view of real exchange rate' as opposed to the time series regression results based on his study on a panel of Asia pacific countries for the period 1970-1992.

Based on Pedroni (1995) panel cointegration tests and Pedroni (1996) fully modified OLS estimation on heterogeneous panels, Canzoneri (1999) is able to provide evidence from a panel of 13 OECD countries such that the relative prices of non-traded goods reflect the relative labour productivities in the traded and non-traded sectors.

Chapter 5 The Balassa-Samuelson Effect: A General Equilibrium Approach

The main theoretical framework on which we base our empirical work on the Chinese real exchange rates is the two-country and two-sector general equilibrium type of analysis proposed first by Asea and Mendoza (1994). Because Asea and Mendoza (1994) model focuses on the long-run balanced growth equilibrium and examines the equilibrium prices on the steady state, it implicitly assumes that shocks to technologies, and so, the TFPs, are identical across sectors at the steady state. As a result, in the closed-form solutions of the relative prices, the random disturbances to technologies of the two sectors cancel each other out. We argue that shocks to technologies, and so the TFPs, are heterogeneous across the two sectors in real world situation; it is not always necessary to assume a deterministic stationary state of the model. In what follows we extend the Asea and Mendoza (1994) model on the basis of these relaxed assumptions. In Chapter 8, we are able to test the Asea and Mendoza (1994) model restriction that the TFPs are homogeneous across sectors, especially to reject it. This justifies our extensions to their model.

5.1 The Households

5.1.1 Infinitely lived consumers maximize their discounted sum of the expected utility

We assume that the economy consists of infinitely lived consumers, who maximize their discounted sum of the expected utility

$$\underset{C_t^T, C_t^N, Lt}{Max} \quad E[\sum_{t=0}^{\infty} B^t U(C_t^T, C_t^N, Lt)], \tag{1}$$

where

$U(C_t^T, C_t^N, Lt)$ is the instantaneous utility;

C_t^T and C_t^N are the consumption expenditures on traded and non-traded goods respectively;

Lt is the flow of leisure hours;

$B = \dfrac{1}{1+\rho}$ is the discount factor whereas ρ is the subjective discount rate.

5.1.2 Special forms of the instantaneous utility function $U(C_t^T, C_t^N, Lt)$

The instantaneous utility function

The instantaneous utility function $U(C_t^T, C_t^N, Lt)$ has the form of the constant-intertemporal-elasticity-of-substitution (or constant-relative-risk-aversion) in which case the inverse of the elasticity of marginal utility is constant. It is assumed log linear in its two arguments:

$$U(C_t^T, C_t^N, L_t)$$

$$= \ln U(C_t^T, C_t^N) + \omega \ln L_t$$

$$= \ln[U(C_t^T, C_t^N) L_t^{\omega}], \tag{2}$$

where

ω is the elasticity of leisure.

The CES utility function

The utility function $U(C_t^T, C_t^N)$ has the form of constant-elasticity-of substitution, which means the elasticity of substitution $El_{C_t^T, C_t^N}$ between the two types of consumption is constant:

$$U(C_t^T, C_t^N) = [\Omega(C_t^T)^{-\mu} + (1-\Omega)(C_t^N)^{-\mu}]^{-\frac{1}{\mu}} \tag{3}$$

where

μ>1, μ≠0, $El_{C_t^T, C_t^N} = \dfrac{1}{1+\mu}$;

Ω is the share of the composite consumption and 0<Ω<1.

The specifications of the utility function (2) and (3) allow us to obtain some specific form of the instantaneous utility function:

$$U(C_t^T, C_t^N, Lt) = \frac{\{[\Omega(C_t^T)^{-\mu} + (1-\Omega)(C_t^N)^{-\mu}]^{-\frac{1}{\mu}} L_t^{\omega}\}^{1-\sigma}}{1-\sigma}, \tag{4}$$

where

σ >0 is the inverse of the elasticity of the intertemporal substitution.

5.2 The Firms

5.2.1 TFP and a specific form of the production function

Suppose that there are two industries in the economy, each containing a large number of homogeneous profit-maximizing firms, producing goods T and N subject to the constant-returns-to-scale Cobb-Douglas production functions:

$$Y_t^T = F(K_t^T, N_t^T) = \theta_t^T (K_t^T)^{1-\alpha_T} (N_t^T)^{\alpha_T}$$

$$Y_t^N = F(K_t^N, N_t^N) = \theta_t^N (K_t^N)^{1-\alpha_N} (N_t^N)^{\alpha_N}$$

where

$\theta_t^i (i = T, N)$ is the total factor productivity (TFP);

$K_t^i (i = T, N)$ is the flow of machine hours;

$N_t^i (i = T, N)$ is the flow of labour hours;

$\alpha_t^i (i = T, N)$ is the labour shares.

We assume that technology is subject to random disturbances $A_t^i (i = T, N)$ which (in natural logarithm) follow a stationary AR(1) process with a white noise error term.

We also know that for the economy to have a steady state with constant growth rate technology progress must take the *labour-augmenting* form (Solow, 1963). Hence we define the TFP in the following way

$$\theta_t^T = A_t^T (X_t^T)^{\alpha_T} \qquad (5)$$

$$\theta_t^N = A_t^N (X_t^N)^{\alpha_N} \qquad (6)$$

where

$X_t^i (i = T, N)$ is an index of technology

such that the production function can thus be incorporated with the labour-augmenting technological progress:

$$Y_t^T = F(K_t^T, N_t^T) = A_t^T (K_t^T)^{1-\alpha_T} (X_t^T N_t^T)^{\alpha_T} \quad (7)$$

$$Y_t^N = F(K_t^N, N_t^N) = A_t^N (K_t^N)^{1-\alpha_N} (X_t^N N_t^N)^{\alpha_N} \quad (8)$$

5.2.2 Positive marginal product and diminishing marginal productivity

We assume positive marginal product and diminishing marginal productivity. This enables us to conclude that a competitive and profit-maximizing firm would continue to hire factor inputs until the marginal product falls to the extent where extra revenue equals the costs. That is:

$$P_t^i MPK^i = R_t^i, (i = T, N),$$

where

$R_t^i (i = T, N)$ is the rental rate of capital.

$$P_t^i MPL^i = W_t^i, (i = T, N),$$

where

$W_t^i (i = T, N)$ is the nominal wage rate.

Hence we have the following four optimality conditions:

$$r_t^T = f_1(K_t^T, N_t^T) \quad \leftrightarrow \quad \frac{R_t^T}{P_t^T} = MPK_t^T$$

$$w_t^T = f_2(K_t^T, N_t^T) \quad \leftrightarrow \quad \frac{W_t^T}{P_t^T} = MPL_t^T$$

$$r_t^N = f_1(K_t^N, N_t^N) \quad \leftrightarrow \quad \frac{R_t^N}{P_t^N} = MPK_t^N$$

$$w_t^N = f_2(K_t^N, N_t^N) \quad \leftrightarrow \quad \frac{W_t^N}{P_t^N} = MPL_t^N$$

where

r_t^i (i = T, N) is the real interest rate;

w_t^i (i = T, N) is the real wage.

5.2.3 Extended Asea and Mendoza (1994) model – equation (I)

We assume that labour is perfectly mobile across sectors. This ensures that the nominal wage rates would be identical in two sectors, i.e. $W_t^T = W_t^N$.

So

$$P_t^T MPL_t^T = P_t^N MPL_t^N .$$

Thus:

$$\frac{P_t^N}{P_t^T} = p_t^N = \frac{MPL_t^T}{MPL_t^N}$$

$$= \frac{A_t^T (K_t^T)^{1-\alpha_T} (X_t^T)^{\alpha_T} \alpha_T (N_t^T)^{\alpha_T - 1}}{A_t^N (K_t^N)^{1-\alpha_N} (X_t^N)^{\alpha_N} \alpha_N (N_t^N)^{\alpha_N - 1}}$$

$$= \frac{\alpha_T \frac{Y_t^T}{N_t^T}}{\alpha_N \frac{Y_t^N}{N_t^N}}. \quad (9)$$

Given that the production function is:

$$Y_t^T = A_t^T (K_t^T)^{1-\alpha_T} (X_t^T N_t^T)^{\alpha_T},$$

then:

$$(Y_t^T)^{\frac{1}{\alpha_T}} = (A_t^T)^{\frac{1}{\alpha_T}} (K_t^T)^{\frac{1-\alpha_T}{\alpha_T}} (X_t^T N_t^T),$$

which is equivalent to

$$Y_t^T (Y_t^T)^{\frac{1-\alpha_T}{\alpha_T}} = (A_t^T)^{\frac{1}{\alpha_T}} (K_t^T)^{\frac{1-\alpha_T}{\alpha_T}} (X_t^T N_t^T).$$

Hence

$$\frac{Y_t^T}{N_t^T} = (A_t^T)^{\frac{1}{\alpha_T}} \left(\frac{K_t^T}{Y_t^T}\right)^{\frac{1-\alpha_T}{\alpha_T}} X_t^T. \quad (10)$$

Similarly,

$$\frac{Y_t^N}{N_t^N} = (A_t^N)^{\frac{1}{\alpha_N}} \left(\frac{K_t^N}{Y_t^N}\right)^{\frac{1-\alpha_N}{\alpha_N}} X_t^N \quad (11)$$

Substituting (10) and (11) into (9) yields:

$$p_t^N = \frac{\alpha_T (A_t^T)^{\frac{1}{\alpha_T}} X_t^T (\frac{K_t^T}{Y_t^T})^{\frac{1-\alpha_T}{\alpha_T}}}{\alpha_N (A_t^N)^{\frac{1}{\alpha_N}} X_t^N (\frac{K_t^N}{Y_t^N})^{\frac{1-\alpha_N}{\alpha_N}}} = \frac{\alpha_T (\theta_t^T)^{\frac{1}{\alpha_T}} (\frac{K_t^T}{Y_t^T})^{\frac{1-\alpha_T}{\alpha_T}}}{\alpha_N (\theta_t^N)^{\frac{1}{\alpha_N}} (\frac{K_t^N}{Y_t^N})^{\frac{1-\alpha_N}{\alpha_N}}} \tag{12}$$

The relative price expression we obtain here is an extended version from equation (27) in Asea and Mendoza (1994) since we explicitly assume that shocks to technologies are the *heterogeneous* across the two sectors and so they do not cancel each other out in those closed-form solutions for the relative prices of non-tradables.

We then transform equation (12) into a regression equation. Taking natural logarithm of both sides of the equation (12) we obtain:

$$\begin{aligned} \ln p_t^N &= \ln \alpha_T + \frac{1}{\alpha_T} \ln \theta_t^T + \frac{1-\alpha_T}{\alpha_T} \ln(\frac{K_t^T}{Y_t^T}) - \ln \alpha_N - \frac{1}{\alpha_N} \ln \theta_t^N - \frac{1-\alpha_N}{\alpha_N} \ln(\frac{K_t^N}{Y_t^N}) \\ &= (\ln \alpha_T - \ln \alpha_N) + (\frac{1}{\alpha_T} \ln \theta_t^T - \frac{1}{\alpha_N} \ln \theta_t^N) + \frac{1-\alpha_T}{\alpha_T} \ln(\frac{K_t^T}{Y_t^T}) - \frac{1-\alpha_N}{\alpha_N} \ln(\frac{K_t^N}{Y_t^N}) \quad (13) \end{aligned}$$

The cross-section regression equation is then:

$$\ln p_{jt}^N = \delta_{0j} + \delta_1 \ln(\frac{K_{jt}^T}{Y_{jt}^T}) + \delta_2 \ln(\frac{K_{jt}^N}{Y_{jt}^N}) + \delta_3 \ln \theta_{jt}^T + \delta_4 \ln \theta_{jt}^N + \varepsilon_{jt} \tag{I}$$

(j = 1, …, N, t = 1, …, T)

Since labour productivity is a monotonic transformation of the capital-output ratio (see equation 10 and 11), the relative price of non-tradables is in line with the labour productivity in the tradable sector relative to the non-tradable sector (Asea and

Mendoza, 1994). As a result, the coefficient on $\ln(\frac{K_{jt}^T}{Y_{jt}^T})$ needs to be positive, and the coefficient on $\ln(\frac{K_{jt}^N}{Y_{jt}^N})$ needs to be negative, if the Balassa-Samuelson effect[6] holds. Usually we restrict δ_3 =-δ_4, and then we say that the coefficient on $(\ln\theta_{jt}^T - \ln\theta_{jt}^N)$ needs to be positive if the Balassa-Samuelson effect holds. An alternative way to test if the theory holds is to run regression equation (I) directly. The theory requires δ_3 to be positive and δ_4 to be negative.

5.3 The Budget Constraint

In the absence of the government sector, the representative household's consumption expenditures are financed by the value of total output minus investment plus net foreign assets. In other words, the budget constraint of the household is given by

$$P_t^T C_t^T + P_t^N C_t^N$$

$$= (P_t^T Y_t^T - P_t^T I_t^T) + (P_t^N Y_t^N - P_t^N I_t^N) - \gamma R_t b_{t+1} + b_t \qquad \text{(Asea and Mendoza, 1994)}$$

where

b is the net foreign assets accumulated by the household;

R is the inverse of the real gross rate of return paid on international bonds.

<u>Output</u>

According to the Euler's Theorem, if the production function has constant returns to

[6] According to the Balassa-Samuelson effect, a faster increase of tradable sector productivity relative to the non-tradable sector productivity leads to an increase in relative prices of the non-tradables.

scale, then the sum of factor payments equals total output. In addition, since capital is the only mobile factor input across borders, the total real returns paid to the households includes the ones on the stock of capital in the foreign tradable sector. That is,

$$Y_t^T = w_t^T N_t^T + r_t^T K_t^H + r_t^{T*} K_t^F$$

where

H and F refers to home country and foreign country, * refers to foreign country.

So:

$$P_t^T Y_t^T = w_t^T N_t^T + r_t^T K_t^H + r_t^{T*} K_t^F ,$$

as we assume that the price of the tradables is one.

For the non-tradable sector, the production function reads as:

$$Y_t^N = w_t^N N_t^N + r_t^N K_t^N .$$

So:

$$P_t^N Y_t^N = P_t^N w_t^N N_t^N + P_t^N r_t^N K_t^N .$$

Investment

Investment is the change in the capital stock $I_t = \gamma K_{t+1} - (1-\delta) K_t$, where γ is the nominal interest rate, δ is the depreciation rate.

Then:

$$I_t^T = [\gamma K_{t+1}^H - (1-\delta)K_t^H] + [\gamma K_{t+1}^F - (1-\delta)K_t^F]$$

$$= P_t^T I_t^T ,$$

as we assume that the price of the tradables is one.

$$I_t^N = \gamma K_{t+1}^N - (1-\delta)K_t^N$$

So

$$P_t^N I_t^N = \gamma P_t^N K_{t+1}^N - (1-\delta)P_t^N K_t^N$$

<u>The budget constraint</u>

As a result, the budget constraint of the households is given by:

$$P_t^T C_t^T + P_t^N C_t^N$$

$$= (P_t^T Y_t^T - P_t^T I_t^T) + (P_t^N Y_t^N - P_t^N I_t^N) - \gamma R_t b_{t+1} + b_t$$

$$=(r_t^T K_t^H + r_t^{T*} K_t^F + P_t^N r_t^N K_t^N)+(w_t^T N_t^T + P_t^N w_t^N N_t^N)=(r_t^T K_t^H + r_t^{T*} K_t^F + P_t^N r_t^N K_t^N)+($$

$$w_t^T N_t^T + P_t^N w_t^N N_t^N) - \gamma(K_{t+1}^H + K_{t+1}^F + P_t^N K_{t+1}^N) + (1-\delta)(K_t^H + K_t^F + P_t^N K_t^N)$$

$$-\gamma(K_{t+1}^H + K_{t+1}^F + P_t^N K_{t+1}^N) + (1-\delta)(K_t^H + K_t^F + P_t^N K_t^N) - \gamma R_t b_{t+1} + b_t$$

(Asea and Mendoza, 1994) (10)

5.4 Competitive Equilibrium

5.4.1 The households' maximization problem

Households maximize the discounted sum of the expected utility

$$\underset{C_t^T, C_t^N, Lt}{Max} \quad E\{\sum_{t=0}^{\infty} B^t \frac{\{[\Omega(C_t^T)^{-\mu} + (1-\Omega)(C_t^N)^{-\mu}]^{-\frac{1}{\mu}} L_t^{\omega}\}^{1-\sigma}}{1-\sigma}\}$$

subject to the budget constraint:

$$C_t^T + P_t^N C_t^N$$

$$=(r_t^T K_t^H + r_t^{T*} K_t^F + P_t^N r_t^N K_t^N)+(w_t^T N_t^T + P_t^N w_t^N N_t^N)$$

$$-\gamma(K_{t+1}^H + K_{t+1}^F + P_t^N K_{t+1}^N) + (1-\delta)(K_t^H + K_t^F + P_t^N K_t^N) - \gamma R_t b_{t+1} + b_t \, .$$

<u>The Lagrangean</u>

The Lagrangean is then:

$$L = E\{\sum_{t=0}^{\infty} B^t \frac{\{[\Omega(C_t^T)^{-\mu} + (1-\Omega)(C_t^N)^{-\mu}]^{-\frac{1}{\mu}} L_t^{\omega}\}^{1-\sigma}}{1-\sigma} - \sum_{t=0}^{\infty} \lambda^t \, [C_t^T + P_t^N C_t^N -($$

$$r_t^T K_t^H + r_t^{T*} K_t^F + P_t^N r_t^N K_t^N)-(w_t^T N_t^T + P_t^N w_t^N N_t^N)+$$

$$\gamma(K_{t+1}^H + K_{t+1}^F + P_t^N K_{t+1}^N) - (1-\delta)(K_t^H + K_t^F + P_t^N K_t^N) + \gamma R_t b_{t+1} - b_t \,]\}$$

<u>The first order conditions</u>

The first order conditions are

$$\frac{\partial L}{\partial C_t^T}=0$$

$$\leftrightarrow \quad E[B^t\frac{\partial U(.)}{\partial C_t^T}]-E(\lambda_t)=0.$$

Denoting $\frac{\partial U(.)}{\partial C_t^T}$ as $U_1(t)$, then $U_1(t) = \frac{\lambda_t}{B_t}$.

$$\frac{\partial L}{\partial C_t^N}=0$$

$$\leftrightarrow E[B^t\frac{\partial U(.)}{\partial C_t^N}]-E(\lambda_t P_t^N)=0.$$

Denoting $\frac{\partial U(.)}{\partial C_t^N}$ as $U_2(t)$, then $U_2(t) = \frac{\lambda_t P_t^N}{B_t}$.

$$\frac{\partial L}{\partial L_t}=0$$

$$\leftrightarrow \quad E[B^t\frac{\partial U(.)}{\partial L_t}]-\frac{\partial}{\partial L_t}\lambda_t(-w_t^T N_t^T - P_t^N w_t^N N_t^N)=0.$$

Since

$$w_t^T=\frac{W_t^T}{P_t^T}=W_t^T=\bar{W}\,,\quad w_t^N=\frac{W_t^N}{P_t^N},$$

then

$$P_t^N w_t^N = W_t^N = W_t^T = \bar{W},$$

$$\frac{\partial}{\partial L_t}\lambda_t(-w_t^T N_t^T - P_t^N w_t^N N_t^N)$$

$$=\frac{\partial}{\partial L_t}\lambda_t[-\bar{W}(N_t^T + N_t^N)]$$

$$=\frac{\partial}{\partial L_t}\lambda_t[-\bar{W}(1-L_t)]$$

$$=-\bar{W}\lambda_t = -W_t^T\lambda_t = -W_t^N\lambda_t$$

Denoting $\frac{\partial U(.)}{\partial L_t}$ as $U_3(t)$, then $U_3(t) = \frac{\lambda_t}{B_t}\bar{W}$.

<u>The market-clearing conditions</u>

As a result, the set of market-clearing conditions that Asea and Mendoza (1994)[7] obtain is, as follows:

$$\frac{U_1(t)}{U_2(t)} = \frac{1}{P_t^N} \tag{14}$$

$$\frac{U_3(t)}{U_1(t)} = \bar{W} = W_t^T = w_t^T \tag{15}$$

$$\frac{U_3(t)}{U_2(t)} = \frac{\bar{W}}{P_t^N} = w_t^N \tag{16}$$

$$f(K_t^N, N_t^N) = Y_t^N = C_t^N + I_t^N = C_t^N + \gamma K_{t+1}^N - (1-\delta)K_t^N \tag{17}$$

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[7] See Journal page 249

$$f(K_t^N*, N_t^N*) = Y_t^N* = C_t^N* + I_t^N* = C_t^N* + \gamma * K_{t+1}^N* - (1-\delta)K_t^N* \quad (18)$$

$$f(K_t^T, N_t^T) = Y_t^T = C_t^T + I_t^T = C_t^T + \gamma K_{t+1}^T - (1-\delta)K_t^T \quad (19)$$

$$f(K_t^T*, N_t^T*) = Y_t^T* = C_t^T* + I_t^T* = C_t^T* + \gamma * K_{t+1}^T* - (1-\delta)K_t^T* \quad (20)$$

<u>Another set of market clearing conditions</u>

Another set of market clearing conditions, put forward by Asea and Mendoza (1994)[8], is illustrated as follows. On the basis of these general equilibrium conditions, it can be shown that the relative price equation (I) and (II) are the proper representations of the *equilibrium* prices[8].

$$L = E\{\sum_{t=0}^{\infty} B^t\ U(C_t^T, C_t^N, Lt) - \sum_{t=0}^{\infty} \lambda^t\ [C_t^T + P_t^N C_t^N - (r_t^T K_t^H + r_t^{T*} K_t^F + P_t^N r_t^N K_t^N) - (w_t^T N_t^T$$

$$+ P_t^N w_t^N N_t^N) + \gamma(K_{t+1}^H + K_{t+1}^F + P_t^N K_{t+1}^N) - (1-\delta)(K_t^H + K_t^F + P_t^N K_t^N) + \gamma R_t b_{t+1} - b_t]\}$$

$$\frac{\partial L}{\partial C_t^T} = U'(C_t^T, C_t^N, L_t) - \lambda_t = 0 \quad (21)$$

$$\frac{\partial L}{\partial C_{t+1}^T} = BE[U'(C_{t+1}^T, C_{t+1}^N, L_{t+1})] - \lambda_{t+1} = 0 \quad (22)$$

$\frac{(21)}{(22)}$ yields:

[8] See Journal page 249

$$\frac{U'(C_t^T, C_t^N, L_t)}{BE[U'(C_{t+1}^T, C_{t+1}^N, L_{t+1})]} = \frac{\lambda_t}{\lambda_{t+1}} \tag{23}$$

Denoting $U'(C_t^T, C_t^N, L_t)$ as $U_1(t)$ and $U'(C_{t+1}^T, C_{t+1}^N, L_{t+1})$ as $U_1(t+1)$, then equation (23) becomes:

$$\frac{U_1(t)}{BE[U_1(t+1)]} = \frac{\lambda_t}{\lambda_{t+1}} \tag{24}$$

Differentiating L with respect to $b_{t+1}, K_{t+1}^H, K_{t+1}^F, K_{t+1}^N$ respectively yields the following results:

$$\frac{\partial L}{\partial b_{t+1}} = -\lambda_t \gamma Rt + \lambda_{t+1} = 0.$$

Then:

$$\lambda_t \gamma Rt = \lambda_{t+1}. \tag{25}$$

Substituting (25) into (24) yields:

$$\gamma R_t U_1(t) = BE[U_1(t+1)]. \tag{26}$$

$$\frac{\partial L}{\partial K_{t+1}^H} = \lambda_{t+1} r_{t+1}^T - \lambda_t \gamma + (1-\delta)\lambda_{t+1} = 0.$$

Then

$$\lambda_{t+1}[r_{t+1}^T + (1-\delta)] = \lambda_t \gamma. \tag{27}$$

Substituting (27) into (24) yields:

$$\gamma U_1(t) = BE[U_1(t+1)][r_{t+1}^T + (1-\delta)]. \tag{28}$$

$$\frac{\partial L}{\partial K_{t+1}^F} = \lambda_{t+1} r_{t+1}^T * - \lambda_t \gamma + (1-\delta)\lambda_{t+1} = 0.$$

Then:

$$\lambda_{t+1}[r_{t+1}^T * + (1-\delta)] = \lambda_t \gamma. \tag{29}$$

Substituting (29) into (24) yields:

$$\gamma U_1(t) = BE[U_1(t+1)][r_{t+1}^T * + (1-\delta)]. \tag{30}$$

$$\frac{\partial L}{\partial K_{t+1}^N} = \lambda_{t+1} P_{t+1}^N r_{t+1}^N - \lambda_t \gamma P_t^N + (1-\delta)\lambda_{t+1} P_{t+1}^N = 0.$$

Then:

$$\lambda_{t+1} P_{t+1}^N [r_{t+1}^N + (1-\delta)] = \lambda_t P_t^N \gamma. \tag{31}$$

Substituting (31) into (24) yields:

$$P_t^N \gamma U_1(t) = BE[U_1(t+1)] P_{t+1}^N [r_{t+1}^N + (1-\delta)]. \tag{32}$$

5.5 The long run price of non-tradables

5.5.1 Extended Asea and Mendoza (1994) model – equation (II)

From (28) and (32), it follows that in a deterministic stationary equilibrium with perfect sectoral capital mobility, the marginal product of capital in the tradable and non-tradable sectors are equalized (Asea and Mendoza, 1994). That is, $MPK_t^T = MPK_t^N$:

$$\begin{aligned} MPK_t^T &= \frac{\partial Y_t^T}{\partial K_t^T} \\ &= \frac{\partial}{\partial K_t^T}[A_t^T(K_t^T)^{1-\alpha_T}(X_t^T N_t^T)^{\alpha_T}] \\ &= A_t^T(X_t^T N_t^T)^{\alpha_T}(1-\alpha_T)(K_t^T)^{-\alpha_T} \\ &= A_t^T(X_t^T N_t^T)^{\alpha_T}(1-\alpha_T)(K_t^T)^{1-\alpha_T-1} \\ &= (1-\alpha_T)Y_t^T(K_t^T)^{-1} \\ &= (1-\alpha_T)\frac{Y_t^T}{K_t^T} \end{aligned}$$

By the same reasoning:

$$MPK_t^N = (1-\alpha_N)\frac{Y_t^N}{K_t^N}$$

Then $MPK_t^T = MPK_t^N$ yields:

$$(1-\alpha_T)\frac{Y_t^T}{K_t^T} = (1-\alpha_N)\frac{Y_t^N}{K_t^N} \qquad (33)$$

Rearranging (33) we have:

$$\frac{K_t^N}{Y_t^N} = \frac{(1-\alpha_N)}{(1-\alpha_T)}\frac{K_t^T}{Y_t^T}. \tag{34}$$

Then substituting (34) into (12) yields:

$$p_t^N = \frac{\alpha_T (\theta_t^T)^{\frac{1}{\alpha_T}} (\frac{K_t^T}{Y_t^T})^{\frac{1-\alpha_T}{\alpha_T}}}{\alpha_N (\theta_t^N)^{\frac{1}{\alpha_N}} (\frac{1-\alpha_N}{1-\alpha_T})^{\frac{1-\alpha_N}{\alpha_N}} (\frac{K_t^T}{Y_t^T})^{\frac{1-\alpha_N}{\alpha_N}}}$$

$$= \frac{\alpha_T (\theta_t^T)^{\frac{1}{\alpha_T}}}{\alpha_N (\theta_t^N)^{\frac{1}{\alpha_N}}} (\frac{1-\alpha_N}{1-\alpha_T})^{\frac{\alpha_N - 1}{\alpha_N}} (\frac{K_t^T}{Y_t^T})^{\frac{1-\alpha_T}{\alpha_T} - \frac{1-\alpha_N}{\alpha_N}} \tag{35}$$

Again, the expression we obtain here is an extended version of the relative prices of non-tradables (see Asea and Mendoza, 1994: p.251 for a comparison) due to our assumption on shocks to technology.

We then transform equation (35) into a regression equation. Taking natural logarithms of both sides of the equation (35) we obtain:

$$\ln p_t^N = (\ln \alpha_T - \ln \alpha_N) + \frac{\alpha_N - 1}{\alpha_N}[\ln(1-\alpha_N) - \ln(1-\alpha_T)] + (\frac{1}{\alpha_T}\ln \theta_t^T - \frac{1}{\alpha_N}\ln \theta_t^N)$$
$$+ (\frac{1-\alpha_T}{\alpha_T} - \frac{1-\alpha_N}{\alpha_N}) \ln(\frac{K_t^T}{Y_t^T}) \tag{36}$$

The regression equation is then:

$$\ln p_{jt}^{N} = \gamma_{0j} + \gamma_1 \ln(\frac{K_{jt}^{T}}{Y_{jt}^{T}}) + \gamma_2 \ln \theta_{jt}^{T} + \gamma_3 \ln \theta_{jt}^{N} + \varepsilon_{jt} \qquad \text{(II)}$$

The expected sign of the coefficient on $\ln(\frac{K_{jt}^{T}}{Y_{jt}^{T}})$ is vague. However, according to Asea and Mendoza (1994), if we assume $\alpha_T > \alpha_N$ then γ_1 should be negative. Again, the theory requires γ_2 to be positive and γ_3 to be negative.

5.5.2 Extended Asea and Mendoza (1994) model – equation (III)

Investment is the change in the capital stock: $I_t = \gamma K_{t+1} - (1-\delta)K_t$, where γ is the nominal interest rate, δ is the depreciation rate. At the steady-state, we have: $K_{t+1} = K_t$. Thus, $I_t = [\gamma - (1-\delta)]K_t$, at the steady-state. Hence we have the following expression:

$\frac{I_t^T}{Y_t^T} = [\gamma - (1-\delta)]\frac{K_t^T}{Y_t^T}$ at the steady state.

Then:

$$\frac{K_t^T}{Y_t^T} = \frac{\frac{I_t^T}{Y_t^T}}{\gamma - (1-\delta)} \qquad (37)$$

at steady state.

Substituting (37) into (35) yields

$$p_t^N = \frac{\alpha_T (\theta_t^T)^{\frac{1}{\alpha_T}}}{\alpha_N (\theta_t^N)^{\frac{1}{\alpha_N}}} \left(\frac{1-\alpha_N}{1-\alpha_T}\right)^{\frac{\alpha_N - 1}{\alpha_N}} \left(\frac{\frac{I_t^T}{Y_t^T}}{\gamma - (1-\delta)}\right)^{\frac{1-\alpha_T}{\alpha_T} - \frac{1-\alpha_N}{\alpha_N}} \qquad (38)$$

It is an extended expression for the relative prices of non-tradables, again, based on our assumptions on technological shocks (see Asea and Mendoza, 1994, p.252 for a comparison).

We then transform equation (38) into a regression equation. Taking natural logarithms of both sides of the equation (38) we obtain:

$$\ln p_t^N = (\ln \alpha_T - \ln \alpha_N) + \frac{\alpha_N - 1}{\alpha_N}[\ln(1-\alpha_N) - \ln(1-\alpha_T)]$$
$$-\left(\frac{1-\alpha_T}{\alpha_T} - \frac{1-\alpha_N}{\alpha_N}\right)\ln[\gamma - (1-\delta)] + \left(\frac{1}{\alpha_T}\ln\theta_t^T - \frac{1}{\alpha_N}\ln\theta_t^N\right) + \left(\frac{1-\alpha_T}{\alpha_T} - \frac{1-\alpha_N}{\alpha_N}\right)\ln\left(\frac{I_t^T}{Y_t^T}\right) \qquad (39)$$

The regression equation is then:

$$\ln p_{jt}^N = \eta_{0j} + \eta_1 \ln\left(\frac{I_{jt}^T}{Y_{jt}^T}\right) + \eta_2 \ln\theta_{jt}^T + \eta_3 \ln\theta_{jt}^N + \varepsilon_{jt} \qquad \text{(III)}$$

We do not know whether the coefficient on $\ln(\frac{I_{jt}^T}{Y_{jt}^T})$ is positive or negative. However, according to Asea and Mendoza (1994), if we assume $\alpha_T > \alpha_N$ then η_1 should be negative. Also, the theory requires η_2 to be positive and η_3 to be negative. In addition, if η_1 is indeed less than zero, then the absolute value of η_2 is less than that of η_3.

5.6 The long run real exchange rates

5.6.1 Extended Asea and Mendoza (1994) model – equation (V) when utility function is CES

The representative household faces the constrained budget minimization problem for unit utility:

$$\underset{c_t^T, c_t^N}{Min}\ UC = P_t^T c_t^T + P_t^N c_t^N \qquad (40)$$

subject to

$$U(c_t^T, c_t^N) = [\Omega(c_t^T)^{-\mu} + (1-\Omega)(c_t^N)^{-\mu}]^{-\frac{1}{\mu}} = 1 \qquad (41)$$

where

c_t^T, c_t^N are the shares of one unit composite consumption (or utility);

UC is the budget of the household for obtaining one unit of utility.

The Lagrangean is:

$$\mathrm{L} = P_t^T c_t^T + P_t^N c_t^N + \lambda\{[\Omega(c_t^T)^{-\mu} + (1-\Omega)(c_t^N)^{-\mu}]^{-\frac{1}{\mu}} - 1\}$$

The first order conditions are

$$\frac{\partial L}{\partial c_t^T} = P_t^T + \lambda(-\frac{1}{\mu})[\Omega(c_t^T)^{-\mu} + (1-\Omega)(c_t^N)^{-\mu}]^{-\frac{1}{\mu}-1}\Omega(-\mu)(c_t^T)^{-\mu-1} = 0$$

$$P_t^T = -\lambda(-\frac{1}{\mu})[\Omega(c_t^T)^{-\mu} + (1-\Omega)(c_t^N)^{-\mu}]^{-\frac{1}{\mu}-1}\Omega(-\mu)(c_t^T)^{-\mu-1} \qquad (42)$$

$$\frac{\partial L}{\partial c_t^N} = P_t^N + \lambda(-\frac{1}{\mu})[\Omega(c_t^T)^{-\mu} + (1-\Omega)(c_t^N)^{-\mu}]^{-\frac{1}{\mu}-1}(1-\Omega)(-\mu)(c_t^N)^{-\mu-1} = 0$$

$$P_t^N = -\lambda(-\frac{1}{\mu})[\Omega(c_t^T)^{-\mu} + (1-\Omega)(c_t^N)^{-\mu}]^{-\frac{1}{\mu}-1}(1-\Omega)(-\mu)(c_t^N)^{-\mu-1} \qquad (43)$$

Thus:

$$\frac{(42)}{(43)}: \frac{P_t^T}{P_t^N} = \frac{\Omega}{1-\Omega}(\frac{c_t^T}{c_t^N})^{-\mu-1}$$

Hence:

$$c_t^T = c_t^N[\frac{P_t^N\Omega}{P_t^T(1-\Omega)}]^{\frac{1}{\mu+1}} \qquad (44)$$

and:

$$c_t^N = c_t^T[\frac{P_t^T(1-\Omega)}{P_t^N\Omega}]^{\frac{1}{\mu+1}}. \qquad (45)$$

Substituting (44) into (41) we have:

$$\{\Omega(c_t^N)^{-\mu}[\frac{P_t^N\Omega}{P_t^T(1-\Omega)}]^{\frac{-\mu}{1+\mu}} + (1-\Omega)(c_t^N)^{-\mu}\}^{-\frac{1}{\mu}} = 1.$$

Then:

$$c_t^N\{\Omega[\frac{P_t^N\Omega}{P_t^T(1-\Omega)}]^{\frac{-\mu}{1+\mu}}+(1-\Omega)\}^{-\frac{1}{\mu}}=1,$$

which is:

$$c_t^N[\Omega(P_t^N)^{\frac{-\mu}{1+\mu}}\Omega^{\frac{-\mu}{1+\mu}}(P_t^T)^{\frac{\mu}{1+\mu}}(1-\Omega)^{\frac{\mu}{1+\mu}}+(1-\Omega)]^{-\frac{1}{\mu}}=1.$$

So:

$$c_t^N=\frac{1}{[\Omega(P_t^N)^{\frac{-\mu}{1+\mu}}\Omega^{\frac{-\mu}{1+\mu}}(P_t^T)^{\frac{\mu}{1+\mu}}(1-\Omega)^{\frac{\mu}{1+\mu}}+(1-\Omega)]^{-\frac{1}{\mu}}}.$$

Multiplying both the numerator and denominator by $[(P_t^N)^{\frac{\mu}{1+\mu}}(1-\Omega)^{\frac{-\mu}{1+\mu}}]^{-\frac{1}{\mu}}$ yields:

$$c_t^N=\frac{(P_t^N)^{\frac{-1}{1+\mu}}(1-\Omega)^{\frac{1}{1+\mu}}}{[\Omega^{\frac{1}{1+\mu}}(P_t^T)^{\frac{\mu}{1+\mu}}+(1-\Omega)^{\frac{1}{1+\mu}}(P_t^N)^{\frac{\mu}{1+\mu}}]^{-\frac{1}{\mu}}}. \tag{46}$$

Similarly, substituting (45) into (41) we have:

$$\{(1-\Omega)(c_t^T)^{-\mu}[\frac{P_t^T(1-\Omega)}{P_t^N\Omega}]^{\frac{-\mu}{1+\mu}}+\Omega(c_t^T)^{-\mu}\}^{-\frac{1}{\mu}}=1$$

Then:

$$c_t^T\{(1-\Omega)[\frac{P_t^T(1-\Omega)}{P_t^N\Omega}]^{\frac{-\mu}{1+\mu}}+\Omega\}^{-\frac{1}{\mu}}=1,$$

which is:

$$c_t^T[(P_t^T)^{\frac{-\mu}{1+\mu}}(1-\Omega)^{\frac{1}{1+\mu}}(P_t^N)^{\frac{\mu}{1+\mu}}\Omega^{\frac{\mu}{1+\mu}}+\Omega]^{-\frac{1}{\mu}}=1$$

So

$$c_t^T=\frac{1}{[(P_t^T)^{\frac{-\mu}{1+\mu}}(1-\Omega)^{\frac{1}{1+\mu}}(P_t^N)^{\frac{\mu}{1+\mu}}\Omega^{\frac{\mu}{1+\mu}}+\Omega)]^{-\frac{1}{\mu}}}$$

Multiplying both the numerator and denominator by $[(P_t^T)^{\frac{\mu}{1+\mu}}\Omega^{\frac{-\mu}{1+\mu}}]^{-\frac{1}{\mu}}$ we have:

$$c_t^T=\frac{(P_t^T)^{\frac{-1}{1+\mu}}\Omega^{\frac{1}{1+\mu}}}{[\Omega^{\frac{1}{1+\mu}}(P_t^T)^{\frac{\mu}{1+\mu}}+(1-\Omega)^{\frac{1}{1+\mu}}(P_t^N)^{\frac{\mu}{1+\mu}}]^{-\frac{1}{\mu}}} \tag{47}$$

Substituting (46) and (47) into (40) we have:

$$UC=\frac{(P_t^N)^{\frac{\mu}{1+\mu}}(1-\Omega)^{\frac{1}{1+\mu}}+(P_t^T)^{\frac{\mu}{1+\mu}}\Omega^{\frac{1}{1+\mu}}}{[\Omega^{\frac{1}{1+\mu}}(P_t^T)^{\frac{\mu}{1+\mu}}+(1-\Omega)^{\frac{1}{1+\mu}}(P_t^N)^{\frac{\mu}{1+\mu}}]^{-\frac{1}{\mu}}}$$

$$=[\Omega^{\frac{1}{1+\mu}}(P_t^T)^{\frac{\mu}{1+\mu}}+(1-\Omega)^{\frac{1}{1+\mu}}(P_t^N)^{\frac{\mu}{1+\mu}}]^{\frac{1+\mu}{\mu}}$$

In the long-run perfect competitive equilibrium, the unit costs of obtaining the composite consumption goods should equal the price of the goods such that the no profits are made. Hence we have:

$$P_t(P_t^T,P_t^N)=[\Omega^{\frac{1}{1+\mu}}(P_t^T)^{\frac{\mu}{1+\mu}}+(1-\Omega)^{\frac{1}{1+\mu}}(P_t^N)^{\frac{\mu}{1+\mu}}]^{\frac{1+\mu}{\mu}}$$

We define the real exchange rate as $e_t=E\frac{P_t^*}{P_t}$, where E is the nominal exchange rate, * refers to the domestic country (e.g. US). Then we substitute the price equation into the real exchange rate expression and obtain:

$$e_t = E\frac{P_t^*}{P_t}$$
$$= E\frac{[\Omega *^{\frac{1}{1+\mu^*}}(P_t^T *)^{\frac{\mu^*}{1+\mu^*}} + (1-\Omega *)^{\frac{1}{1+\mu^*}}(P_t^N *)^{\frac{\mu^*}{1+\mu^*}}]^{\frac{1+\mu^*}{\mu^*}}}{[\Omega^{\frac{1}{1+\mu}}(P_t^T)^{\frac{\mu}{1+\mu}} + (1-\Omega)^{\frac{1}{1+\mu}}(P_t^N)^{\frac{\mu}{1+\mu}}]^{\frac{1+\mu}{\mu}}}$$

Multiplying the numerator and denominator by $\frac{[(P_t^T *)^{\frac{-\mu^*}{1+\mu^*}}]^{\frac{1+\mu^*}{\mu^*}}}{[(P_t^T *)^{\frac{-\mu^*}{1+\mu^*}}]^{\frac{1+\mu^*}{\mu^*}}}$ and $\frac{[(P_t^T)^{\frac{-\mu}{1+\mu}}]^{\frac{1+\mu}{\mu}}}{[(P_t^T)^{\frac{-\mu}{1+\mu}}]^{\frac{1+\mu}{\mu}}}$

respectively we obtain:

$$e_t = E\frac{P_t^T *[\Omega *^{\frac{1}{1+\mu^*}} + (1-\Omega *)^{\frac{1}{1+\mu^*}}(\frac{P_t^N *}{P_t^T *})^{\frac{\mu^*}{1+\mu^*}}]^{\frac{1+\mu^*}{\mu^*}}}{P_t^T[\Omega^{\frac{1}{1+\mu}} + (1-\Omega)^{\frac{1}{1+\mu}}(\frac{P_t^N}{P_t^T})^{\frac{\mu}{1+\mu}}]^{\frac{1+\mu}{\mu}}}$$

We assume that the Law of One Price holds for tradable goods. This means that $E\frac{P_t^T *}{P_t^T} = 1$.

Denoting $\frac{P_t^N *}{P_t^T *}$ as $p_t^N *$, and $\frac{P_t^N}{P_t^T}$ as p_t^N.

Then:

$$e_t = \frac{[\Omega *^{\frac{1}{1+\mu^*}} + (1-\Omega *)^{\frac{1}{1+\mu^*}}(p_t^N *)^{\frac{\mu^*}{1+\mu^*}}]^{\frac{1+\mu^*}{\mu^*}}}{[\Omega^{\frac{1}{1+\mu}} + (1-\Omega)^{\frac{1}{1+\mu}}(p_t^N)^{\frac{\mu}{1+\mu}}]^{\frac{1+\mu}{\mu}}}$$ (Asea and Mendoza, 1994: p.252) (48)

The equation demonstrates that the real exchange rate e_t is a function of the relative price of non-tradables of the two countries.

5.6.2 Extended Asea and Mendoza (1994) model – equation (VI) when utility function is Cobb-Douglas

$$\underset{c_t^T, c_t^N}{Min}\ UC = P_t^T c_t^T + P_t^N c_t^N \tag{49}$$

subject to:

$$U(c_t^T, c_t^N) = (c_t^T)^{\Omega}(c_t^N)^{1-\Omega} = 1 \tag{50}$$

The Lagrangean is:

$$\mathrm{L} = P_t^T c_t^T + P_t^N c_t^N + \lambda[(c_t^T)^{\Omega}(c_t^N)^{1-\Omega} - 1]$$

The first order conditions are:

$$\frac{\partial L}{\partial c_t^T} = P_t^T + \lambda (c_t^N)^{1-\Omega}\Omega(c_t^T)^{\Omega-1} = 0$$

$$P_t^T = -\lambda (c_t^N)^{1-\Omega}\Omega(c_t^T)^{\Omega-1} \tag{51}$$

$$\frac{\partial L}{\partial c_t^N} = P_t^N + \lambda (c_t^T)^{\Omega}(1-\Omega)(c_t^N)^{-\Omega} = 0$$

$$P_t^N = -\lambda (c_t^T)^{\Omega}(1-\Omega)(c_t^N)^{-\Omega} \tag{52}$$

Thus:

$$\frac{(51)}{(52)} : \frac{P_t^T}{P_t^N} = \frac{\Omega c_t^N}{(1-\Omega)c_t^T}$$

So:

$$c_t^T = c_t^N \frac{P_t^N \Omega}{P_t^T (1-\Omega)} \tag{53}$$

and:

$$c_t^N = c_t^T \frac{P_t^T (1-\Omega)}{P_t^N \Omega} \tag{54}$$

Substituting (e) into (b) we have:

$$(c_t^N)^\Omega (\frac{P_t^N}{P_t^T})^\Omega (\frac{\Omega}{1-\Omega})^\Omega (c_t^N)^{1-\Omega} = 1.$$

Then:

$$c_t^N (\frac{P_t^N}{P_t^T})^\Omega (\frac{\Omega}{1-\Omega})^\Omega = 1.$$

So:

$$c_t^N = \frac{1}{(P_t^N)^\Omega (P_t^T)^{-\Omega} \Omega^\Omega (1-\Omega)^{-\Omega}}.$$

Multiplying both the numerator and denominator by $(P_t^N)^{-\Omega}(1-\Omega)^\Omega$ we have:

$$c_t^N = \frac{(P_t^N)^{-\Omega}(1-\Omega)^\Omega}{(P_t^T)^{-\Omega}\Omega^\Omega} \tag{55}$$

Similarly substituting (54) into (50) we have:

$$(c_t^T)^\Omega (\frac{P_t^T}{P_t^N})^{1-\Omega} (\frac{1-\Omega}{\Omega})^{1-\Omega} (c_t^T)^{1-\Omega} = 1.$$

Then:

$$c_t^T (\frac{P_t^T}{P_t^N})^{1-\Omega} (\frac{1-\Omega}{\Omega})^{1-\Omega} = 1.$$

So:

$$c_t^T = \frac{1}{(P_t^T)^{1-\Omega} (P_t^N)^{\Omega-1} (1-\Omega)^{1-\Omega} \Omega^{\Omega-1}}.$$

Multiplying both the numerator and denominator by $(P_t^T)^{\Omega-1} \Omega^{1-\Omega}$, we have

$$c_t^T = \frac{(P_t^T)^{\Omega-1} \Omega^{1-\Omega}}{(P_t^N)^{\Omega-1} (1-\Omega)^{1-\Omega}} \quad (56)$$

Substituting (55) and (56) into (49), we have:

$$\mathrm{UC} = P_t^T \frac{(P_t^T)^{\Omega-1} \Omega^{1-\Omega}}{(P_t^N)^{\Omega-1} (1-\Omega)^{1-\Omega}} + P_t^N \frac{(P_t^N)^{-\Omega} (1-\Omega)^{\Omega}}{(P_t^T)^{-\Omega} \Omega^{\Omega}}$$

$$= \frac{(P_t^T)^{\Omega} \Omega^{1-\Omega}}{(P_t^N)^{\Omega-1} (1-\Omega)^{1-\Omega}} + \frac{(P_t^N)^{1-\Omega} (1-\Omega)^{\Omega}}{(P_t^T)^{-\Omega} \Omega^{\Omega}}$$

$$= \frac{1}{(P_t^N)^{\Omega-1} (1-\Omega)^{1-\Omega} (P_t^T)^{-\Omega} \Omega^{\Omega}}$$

$$= (P_t^N)^{1-\Omega} (1-\Omega)^{\Omega-1} (P_t^T)^{\Omega} \Omega^{-\Omega}$$

By the same reasoning, in perfect competitive equilibrium, the costs of obtaining one unit of the composite consumption goods should equal the price of the goods. Hence we have:

$$P_t(P_t^T, P_t^N) = (P_t^N)^{1-\Omega} (1-\Omega)^{\Omega-1} (P_t^T)^{\Omega} \Omega^{-\Omega}$$

We substitute this price equation into the real exchange rate expression $e_t = E\frac{P_t^*}{P_t}$

and obtain:

$$e_t = E\frac{P_t^*}{P_t}$$

$$= E\frac{(P_t^N*)^{1-\Omega*}(1-\Omega*)^{\Omega*-1}(P_t^T*)^{\Omega*}(\Omega*)^{-\Omega*}}{(P_t^N)^{1-\Omega}(1-\Omega)^{\Omega-1}(P_t^T)^{\Omega}\Omega^{-\Omega}}$$

$$= E\frac{P_t^T*(P_t^N*)^{1-\Omega*}(1-\Omega*)^{\Omega*-1}(P_t^T*)^{\Omega*-1}(\Omega*)^{-\Omega*}}{P_t^T(P_t^N)^{1-\Omega}(1-\Omega)^{\Omega-1}(P_t^T)^{\Omega-1}\Omega^{-\Omega}}$$

$$= E\frac{P_t^T*(\frac{P_t^N*}{P_t^T*})^{1-\Omega*}(1-\Omega*)^{\Omega*-1}(\Omega*)^{-\Omega*}}{P_t^T(\frac{P_t^N}{P_t^T})^{1-\Omega}(1-\Omega)^{\Omega-1}\Omega^{-\Omega}}$$

Since $E\frac{P_t^T*}{P_t^T} = 1$,

then:

$$e_t = \frac{(1-\Omega*)^{\Omega*-1}(\Omega*)^{-\Omega*}(p_t^{N*})^{1-\Omega*}}{(1-\Omega)^{\Omega-1}\Omega^{-\Omega}(p_t^N)^{1-\Omega}}$$

$$= \frac{(\Omega^*)^{-\Omega*}(1-\Omega^*)^{\Omega*-1}}{(\Omega)^{-\Omega}(1-\Omega)^{\Omega-1}}\frac{(p_t^{N*})^{1-\Omega*}}{(p_t^N)^{1-\Omega}}$$

$$= (\Omega^*)^{-\Omega*}(1-\Omega^*)^{\Omega*-1}[(\Omega)^{-\Omega}(1-\Omega)^{\Omega-1}]^{-1}\frac{(p_t^{N*})^{1-\Omega*}}{(p_t^N)^{1-\Omega}}$$

$$= (\Omega^*)^{-\Omega*}(1-\Omega^*)^{\Omega*-1}[(\Omega)^{\Omega}(1-\Omega)^{1-\Omega}]\frac{(p_t^{N*})^{1-\Omega*}}{(p_t^N)^{1-\Omega}}$$

$$= [(\Omega^*)^{\Omega^*}(1-\Omega^*)^{1-\Omega^*}]^{-1}[(\Omega)^{\Omega}(1-\Omega)^{1-\Omega}]\frac{(p_t^{N*})^{1-\Omega^*}}{(p_t^N)^{1-\Omega}}$$

$$= \frac{(\Omega)^{\Omega}(1-\Omega)^{1-\Omega}}{(\Omega^*)^{\Omega^*}(1-\Omega^*)^{1-\Omega^*}}\frac{(p_t^{N*})^{1-\Omega^*}}{(p_t^N)^{1-\Omega}} \tag{57}$$

The real exchange rate equation we obtain here is different from equation (32) in Asea and Mendoza (1994) in terms of the position of the Ωs in the equation. Nevertheless, it shows that the real exchange rate as a function of the relative price of the non-tradables of the two countries.

We then transform equation (57) into a regression equation[9]. Taking natural logarithm of both sides of equation (57) we obtain:

$$\ln e_t = \Omega \ln \Omega + (1-\Omega)\ln(1-\Omega) + (1-\Omega^*)\ln p_t^{N*} - \Omega^* \ln \Omega^* - (1-\Omega^*)\ln(1-\Omega^*) - (1-\Omega)\ln p_t^N$$

$$= (1-\Omega)(\ln p_t^{N*} - \ln p_t^N) \qquad \text{(assume that } \Omega = \Omega^*) \tag{58}$$

So the corresponding regression equation becomes:

$$q_{jt} = \zeta_{oj} + \zeta_1(\ln p_{jt}^{N*} - \ln p_{jt}^N) + e_{jt} \tag{IV}$$

The Balassa-Samuelson hypothesis suggests that the real exchange rate and relative price differential are negatively correlated (since a fall of the real exchange rate implies an appreciation). Thus if the theory holds, ζ_1 should be negative.

[9] In fact, transforming equation (48) leads to the same regression equation.

Part II Data

Chapter 6 Data

6.1 China Data

Our empirical estimation requires data on relative price of non-tradables, relative productivity of the tradable sectors, the PPP exchange rates, the real official and parallel exchange rates, relative productivity and price differential between US and China, and the sectoral capital-output and investment-output ratios. These variables do not exist in ready form, so we need to construct these variables from existing sources.

In the following chapters, we first construct the intermediate variables, namely the traded and non-traded GDP deflators, the TFPs, and the real exchange rates, across 31 Chinese provinces during the period 1980 to 2000, using the database of the China Statistical Yearbooks. The chapters also include an explanation of some of the basic variables used in constructing the intermediate ones. These variables are the real and nominal GDP, investment, capital stock, wages, factor returns, and employment for each of the sectors. On the basis of such an intermediate database, we then construct our final series explained in Chapter 6.3, for each province in our sample.

6.1.1 Classification of sectors

In order to construct the required data, the first issue was to decide which sectors are to be considered as tradable and non-tradable. De Gregorio, Giovannini, and Wolf

(1994) classify sectors on the basis of 'export shares in output for the whole sample of countries, using a cut-off point of 10% to delineate non-tradables.' We follow such a classification scheme. The 10% threshold classifies the Chinese agriculture (farming, forestry, animal husbandry and fishery) and industry (excavation, manufacturing, production and supply of power, gas and water[10]) sectors as tradables; with the remaining sectors - construction, transportation, storage, postal and telecommunications services, wholesale, retail trade and catering services classified as non-tradables.

6.1.2 Tradable and non-tradable prices

The sectoral prices (2000=100) (see Data 6.2 and 6.3) are the ratio of the nominal to real GDP index both at 2000 constant prices for each sector. The real GDP index at 2000 prices is calculated through the real index of GDP (preceding year=100) in T, N (see Data 6.4 and 6.5) which is obtained through the fractions representing the composition of overall GDP and real GDP index by region and by individual sector.

6.1.3 TFP

TFP (see Data 6.6 and 6.7), the Solow residuals, are constructed from real GDP, capital stock, labour hours (or total employment), and factor returns:

$$\ln TFP_i = \ln Y_i - \alpha_i \ln K_i - (1-\alpha_i) \ln L_i$$

where Y_i is the real output, $i = T, N$;

[10] If we consider the industry data as a whole, the industry sector ought to be classified as the tradables, according to the classification scheme. Limitation of the China data sources lies in the fact that the power, gas, and water supply is always with the industry category. We have practical difficulties in subtracting the power, gas, and water supply figure. On the other hand, to achieve consistency, we consider the electricity, gas, and water as tradable goods too for the US (see page 76).

where Y_i is the real output, i = T, N;

K_i is the real capital stock, i = T, N;

L_i is the total employment, i = T, N;

α_i, $1-\alpha_i$ are the returns to capital and labour respectively, i = T, N.

Real GDP

Gross output value (see Data 6.8 and 6.9) is the sum of the current value of final products produced in a given sector during a given period with the value of intermediate goods double counted (China Statistical Yearbook).

Real investment

Capital construction investment (see Data 6.10 and 6.11) refers to 'investment in the new projects, including construction of a new facility, or an addition to an existing facility, and the related activities of the enterprises, institutions or administrative units mainly for the purpose of expanding production activity, covering only projects each with a total investment of 500,000 RMB yuan and over.' (China Statistical Yearbook)

Real capital stock

Due to the lack of readily available data on sectoral capital stock, all total capital are approximated via investment figures (see Data 6.12 and 6.13) except the one for industry from 1993 to 2002, which is readily available and which refers to 'the capital received by the industrial enterprises from investors that could be used as operational capitals for a long period.' (China Statistical Yearbook) The rate of depreciation of the capital stock is assumed to be 0.05 per year.

Real wages

Wages (see Data 6.14 and 6.15) refer to 'the total wage bill of staffs and workers.' (China Statistical Yearbook)

Returns to labour

Returns to labour are real wages divided by real output (see Data 6.16 and 6.17).

Total employment

Due to the lack of readily available data for labour hours, we follow most journal articles and use total employment figures as an alternative (see Data 6.18 and 6.19). Total employment, according to the definition by the China Statistical Yearbook, is 'the number of staff and workers, which refers to a literal translation of the Chinese term 'zhigong' that includes employees of state-owned units in urban and rural areas (including government agencies), of collective-owned units in urban areas, of other ownership units in urban areas, and of state-collective joint ownership.'

6.1.4 RER

The real exchange rate (see Data 6.23A, B) is defined as $\ln(\frac{XRP_d}{P_f})$, where XR is the nominal exchange rate, P_d and P_f are the domestic and foreign GDP deflator (US GDP deflator see Data 6.24, China GDP deflator see Data 6.21) respectively. Following such definition, an increase of real exchange rate implies depreciation.

Official exchange rate

The official exchange rate (see Data 6.20) is the annual average rate that is calculated based on monthly averages, in Chinese RMB yuan per U.S. dollar, from the International Monetary Fund, International Financial Statistics. Following such a definition, an increase of the nominal exchange rate implies depreciation.

<u>Black market exchange rate</u>

The black market exchange rate (see Data 6.20), which is defined as the number of units of the Chinese RMB yuan per US dollar, is calculated as an annual average based on end of month rate (1985-1993) from the World Currency Yearbook. Due to the lack of data from 1993 onwards, we use the official to parallel rate ratio from the World Development Indicators to approximate the annual black market exchange rate data.

<u>GDP deflator</u>

GDP deflator (2000=100) (see Data 6.21) is the ratio of nominal to real GDP index (2000=1000). The real GDP index is obtained through the GDP index with the preceding year being treated as 100 (see Data 6.22).

6.2 US data

The following chapters construct traded and non-traded GDP deflators and the TFPs for the United States, for the period 1980 to 2000, utilizing OECD STAN database for Industrial Analysis. The chapters also include some explanation of some of the major variables used in constructing the intermediate ones. These variables include nominal and real value added, capital stock, investment, wages, returns to labour, and total employment for each of the sectors. From this database we construct the final variables in Chapter 6.3.

6.2.1 Classification of sectors

On the basis of the current STAN industry list, the 10% threshold, according to De Gregoria, Giovannini and Wolf's (1994), classifies the US agriculture, hunting, forestry and fishing, mining and quarrying, total manufacturing, electricity, gas and water supply sectors as tradables with the remaining construction, wholesale and retail trade, restaurants and hotels, transport, storage and communication sectors classified as non-tradables.

6.2.2 Tradable and non-tradable prices

The tradable and non-tradable price deflators (see Data 6.24) are constructed by dividing the nominal GDP or the nominal value added by the real GDP or the real value added for each sector.

<u>Value added at current and constant prices</u>

Value added for a particular industry, according to the definition by OECD Annual National Accounts, 'represents its contribution to national GDP' and 'is sometimes referred to as GDP by industry'. In general, it is calculated as 'the difference between production and intermediate inputs. Value added comprise labour costs (compensation of employees), consumption of fixed capital, indirect taxes less subsidies, and net operating surplus and mixed income.' The data for nominal and real value added at 2000 constant prices (see Data 6.24) are from the OECD Annual National Accounts – Main Aggregates under the code VALU and VALUK respectively.

6.2.3 TFP

Traded and non-traded sector TFP (see Data 6.24) data are obtained through the real value added, the real capital stock, total employment, and real wages (see Chapter 6.1.3 for the constructions of TFP and returns to labour).

Real capital stock

Due to the lack of readily available data on the value of the capital stock of each sector, US total capital value (see Data 6.24) is approximated via gross domestic investment figures (see Data 6.24) from the World Development Indicators. The rate of depreciation of the capital stock is assumed to be 0.05 per year.

Real wages

The real wages (see Data 6.24) comprise of 'wages and salaries of employees paid by producers' (OECD STAN database) at 2000 constant prices. The data are from the OECD STAN database under the code WAGE.

Returns to labour

Returns to labour (see Data 6.24) are the real wages divided by the real value added.

Total employment

Total employment (see Data 6.24) refers to 'the number of employees as well as self-employed, owner proprietors and unpaid family workers.' (OECD STAN database) It is based on 'full-time equivalent jobs, which is defined as total hours worked divided by average annual hours worked in full-time jobs, where adjustments are made for part-time employment.' (OECD STAN database) The annual employment data are the 12-month averages data and are from the OECD STAN database under the code EMPN.

6.3 Final Variables

The relative price of non-tradables at 2000 constant prices (see Data 6.25) is the difference between the non-tradable and the tradable prices.

The relative productivity of the tradable sector at 2000 constant price (see Data 6.26) is the difference between the tradable and the non-tradable sector TFPs.

The PPP exchange rate at 2000 constant price (see Data 6.27) is the difference between the Chinese tradable prices and the US tradable prices.

The relative productivity differential between US and China at 2000 constant price (see Data 6.28) is the difference between the relative productivity of the tradable sector between the two countries.

The relative price differential between US and China at 2000 constant price (see Data 6.29) is the difference between the relative prices of the non-tradables of the two countries.

The sectoral capital-output ratio (see Data 6.30 and 6.31) is the real capital stock divided by real output in each sector.

The investment-output ratio of the tradable sector (see Data 6.32) is the real investment divided by real output in that sector.

Part III Regression Evidence

Chapter 7 The Relationship between China's Official and Black Market Exchange Rate

According to Kiguel and O'Connell (1995), the black market premium, may serve as a signal of macroeconomic misalignments. From time to time the central banks adjust the official rate so that the severity of the misalignment can be alleviated. Thus, it is important to investigate if the two rates have any long run relationship (Bahmani-Oskooee, Miteza, and Nasir 2002). In this chapter we attempt to model the long-run determination of the Chinese black market exchange rates using co-integration techniques by Johansen (1988, 1991), Davidson (1998), and Barassi, Caporale, and Hall (2000).

7.1 Econometrics methodology discussion - maximum likelihood estimation of cointegration vector

The Granger representation theorem establishes that for a valid Error Correction Model (ECM) to exist the vector of variables must co-integrate. The importance of this result is that if an ECM model is estimated for a vector of variables that fail to co-integrate, then this regression will be liable to the problem of spurious regression (Hall, Henry, and Wilcox 1990).

7.1.1 The Vector Autoregressive (VAR) System

We assume that our Data Generation Process (DGP), a vector X, consists of j variables with n being endogenous (called a vector Y) and m being weakly exogenous (called a vector Z) with respect to Y. We also assume that our DGP is modelled by the VAR of order P that takes the form of:

$$\underset{jx1}{X_t} = \underset{jxj}{\Phi_1}\,\underset{jx1}{X_{t-1}} + \underset{jxj}{\Phi_2}\,\underset{jx1}{X_{t-2}} + \dots + \underset{jxj}{\Phi p}\,\underset{jx1}{X_{t-p}} + \underset{jx1}{\varepsilon_t}, \qquad (t = 1, \dots, T)$$

where

$$X_t = \begin{pmatrix} X_{1t} \\ X_{2t} \\ . \\ . \\ . \\ X_{jt} \end{pmatrix},$$

$$\Phi_1 = \begin{pmatrix} \phi_{1,11} & \phi_{1,12} \dots & \phi_{1,1j} \\ \phi_{1,21} & \phi_{1,22} \dots & \phi_{1,2j} \\ . & . & . \\ . & . & . \\ \phi_{1,j1} & \phi_{1,j2} \dots & \phi_{1,jj} \end{pmatrix}, \quad \Phi_2 = \begin{pmatrix} \phi_{2,11} & \phi_{2,12} \dots & \phi_{2,1j} \\ \phi_{2,21} & \phi_{2,22} \dots & \phi_{2,2j} \\ . & . & . \\ . & . & . \\ \phi_{2,j1} & \phi_{2,j2} \dots & \phi_{2,jj} \end{pmatrix}, \dots, \Phi p = \begin{pmatrix} \phi_{p,11} & \phi_{p,12} \dots & \phi_{p,1j} \\ \phi_{p,21} & \phi_{p,22} \dots & \phi_{p,2j} \\ . & . & . \\ . & . & . \\ \phi_{p,j1} & \phi_{p,j2} \dots & \phi_{p,jj} \end{pmatrix},$$

$$X_{t-1} = \begin{pmatrix} X_{1,t-1} \\ X_{2,t-1} \\ . \\ . \\ . \\ X_{j,t-1} \end{pmatrix}, \quad X_{t-2} = \begin{pmatrix} X_{1,t-2} \\ X_{2,t-2} \\ . \\ . \\ . \\ X_{j,t-2} \end{pmatrix}, \dots, \quad X_{t-p} = \begin{pmatrix} X_{1,t-p} \\ X_{2,t-p} \\ . \\ . \\ . \\ X_{j,t-p} \end{pmatrix},$$

$\varepsilon_t \sim \text{IID}(0, \Omega)$.

i.e. $(I - \Phi_1 L - \Phi_2 L^2 - \dots - \Phi p L^p)\, X_t = \varepsilon_t$

i.e. $\underset{jxj}{A(L)}\,\underset{jx1}{X_t} = \underset{jx1}{\varepsilon_t}$

Re-parameterising this equation yields the Vector Error Correction Model (VECM) that takes the form of:

$$\Delta X_t = \Gamma \nabla X - \pi X_{t-p} + \varepsilon_t, \qquad (t = 1, \ldots, T)$$

$$\underset{jx1}{} \quad \underset{jxj\,jx1}{} \quad \underset{jxj\,jx1}{} \quad \underset{jx1}{}$$

jx1 jxj jx1 jxj jx1 jx1

$$= \Gamma \nabla X - \alpha\beta' X_{t-p} + \varepsilon_t$$

jxr rxj

where

1) $\Delta X_t = (\Delta X_{1t}, \Delta X_{2t, \ldots,} \Delta X_{jt})'$;

2) $\Gamma = [(- I + \pi_1), (- I + \pi_1 + \pi_2), \ldots, (- I + \pi_1 + \ldots + \pi_{p-1})]$;

3) $\nabla X = (\Delta X_{t-1}, \Delta X_{t-2}, \ldots, \Delta X_{t-p+1})$;

4) π is the long-run or co-integrating matrix and

$$\pi = I - \pi_1 - \pi_2 - \ldots - \pi_p;$$

5) α is the matrix of loading weights;

6) β is the matrix of cointegrating vectors;

7) r representing the number of linearly independent co-integrating vectors that exists among the x_{it}'s ($i = 1, 2, \ldots, j$) is given by the rank of the π matrix, that is the columns of β.

7.1.2 Johansen Procedure

Johansen (1988, 1991) Procedure begins with the following two regression equations:

$$\Delta X_t = \hat{\Gamma}' \nabla X_t + R_{ot} \qquad (1)$$

$$R_{pt} = X_{t-p} - \hat{\Gamma}^2 \nabla X_t \qquad (2)$$

However the latter regression will result in non-stationary residuals because, regressing an I(1) level of term on dynamics still produces non-stationary residuals. Since the co-integrating vectors makes the regression involving non-stationary variables produce white noise residuals, Johansen Procedure then makes use of the co-integrating matrix π and uses canonical correlation to combine those non-stationary residuals and make them much like the other stationary residuals generated from the first regression.

Then the likelihood function, in terms of α, β and Ω, is a function of Ω and sum of squared residuals generated from that canonical correlation procedure:

$$L(\alpha,\beta,\Omega) = |\Omega|^{-\frac{T}{2}} \exp\left\{-\frac{1}{2}\sum_{t=1}^{T}(R_{ot} + \alpha\beta' R_{pt})'\Omega^{-1}(R_{ot} + \alpha\beta' R_{pt})\right\} \tag{3}$$

Hall (1989) provides us a review on the set of maximisation problem on this log likelihood function with respect to its arguments. Then, a diagonal matrix D is defined. It consists of consists of the ordered eigenvalues $\lambda_1 > ... > \lambda_N$ that satisfies:

$$\left|\lambda S_{pp} - S_{po} S_{oo}^{-1} S_{op}\right| = 0 \tag{4}$$

The solution to equation (4) generates sets of eigenvalues and the corresponding eigenvectors, which are the estimates of all the co-integrating vectors in the system. It is a matrix of eigenvectors E such that:

$$S_{pp} ED = S_{po} S_{oo}^{-1} S_{op} E \tag{5}$$

where $E' S_{pp} E = I$

The maximum likelihood estimator of the matrix of cointegrating vectors β is given by the first r rows of E. If the eigenvalue is significantly non-zero, then the corresponding eigenvector and hence the co-integrating vector is distinct or independent, separate from all the others; the corresponding eigenvector representing an estimate of this co-integrating vector is a valid estimate. If the eigenvalue is significantly zero, then the corresponding eigenvector and hence the co-integrating vector is not a distinct one, but another product of earlier ones, which are in the system already.

Testing Ho: $\lambda_i = 0$, i = r+1, ... , j (where only the first r eigenvalues are non-zero) amounts to test the null hypothesis that there are at most r cointegrating vectors in the system. The likelihood ratio (LR) test tests hypothesis that there are at most r cointegrating vectors against the alternative that the number of cointegrating vectors are greater than r:

$$\lambda_{trace} = -2\ln Q = -T\sum_{i=r+1}^{j}\ln(1-\hat{\lambda}_i)\text{, r = 0, ..., j-1,}$$

where Q is the restricted maximised likelihood / unrestricted maximised likelihood.

7.1.3 Extended Davidson's Methodology

Consider the cointegrated VAR(P), as analysed by Johansen (1988):

$A(L)\ X_t = \varepsilon_t,$

jxj jx1 jx1

where $X_t \sim I(1)$, $A(L)= \alpha\beta' + A_*(L)(1-L)$ such that $A(1) = \alpha\beta' = \pi$

$$\leftrightarrow \underset{jxr}{\alpha}\underset{rxj}{\beta'}\underset{jx1}{X_t} + \underset{jxj}{A_*(L)}\underset{jx1}{\Delta X_t} = \underset{jx1}{\varepsilon_t},$$

where $\Delta X_t = X_t - X_{t-1}$.

When r<j it can be shown that the system incorporates a set of long run relationships of the form:

$$A(L)X_t = \varepsilon_t$$

$$\leftrightarrow \alpha\beta' X_t + A_*(L)\Delta X_t = \varepsilon_t$$

$$\leftrightarrow \alpha'\alpha\beta' X_t = \alpha' (\varepsilon_t - A_*(L)\Delta X_t)$$

$$\leftrightarrow \beta' X_t = (\alpha'\alpha)^{-1} \alpha' (\varepsilon_t - A_*(L)\Delta X_t)$$

$$\sim I(0) \qquad \text{(both } \varepsilon_t \text{ and } \Delta X_t \text{ are stationary)}$$

$$\equiv S_t$$

In this model, a collection of I(1) variables is found cointegrated as we have illustrated above. In such system, r representing the number of linearly independent co-integrating vectors that exists among the x_{it}'s (i = 1, 2, ... , j) is given by the rank of the π matrix, that is the columns of β.

Note that without restrictions on β we can always scale the matrix of the cointegrating relations by post-multiplying it by any non-singular r x r matrix M, to get $M\beta' X_t = M S_t$ that is observationally equivalent to $\beta' X_t = S_t$ with loading matrix αM^{-1} (Davidson, 1998). According to Theorem 1 (Davidson, 1994), if a column of β (say b_1) is identified by the rank condition, the OLS regression which includes just the variables having unrestricted non-zero coefficients in b_1 is consistent for b_1. Without restrictions on β , the usual rank condition might give misleading I(0) relation.

What we have obtained from the above illustration is that, if a set of I(1) variables is found cointegrated, it does not necessarily follow that the estimated vectors can be interpreted as structural. According to Davidson's (1998), a cointegrated relation is structural/irreducible if and only if the set of I(1) variables are cointegrated, but dropping any of the variables leaves a set that is not cointegrated. Such an irreducible cointegration idea was first put forward by Davidson (1988) and later extended by Barassi, Caporale, and Hall (2000), who perform cointegration tests on pairs of series, in order to rule out those series that are not cointegrated. This would leave us a cointegrated relation that is irreducible. Such a method effectively eliminates the presence of potentially redundant variables that interact with the other cointegrated variables driving the cointegrating regression coefficients towards some other elements of the cointegrating space (Barassi, Caporale, and Hall, 2000).

7.2 Test the number of independent co-integrating vectors

In Chapter 2.2.4, we discuss the possible determinants of the black market exchange rate. We have shown that the black market rate is a function of the official rate, real GDP, GDP deflator, real consumption expenditure, and US interest rate. In what follows we attempt to empirically model the long-run determination of the Chinese black market exchange rate using co-integration techniques by Johansen (1988, 1991), Davidson (1998), and Barassi, Caporale, and Hall (2000).

7.2.1 Examine properties of the series

Since it is only possible for I(1) series to co-integrate, we first need to determine the order of integration of the time series before any co-integration tests can properly begin. To do this, we plot each series and split them into two categories: (1) time series that have no obvious structural breaks and no changing in slope; (2) series that have obvious breaks and / or changing in slope. We then perform the unit root tests, namely, the Augmented Dickey Fuller (ADF) and the Phillips-Perron[11] (PP) tests on (1) and (2) respectively.

7.2.1.1 Series that have no obvious breaks

Time series that have no obvious breaks include the GDP deflator, the real GDP, consumption expenditure, and the US interest rate (see Figure 7.1).

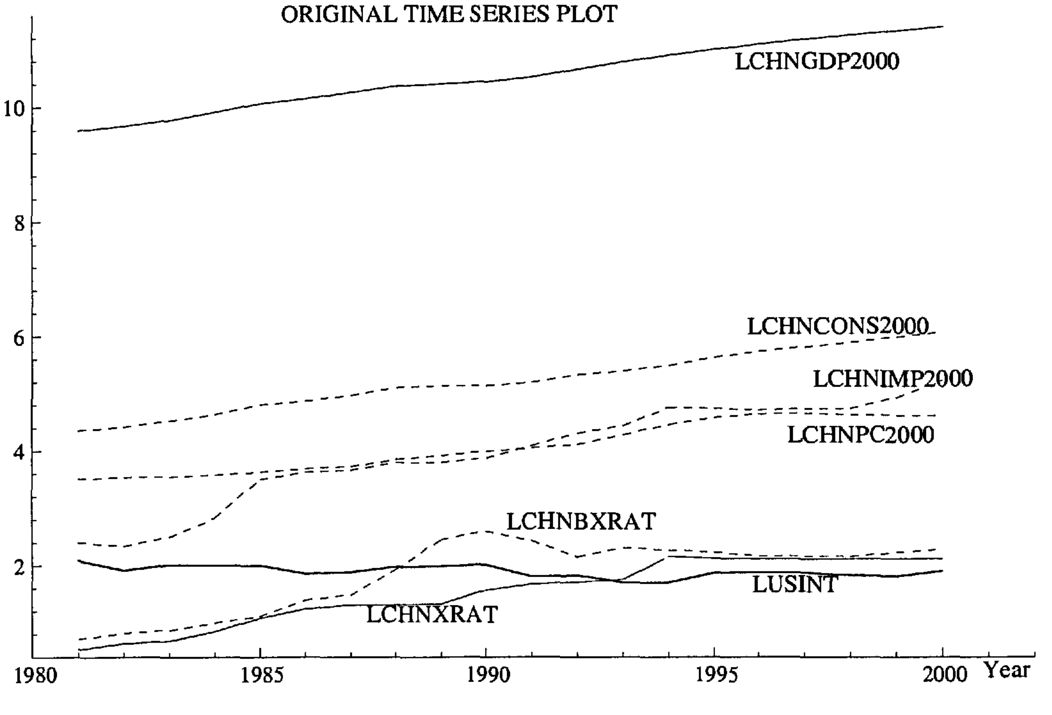

Figure 7.1

[11] The PP test statistics allows the error term to be non-white noise.

Preliminary inspection of the time series suggests that the data we are dealing with might be integrated of order one. When we plot the first-differenced series we find that they generally fluctuate around the mean with broadly constant amplitude (see Figure 7.2). The sample autocorrelation functions appear to follow a smooth pattern at high lags rather than decaying quickly to zero (see Figure 7.3). The spectrum appears to have a spike at zero frequency (see Figure 7.4).

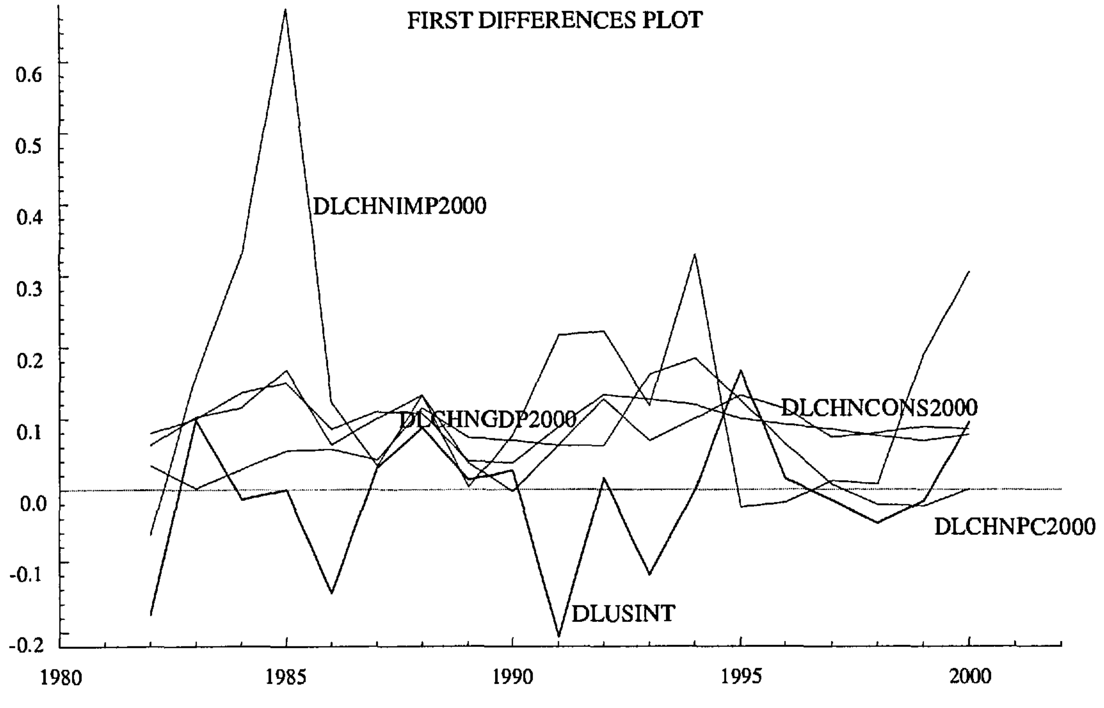

Figure 7.2

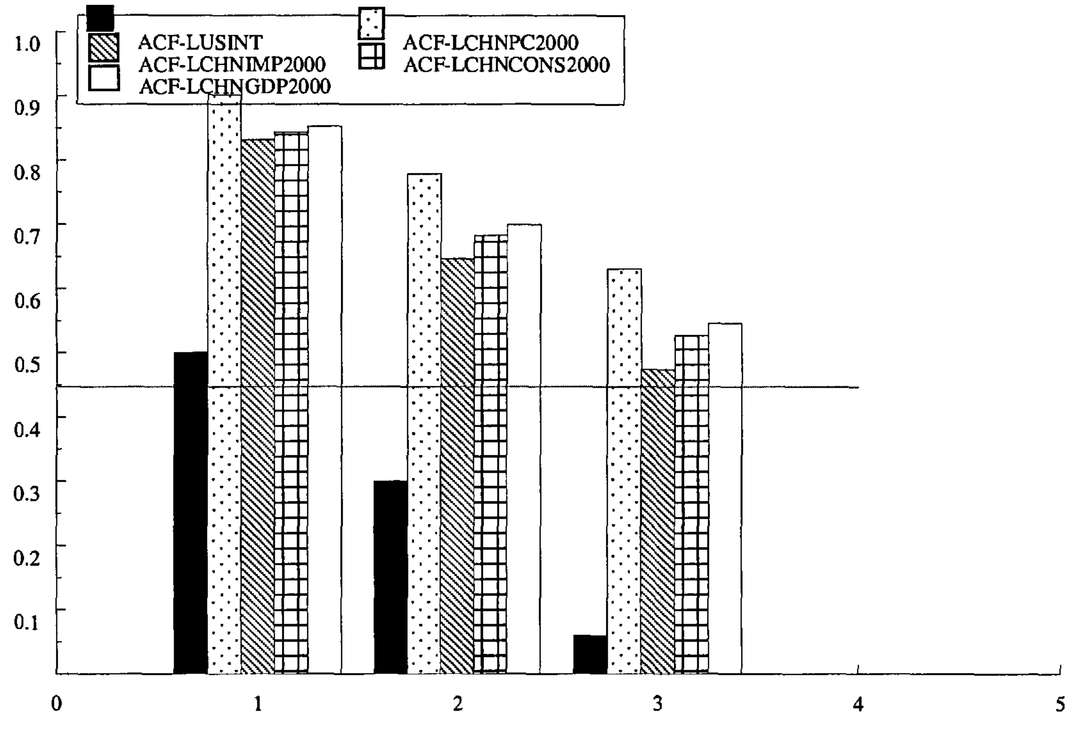

Figure 7.3

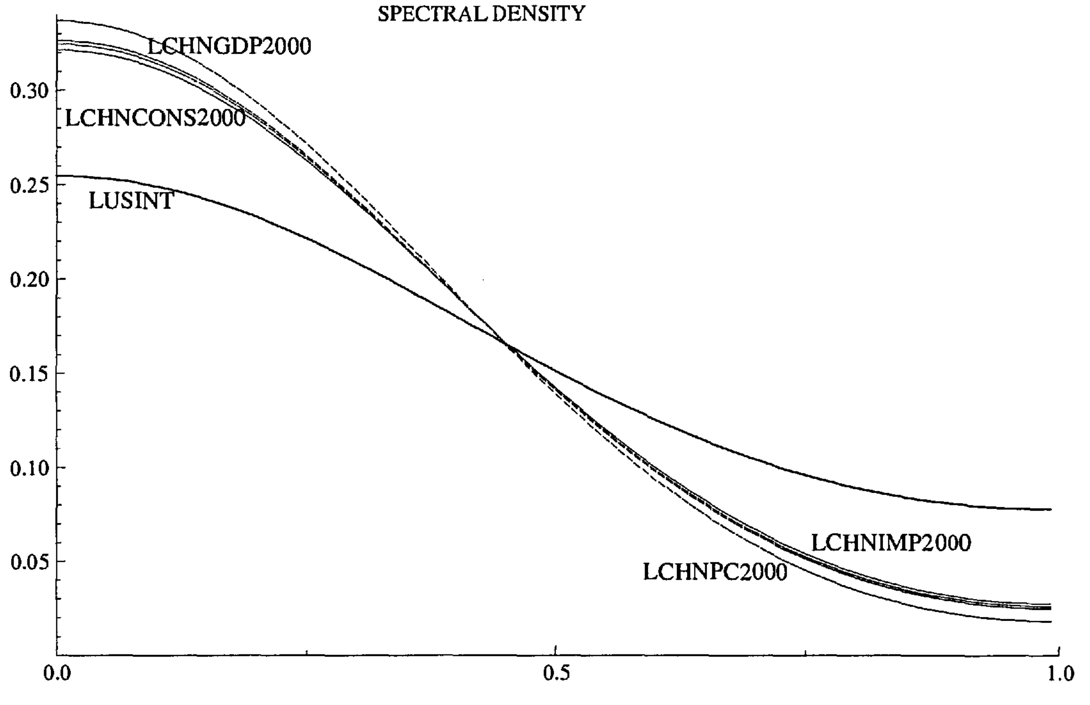

Figure 7.4

The formal ADF test results generally confirm our predictions with one exception (see Table 7.1). That is, the GDP deflator and the US interest rate series appear to be I(1) at 95% level of confidence. However, the real GDP, and the consumption expenditure might need to be differenced twice to achieve stationary since the null hypothesis of a unit root is rejected by the data at 5% level of significance.

Table 7.1 Test for Unit Roots in China GDP deflator 2000, real import and consumption expenditure, real GDP, and US interest rate

Variables	ADF test w/intercept and trend	No. of lags	Critical value 5%	ADF test w/intercept	No. of lags	Critical value 5%
LCHNPC2000	-3.24	1	-3.60			
LCHNCONS2000	-4.19**	4	-3.60			
LCHNGDP2000	-4.76 **	5	-3.60			
LUSINT				-2.76	0	-3.00

Notes:

1. Statistical significance at the 95% level or greater are signified by **

2. All series except the US interest rate exhibit an upward trend with a non-zero mean. Thus we use the AR (1) model with a constant and time trend as the ADF test model. The US interest rate series behaves like a random walk around constant mean. As a result, the AR (1) model with a constant would be the proper ADF test model.

7.2.1.2 Series that have one break and/or changing slope

Provided that the official exchange rate series has changing slope, whereas the black market exchange rate exhibits one structural break and changing slope, we apply the PP test on these two time series. The test results (see Table 8.6 and 8.7) suggest that both series are I(1) at 95% level of confidence.

7.2.2 Johansen procedure

Having obtained confirmation that among our variables of interest, the Chinese official and black market exchange rate, the GDP deflator, and the US interest rate are integrated of order one, we proceed by performing the Johansen's (1988, 1991) maximum likelihood based cointegration tests to assess the co-integrating rank of the system.

As can be seen from Figure 7.1, the four series generally move with one another, however, from just looking at the graph it is not possible to say whether they are cointegrated. To begin with the formal LR test, we first add a restricted constant in the co-integrating space since the black market exchange rate series is not trended; it looks like a random walk without drift. Both the Schwarz Bayesian criterion (SBC) and the Akaike information criterion (AIC) suggest a VAR of order 1. Also, in such a situation, the residuals of the individual equations in the VAR do not have serial correlation. The results of the LR tests are summarised as follows.

Table 7.2 Johansen Likelihood Ratio Test

TEST OF r=	SMALL SAMPLE LR TEST	95% CRITICAL VALUE
0	62.28	53.48
1	30.17	34.87
2	12.68	20.18
3	3.51	9.16

The LR test that there is at most zero co-integrating vectors easily rejects the null hypothesis, so we know that there is at least one co-integrating vector. The likelihood ratio test that there is at most one cointegrating vector is below the 95% critical value. So there is clearly one cointegrating vector.

7.2.3 Extended Davidson's Methodology

In order to establish the number of irreducible cointegrated relations, we apply Johansen's (1988, 1991) LR tests for each pair of the series. We add a restricted constant in the co-integrating space for tests with LCHNBXRAT and LUSINT as dependent variables, since these series are not trended; we add a constant in data space (i.e. an unrestricted constant) for tests with LCHNXRAT, LCHNPC2000 as dependent variables, since these time series exhibit trend.

Table 7.3 Pairwise cointegration tests

	Test of r=	Small Sample LR Test	95% Critical Value	Order of VAR
LCHNBXRAT - LCHNXRAT	0	14.30	20.18	2
LCHNBXRAT - LCHNPC2000	0	24.78**	20.18	1
LCHNBXRAT - LUSINT	0	18.14*	20.18	1
LCHNXRAT - LCHNPC2000	0	14.51	17.86	2
LCHNXRAT - LUSINT	0	12.34	17.86	2
LCHNPC2000 - LUSINT	0	18.82**	17.86	1

Significance at the 95% and 90% levels is denoted by ** and * respectively

The trace eigenvalue statistics strongly reject the null hypothesis that there is no cointegration (namely that r=0) for the pair of variables involving LCHNBXRAT, LCHNPC2000, and LUSINT.

Table 7.4 Pairwise cointegration tests summary

	LCHNBXRAT	LCHNXRAT	LCHNPC2000	LUSINT
LCHNBXRAT	_	not-co	**co-inte**	**co-inte**
LCHNXRAT		_	not-co	not-co
LCHNPC2000			_	**co-inte**
LUSINT				_

The conclusions we obtain are as follows. If we find that pairwise cointegration holds between each pair of the series, then the rank of the whole five-variable system is four (4-1=3). In fact the rank of the system is two (3-1=2) because direct cointegration does not hold in the tests involving LCHNXRAT, but does hold among the pair of LCHNBXRAT, LCHNPC2000, and LUSINT. Thus, we can rule out the possibility that LCHNXRAT is involved in any of the structural relations.

Recall that we obtain a rank of one as suggested by the Johansen LR test on the whole system X. Here, the Extended Davidson's Methodology suggests a rank of two for the system, which in turn confirms the importance of testing for irreducibility as a diagnostic, in order to achieve a correct identification of the structural relations between the series involved in a system.

7.3 Specify a proper dynamic structure

Having achieved a suitable co-integrating model of the long-run determination of black market exchange rate, we now attempt to build a proper dynamic structure of it. We follow the usual practice by specifying a high-order dynamic model and nest down from such a general model to a parsimoniously encompassing representation of the data.

As the sample size is small we add one lag only to each of the independent variables and one dummy to capture the structural break in 1989 and to reduce the ARCH effect. The regression equation is then:

$$DLCHNBXRAT = DLCHNBXRAT_{t-1} + DLCHNPC2000_{t-1} + DLUSINT_{t-1}$$
$$+ LCHNBXRAT(-1) + LCHNPC2000(-1) + LUSINT(-1) + DUMMY$$

The OLS results are summarised as follows:

Table 7.5 OLS regression output

	Coefficient	Std. Error	t-value	t-prob
DLCHNBXRAT_1	0.33	0.22	1.50	0.17
Constant	3.81	1.87	**2.04**	0.07
DLCHNPC2000_1	-1.42	0.86	-1.65	0.13
DLUSINT_1	1.26	0.59	**2.14**	0.06
LCHNBXRAT_1	-0.99	0.11	-0.81	0.44
LCHNPC2000_1	-0.23	0.18	-1.30	0.23
LUSINT_1	-1.35	0.72	**-1.89**	0.09
DUMMY	0.36	0.16	**2.19**	0.06

Sigma	0.13	RSS	0.16
R^2	0.75	F(7,9) = 3.83 [0.03]*	
Log-likelihood	15.47	DW	2.13
No. of observations	17	no. of parameters	8
Mean (DLCHNBXRAT)	0.08	Var (DLCHNBXRAT)	0.04

Under the assumption that the estimated slope coefficient has a student-t distribution with n-k=17-8=9 degrees of freedom, we reject the hypothesis that the true slope is zero if the absolute value of the t-value of the estimated slope coefficient is greater than 1.833 using a 90% confidence interval. We drop the statistically insignificant variables and finally obtain the following dynamic structure:

$$DLCHNBXRAT = 3.81 + 1.26DLUSINT_{t-1} - 1.35LUSINT_{t-1}$$

The result suggests that in short-run, when the US raises its interest rate by 1%, the Chinese black market rate for US dollars would appreciate by 1.26%. This is consistent with our predictions – when there is less supply of US dollars on the international market due to the increase of the US interest rate, the Chinese black market rate for dollars will increase. However, in long-run, the data suggest that a 1% increase of the US interest rate will cause the black market rate for dollars in China to fall by 1.35% on average.

Finally, the reason why only the US interest rate affects the exchange rate in this model might come from the small sample problem, although we tried to avoid such a problem by adding only one lag to each of the independent variables.

Chapter 8 The Size of the Balassa-Samuelson Effect

There are four major components of the Balassa-Samuelson theory. The first is that a faster increase of tradable goods productivity than of non-tradable ones leads to an increase in relative prices of non-tradable. The second is that the PPP holds for tradable goods. The third component, which is based on the previous two assumptions, says that high productivity growth of the tradable sector comparing to the non-tradable sector causes a rise in the relative price of non-tradables, which puts upward pressure on a country's real exchange rate. Different from the above price approach to the Balassa-Samuelson effect, the fourth component of the Balassa-Samuelson effect starts from the assumption such that the international differences in productivity are greater in the sector of tradable goods than in the non-tradable goods, which in turn generates a proposition that the service prices are lower in country with low level of productivity (Kravis, Heston and Summer 1983). Thus the real exchange rate of the country with high productivity level will appear to be overvalued. We apply the Chinese data and examine these components in Chapters 8.1 to 8.4 respectively.

8.1 Relative prices and relative productivities

Tables 8.1 and 8.2 contain the unit root test results for the relative prices of non-traded goods and relative productivities. There is no evidence against the null hypothesis of a unit root when we look at each province individually. As far as the Im, Pesaran, and Shin (1995) panel unit root test is concerned, which we have applied to a model with a constant, for all 30 Chinese provinces, the unit root hypothesis cannot be rejected for both variables.

Having confirmed that both relative prices and relative productivities are integrated of order one, we proceed with our tests by looking at their cointegrating relationship. Table 8.3 contains the results of the unit root tests on the residuals from regressing relative prices on relative productivities. The tests based on individual province data yield mixed evidence. The two PP tests provide no evidence against the null hypothesis of no cointegration at 5% level of significance, whereas the ADF tests reject the null hypothesis for 9 out of 30 provinces. The results from the panel tests again provide mixed evidence on whether relative prices and relative productivities are cointegrated. We are not able to confirm the existence of a significant long-run relationship between the two variables when we look at the panel results with a constant in the regression. On the other hand, the evidence of cointegration from the panel regression with a time trend is strong. However, it becomes less favourable when we further include common time dummies in the regression.

In Tables 8.4 and 8.5, we test the stronger prediction of the Balassa-Samuelson model that the slope in the cointegrating relationship is 1.0. This can be done by imposing such a restriction and then testing for a unit root in the difference between relative prices and relative productivities. The tests carried out on the data for each province individually and for the whole 30 provinces are consistent, both pointing out the existence of a unit root in the difference at the 5% level of significance.

To test such a stronger prediction of the Balassa-Samuelson model that the slope in the cointegrating relationship is 1.0 we could also do a t-test on the slope coefficient (see Table 8.5). The individual t-tests strongly reject the null hypothesis that the slope is 1.0 at the 5% level of significance for all provinces. The panel test results, with or without common time dummies, also do not support such a unitary theoretical relationship between relative prices and relative productivities. Except for the case of Shandong, the estimated slope coefficients are far from 1.0 - the fully modified (panel) OLS slope estimates being only of -0.20 (-0.14). Finally, according to the Balassa-Samuelson effect, a faster increase of the tradable sector productivity than of the non-tradable ones leads to an increase in relative prices of the non-tradables. However, such a positive relationship between relative prices and relative productivities is not well confirmed by our data, since almost all of the estimated slope coefficients are negative.

8.2 Purchasing power parity in traded goods

Tables 8.6, 8.7, and 8.8 contain the results of the unit root tests on the parallel, the official, and the PPP exchange rates respectively. We find no evidence against the null hypothesis of a unit root for any of the series by looking at both the PP, ADF and panel unit root tests. We, therefore, proceed with our cointegration tests assuming that both the nominal and PPP exchange rates for all our provinces are I(1).

The panel tests provide evidence that the nominal and PPP exchange rates are cointegrated (see Tables 8.9 and 8.10). Almost all six joint tests reject the null hypothesis of no cointegration at the 5% level of significance when a trend or a trend with common time dummy is included in the cointegration regression; regressions with a constant generate relatively less favourable results towards cointegration.

Tests based on data from individual provinces yield mixed evidence yet the conclusion is apparent. The two PP tests provide no evidence against the null hypothesis of no cointegration at 5% level of significance. However, for the official (parallel) exchange rate case, the ADF tests reject the null hypothesis for 16 (30) out of 30 provinces. Clearly, it is the black market exchange rate that moves more closely with the PPP exchange rate.

The results in Tables 8.9 and 8.10 suggest that the nominal and PPP exchange rates are cointegrated. We then go on to test whether the slope in their cointegrating relationship is 1.0. If so, then PPP holds in the long run for traded goods. This can be done by restricting the slope coefficient to unity and then testing if the difference between the nominal and the PPP exchange rate contains a unit root (see Tables 8.11 and 8.13). The tests using the data from each province provide no evidence against the null hypothesis of a unit root at 5% level of significance. The joint tests point to confirm such a conclusion. Thus, although the nominal exchange rate and PPP are cointegrated, the differences between them appear to be non-stationary.

An alternative way to test whether the PPP holds for traded goods is to estimate the slope on the PPP exchange rate directly (see Tables 8.12 and 8.14). Consistent with the results in Tables 8.11 and 8.13, both individual t-tests and the panel group FMOLS tests strongly reject the null hypothesis that the slope is 1.0. The magnitudes of estimated slope coefficients remain much far from 1.0. Hence, although the nominal and PPP exchange rates are cointegrated, they seem to have a non-unitary theoretical relationship.

We find that the magnitudes of the t-value for $\beta=1.0$ differ significantly between the official and parallel cases with the latter indicating a t-value much smaller than the other and much closer to the critical value. In this sense, the Balassa-Samuelson hypothesis holds better with the black market exchange rate.

8.3 Real exchange rate and relative productivity differential

Tables 8.15, 8.16, and 8.17 report the unit root tests for the real parallel and official exchange rates and relative TFP differences. Both individual and joint tests are in favour of the unit root hypothesis for all three variables. Thus, we go on to explore their cointegrating relationship having assumed that each of them contains a stochastic trend.

The hypothesis of the existence of a long run relationship between the real exchange rate and relative productivity differential is largely confirmed by the panel cointegration tests at a 5% level of significance (see Tables 8.18 and 8.19). The cointegration regression with a constant generates the strongest results; when a trend or a trend with common time dummy is included, around 5 out of 7 test statistics are able to reject the null hypothesis of no cointegration at the 5% level of significance. On the other hand, residual-based cointegration tests on individual province data yield mixed evidence. The theoretical long-run relationship between the real exchange rate and productivity differential is rejected at a 5% level of significance by the two PP tests. However, the ADF tests reject the null hypothesis of no cointegration for 0(15) out of 30 provinces for the official (parallel) exchange rate case.

We conclude that the two sets of panel cointegration tests perform equally well for the two cases we consider. The difference is that, when we look at individual province results, the hypothesis of the existence of a long-run relationship between the real parallel exchange rate and relative productivity differential is largely confirmed at a 5% level of significance. Clearly, it is the real black market exchange rates that move closely with the relative productivity differential not the real official exchange rate.

According to Balassa-Samuelson predictions, we would expect the coefficient on the relative productivity differential to be negative since a fall of RER implies an appreciation. Tables 8.20 and 8.21 show the individual and panel data estimates of the slope of the cointegrating relation between the real official and parallel exchange rate and the relative productivity differential. In terms of individual t-tests on the estimated slope, in both cases the answer as to whether the slope coefficients are statistically significant remains vague at the 5% level of significance. On the other hand, the panel group FMOLS test generates a strong result which rejects the null hypothesis that the slope is statistically insignificant at the 10% level for the black market case (see Table 8.21). In addition, the estimated coefficients have the expected sign for all considered provinces. Thus, a significant and negative relationship between real exchange rate and relative productivity differential implied by the Balassa-Samuelson hypothesis is well confirmed by the black market exchange rate data. On the other hand, the Balassa-Samuelson hypothesis seems not to be working well with the official exchange rate data. The panel results in Table 8.20 suggest that the estimated coefficient on the relative productivity differential is statistically insignificant and close to 0 – thus, the relative productivity differential does not have any explanatory power in explaining variation of the real official exchange rate for the full panel of Chinese provinces we consider.

8.4 Real exchange rate and relative prices differential

Table 8.22 reports the unit root tests results on the relative price differential between the US and China. There is no evidence against the null hypothesis of a unit root, both when we consider each individual province and use the whole panel to carry out joint tests.

Tables 8.23 and 8.24 report the results of the unit root tests on the residuals from regressing the real parallel and official exchange rate on relative price differentials. The hypothesis of the existence of a long-run relationship between the two variables is largely confirmed at a 5% level of significance by the panel tests. By looking at individual province results, we are able to provide evidence that a significant long-run relationship between the real exchange rate and relative price differential exists in 24(5) out of 30 provinces for the black (official) exchange rate case.

We conclude that, according to Table 8.23 and 8.24, the panel tests perform equally well for the two co-integrating cases we consider. The difference is that, again, when we look at individual province results the hypothesis of the existence of a long-run relationship between the real parallel exchange rate and relative price differential is largely confirmed at a 5% level of significance. Clearly relative price differential doesn't well account for the long-run movement of the real official exchange rate.

Next we examine one of the key components of the Balassa-Samuelson hypothesis – the real exchange rate and relative price differential are negatively correlated since a fall of RER implies an appreciation. Tables 8.25 and 8.26 show the results of the individual t-test and panel group FMOLS estimates on the slope of the relative price differential. The results suggest significant and negative slope coefficients for both cases. Thus we are able to provide evidence of a long-run negative relationship between the real official (and parallel) exchange rate and relative price differential. On average, the fully modified (panel) OLS slope estimate is -3.14 (-1.07) for the black market case, much greater than -2.99 (-0.53) for the official rate case in absolute value. In this sense, the Balassa-Samuelson effect appears to be explained much better by the black market exchange rate data.

8.5 General equilibrium framework

In this chapter, we attempt to model the Chinese Balassa-Samuelson effect on the basis of the extended Asea and Mendoza (1994) approach; and because changes in China's exchange rates regimes make it difficult to conduct research using a standard time series method, we make use of the panel data method to sidestep such a problem.

According to Baltagi (1995), the panel data method has increased precision of regression estimates, the ability to control for individual fixed effects, and the ability to model temporal effects without aggregation bias. Concerning the performance of estimators when the panel consists of non-stationary data, Zellner (1969) and Malinvaud (1956) argue that the pooled time series estimators will provide consistent estimators of the mean effects. However, Pesaran and Smith (1995) suggest that aggregate time series estimators may perform very poorly if the micro relationships are cointegated but with different cointegrating vectors. Hall and Urga (1999) argue that when T is small and N is large, the GMM estimator is an efficient estimator, especially when taking the first differences or orthogonal deviations to eliminate the fixed effects.

8.5.1 Static panel data estimation

Tables 8.27 to 8.34 provide estimates of equations (I), (II), and (III) based on the pooled (total) regression, the least squares dummy variables (LSDV) regression using individual dummies in the OLS regression, the within estimates replacing y and W by subtracting the means of each time series, the between estimates replacing y and W by the individual means, the feasible generalised least squares (GLS) estimates replacing y and W by deviations from weighted time means, and the maximum likelihood estimates (MLE) obtained by iterating the GLS procedure (see Baltagi 1995)[12].

In these static panel regression models, equation (I) performs quite well. The Balassa-Samuelson proposition is well supported by the data in the Total, LSDV, Within-groups, GLS using within/between groups, GLS using OLS residuals, and MLE models of equation (I) – all coefficients are statistically significant and of the correct signs in these six static panel data models. However, the corresponding residuals do not pass the diagnostic tests so well. Although they fail the AR(1) test, which is what we want to see, they do not pass the AR(2) tests. As a result, the corresponding regression results are not reliable. The only vector of residuals that pass the diagnostic tests are the ones generated by the OLS on differences. However,

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[12] The linear model is given by: $y_{it} = x_{it}'\gamma + \lambda_t + \eta_i + v_{it}$ (t=1,....,T, I=1,....,N), where λ_i is the time effect, η_i is the fixed individual effect, x_{it} is a kx1 vector of time-varying explanatory variable assumed to be strictly exogenous, v_{it} is a vector of the independently and identically distributed errors. Stacking the data for an individual according to time, and then stacking all individuals, and combining the data into W= [X:D] yields $y = W\beta + v$.

the resulting slope coefficients δ_1 and δ_3 are not statistically different from zero.

In 6 out of the 8 regression models the coefficients on the two sectors' TFP are significant and of the expected signs when estimating equation (II). However, the coefficient on the capital-output ratio of the tradable sector remains positive in all cases, which contradicts the predictions of the theory.

When estimating equation (III), we find that the coefficient of the non-tradable sector TFP remains significant and negative in almost all cases. However, all other coefficient estimates are of the wrong sign. In addition, the residuals generated from the eight static panel regression do not pass the AR(2) tests and so the regression results are not reliable.

We conclude that equation (I) is generally a reasonable empirical representation of the Balassa-Samuelson model. Recall that the Asea and Mendoza (1994) model implicitly assumes that the TFPs are identical across sectors at the steady state. Here, we are able to test the Asea and Mendoza (1994) model restriction that the TFPs are homogeneous, especially to reject it. This justifies our extensions to their model. The results from estimating equation (II) and (III) are less favourable in terms of the expected signs of the coefficients. One thing that we should be aware of is that the residuals in all cases do not pass the diagnostic tests so well.

8.5.2 Dynamic panel data estimation

We estimate equations (I), (II) and (III) in levels, using one-step and two-step GMM (Arellano and Bond, 1991) and combined GMM estimation (Arellano and Bover, 1995; Blundell and Bond, 1998). The standard errors and tests are based on the robust variance matrix. To select the proper lag length, we estimate equations with different combinations of the lag structure of the $x_{i,t}$ matrix. Among our various experiments, we choose to look at the results where the residuals pass both the Sargan test[13] so that the instruments are exogenous and AR(2) test but fail the AR(1) test[14].

For equation (I) we choose the results generated by the two-step GMM estimation with one lag on LpNLpT2000, LkTLyT, and LtN2000, and two lags on LkNLyN and LtT2000 (see Table 8.35). With this specification of instrument in GMM estimators, the residuals pass both the Sargan test and AR(2) test but fail the AR(1) test. The estimated coefficients all have the expected signs; although the ones on the capital-output ratio and the TFP of the tradable sector remain insignificant. Again, because Asea and Mendoza (1994) model focuses on the long-run balanced growth equilibrium, it implicitly assumes that the TFPs are homogeneous across sectors at the steady state. Here, the data are able to support our extended model where such restrictions are rejected.

We follow the same lag selection procedure described above to regress equations (II) and (III) using one-step and two-step GMM estimation. The optimal regression results are shown in Table 8.35. The only estimated coefficient that is consistent

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[13] The Sargan (1958, 1988) test tests the over-identifying restrictions. That is, if A_N is optimal for any given Z_i, then under the null hypothesis that the instruments in Z are exogenous (i.e. uncorrelated with the individual effect η_i), the test statistic is $(\sum_{i=1}^{N} \hat{v}_i *' z_i) A_N (\sum_{i=1}^{N} z_i ' \hat{v}_i *) \sim \chi_r^2$

[14] If the AR(1) model is mean-stationary, then Δy_{it} are uncorrelated with η_i, which suggests that $\Delta y_{i,t-1}$ can be used as instruments in the levels equations (see Arellano and Bover, 1995; Blundell and Bond, 1998)

with the theoretical predictions is the one on non-tradable sector TFP, which appears to be negative and significant throughout the two cases. All other coefficients, such as the ones on capital-output ratio (γ_1) in equation (II) and investment-output ratio (η_1) in equation (III) do not have the expected negative sign; the coefficient on the tradable sector TFP appears to be either insignificant (p-value=0.19) in equation (II) or negative (-0.04) in equation (III).

For the combined GMM estimation the regression results for the three equations we consider are remarkably similar to the previous GMM estimation (see Table 8.36). For equation (I), the estimated coefficients have the correct signs; although 50% of the coefficients are not statistically different from zero. Regressions on (II) and (III) generate less favourable results. Two out of the three estimated coefficients in equation (II) appear to be statistically insignificant. When looking at equation (III), the coefficients are all significant; however, we obtain a positive coefficient on investment-output ratio and a negative coefficient on tradable sector TFP.

Part IV Conclusion

Chapter 9 Conclusion

First, the Johansen cointegration approach is applied and one cointegrating vector between the Chinese official rate, the parallel RMB-US dollar exchange rate, the GDP price deflator, the import expenditure, and the US interest rate is found. Second, by further applying the Extended Davidson's Methodology, we are able to rule out the possibility that the official exchange rate and the real import are involved in any of the structural relations. The rank of the system is in fact two. Such a result is important as it suggests no relation between the Chinese black market and official exchange rate. This implies a significant discrepancy between them; the long-run movements of the parallel market rate cannot be predicted by the movements of the official rate. Policy implication arising from this is that in the presence of a black market, the official rate is irrelevant, merely a government bookkeeping convention. The result also suggests that the Kamin (1993) model is not a valid framework to analyse the long-run movements of the parallel RMB-US dollar exchange rate. Third, the resulting ECM model suggests that the US interest rate has a small negative effect on the Chinese black market exchange rate in the long-run.

The first key component of the Balassa-Samuelson hypothesis postulates that the productivity differential between tradable and non-tradable sectors and relative prices are positively correlated. Both the Engle and Granger two-step and the panel cointegration tests do not provide strong evidence of the existence of a long run relationship between these two variables. The estimated slope coefficient on relative prices appears to be negative.

The second assumption of the Balassa-Samuelson hypothesis is that the PPP holds for traded goods. All panel cointegration tests suggest that the nominal exchange rate, both official and parallel, and PPP exchange rates are cointegrated, thus providing strong support for the long-run PPP hypothesis in the full panel of the Chinese provinces, although the price coefficients appear to be different from unity. The individual province ADF tests are able to confirm a stronger long-run relationship in the parallel exchange rate-price relationship than in the official exchange rate-price relationship. This implies the absence of persistently over-valued or under-valued Chinese black market rates. This contrasts with the official exchange rates that tend to be chronically over-valued, which can be seen from the large black market premium. Hence, from a policy perspective, central banks in developing countries should use the black market exchange rate as a signal for real exchange rate misalignment and hence, in the formulation of economic policies.

Another key component of the Balassa-Samuelson hypothesis is that the real exchange rates are negatively correlated to the relative productivity differential. The panel cointegration tests perform equally well for the two cases we consider, namely, the real parallel exchange rate-productivity relationship and the real official exchange rate-productivity relationship. However, the individual time series results point out that clearly it is the real black market exchange rates that move closely with the relative productivity differential, not the real official exchange rates.

In terms of individual t-tests on the estimated slope of the cointegrating relation between the real official and parallel exchange rates and relative productivity differential, in both cases the answer, as to whether the estimated coefficients are statistically significant, remains vague. However, the panel group FMOLS is able to confirm a negative significant relationship between the real parallel exchange rates and relative productivity differential implied by the Balassa-Samuelson hypothesis with 90% level of confidence.

The Balassa-Samuelson effect implies a long-run negative relationship between the real exchange rate and relative price differential. The panel tests perform equally well for the two co-integrating cases we consider. The difference is that, again, when we look at individual province results, the hypothesis of the existence of a long-run relationship between the real parallel exchange rates and relative price differential is largely confirmed at a 95% level of confidence. Clearly relative price differential does not statistically account for the long-run movement of the real official exchange rate.

With both individual t-test and panel group FMOLS on the slope coefficient, we are able to put in evidence a negative relationship between the two types of real exchange rates and relative price differential. On average, the fully modified (panel) OLS slope estimate is -3.14 (-1.07) for the black market case, much greater than -2.99 (-0.53) for the official rate case in absolute value. In this sense, the Chinese Balassa-Samuelson effect appears to be explained much better by the black market exchange rate data.

The reason why the black market exchange rate, as opposed to the official rate, better reflect economic fundamentals lies in the fact that the Chinese official rate is state determined. Even in the recent floating period, the rate is merely allowed to fluctuate within a small range according to the market force. In other words, the fluctuation between the yuan and the dollar is relatively small. On the other hand, as the black market exchange rates are entirely market-determined, the band of fluctuation is much larger.

The implication arising from our empirical findings is that in the presence of a large parallel market for foreign exchange, we should use the black market exchange rate when carrying out economic studies as it moves more closely with economic fundamentals. Such a conclusion is important as it raises questions regarding the appropriate interpretations of the official exchange rate literature in some developing economies.

In general, all panel cointegration tests are able to provide evidence that the traditional Balassa-Samuelson effect holds in contemporary Chinese economy, either in the form of nominal exchange rate-price, real exchange rate-relative price differential, or real exchange rate-relative productivity differential relationship. We then go on to model the effect using the two-country, two-sector general equilibrium type of approach. Both the static and dynamic panel regression suggests that equation (I) of the extended Asea and Mendoza (1994) model is a reasonable empirical representation of the Chinese Balassa-Samuelson effect. The static panel data model seems mis-specified as it left out all the dynamics and the best results are, as expected, from the dynamic one. This can be seen by looking at the resulting Sargan tests which suggest that the instruments are exogenous. In fact, Hall and Urga (1999) show that when T is small and N is large, the GMM estimator is an efficient estimator, especially when taking the first differences or orthogonal deviations to eliminate the fixed effects.

Data 6.1

YEAR	LUSINT	LCHNBXRAT	LCHNXRAT	LCHNPC2000	LCHNIMP2000	LCHNCONS2000	LCHNGDP2000
1981	2.09	0.71	0.53	3.51	2.40	4.36	9.59
1982	1.92	0.81	0.64	3.54	2.34	4.42	9.67
1983	2.01	0.87	0.68	3.55	2.50	4.52	9.77
1984	2.00	0.99	0.84	3.57	2.83	4.64	9.91
1985	2.00	1.11	1.08	3.63	3.50	4.80	10.06
1986	1.86	1.39	1.24	3.69	3.62	4.87	10.14
1987	1.89	1.48	1.31	3.73	3.66	4.97	10.25
1988	1.97	1.92	1.31	3.84	3.79	5.10	10.36
1989	1.99	2.45	1.33	3.91	3.79	5.14	10.40
1990	2.01	2.60	1.57	3.98	3.87	5.13	10.44
1991	1.81	2.43	1.67	4.05	4.09	5.20	10.52
1992	1.82	2.15	1.71	4.11	4.31	5.32	10.66
1993	1.70	2.30	1.75	4.27	4.43	5.39	10.78
1994	1.70	2.27	2.15	4.45	4.75	5.49	10.90
1995	1.87	2.23	2.12	4.58	4.73	5.62	11.00
1996	1.89	2.16	2.12	4.64	4.71	5.74	11.10
1997	1.87	2.16	2.12	4.65	4.73	5.81	11.18
1998	1.82	2.15	2.11	4.63	4.73	5.89	11.25
1999	1.81	2.22	2.11	4.60	4.92	5.98	11.32
2000	1.90	2.28	2.11	4.61	5.23	6.06	11.40

Note:

LUSINT	US 3-month LIBOR %
LCHNBXRAT	China black market exchange rate
LCHNXRAT	China official exchange rate
LCHNPC2000	China GDP deflator 2000=100
LCHNIMP2000	China import expenditure 2000=100 (100,000,000 RMB)
LCHNCONS2000	China consumption expenditure 2000=100 (100,000,000 RMB)
LCHNGDP2000	China GDP 2000=100 (100,000,000RMB)

Data 6.2 China tradable prices (2000=100) - LpT2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	2.51	2.67	2.74	2.32	3.22	3.33	3.47	3.63	3.96	4.26	4.23	4.24	4.29	4.30	4.37	4.61
Tianjin	2.27	2.43	2.60	2.78	3.04	3.14	3.23	3.46	3.76	4.02	4.16	4.29	4.47	4.41	4.47	4.61
Hebei	1.82	1.99	2.16	2.38	2.62	2.77	2.90	3.06	3.39	3.78	3.93	4.15	4.31	4.40	4.49	4.61
Shanxi	2.33	2.49	2.62	2.60	3.00	3.16	3.29	3.37	3.73	4.04	4.24	4.40	4.52	4.52	4.55	4.61
Inner Mongolia	2.22	2.37	2.47	2.81	2.86	3.01	3.14	3.29	3.58	3.84	4.00	4.17	4.34	4.41	4.50	4.61
Liaoning	2.16	2.32	2.49	2.68	2.87	2.97	3.11	3.26	3.62	3.93	4.04	4.17	4.31	4.33	4.41	4.61
Jilin	2.44	2.58	2.69	2.95	3.07	3.16	3.35	3.45	3.71	3.99	4.12	4.21	4.33	4.36	4.48	4.61
Heilongjiang	2.42	2.60	2.80	2.93	3.10	3.17	3.40	3.46	3.66	3.96	4.15	4.24	4.37	4.35	4.39	4.61
Shanghai	2.52	2.69	2.79	2.94	3.10	3.21	3.36	3.52	3.81	4.07	4.28	4.28	4.39	4.45	4.49	4.61
Jiangsu	1.91	2.12	2.36	2.57	2.75	2.91	3.00	3.17	3.66	4.01	4.22	4.25	4.32	4.38	4.46	4.61
Zhejiang	1.40	1.62	1.85	2.08	2.27	2.40	2.50	2.73	3.14	3.56	3.91	4.03	4.20	4.30	4.38	4.61
Anhui	2.07	2.25	2.46	2.66	2.83	2.94	3.05	3.07	3.47	3.86	4.21	4.38	4.55	4.51	4.54	4.61
Fujian	1.35	1.52	1.72	2.00	2.22	2.43	2.52	2.77	3.18	3.66	3.86	4.04	4.21	4.36	4.45	4.61
Jiangxi	2.41	2.56	2.70	2.93	3.09	3.27	3.37	3.49	3.82	4.29	4.22	4.31	4.47	4.51	4.54	4.61
Shandong	1.82	1.98	2.12	2.40	2.71	2.91	3.03	3.21	3.69	4.06	4.14	4.24	4.34	4.38	4.45	4.61
Henan	2.01	2.16	2.32	2.56	2.79	2.92	3.03	3.15	3.56	3.86	4.19	4.33	4.43	4.49	4.52	4.61
Hubei	2.04	2.24	2.39	2.60	2.77	2.89	2.95	3.03	3.35	3.76	4.06	4.24	4.43	4.51	4.55	4.61
Hunan	2.07	2.23	2.39	2.62	2.76	2.89	2.97	3.12	3.41	3.74	3.97	4.22	4.37	4.43	4.50	4.61
Guangdong	1.44	1.63	1.84	2.12	2.38	2.57	2.72	2.97	3.33	3.70	4.01	4.15	4.29	4.38	4.46	4.61
Guangxi	2.20	2.32	2.50	2.77	3.01	3.08	3.21	3.36	3.70	4.15	4.42	4.54	4.69	4.52	4.53	4.61
Hainan	0.00	0.00	0.00	2.66	2.81	2.96	3.06	3.19	3.59	4.00	4.21	4.37	4.40	4.45	4.51	4.61
Sichuan (Chq)	2.42	2.57	2.70	2.92	3.11	3.27	3.35	3.49	3.85	4.25	4.37	4.37	4.47	4.51	4.57	4.61
Guizhou	2.43	2.58	2.73	3.00	3.17	3.28	3.37	3.51	3.71	3.96	4.16	4.29	4.38	4.45	4.51	4.61
Yunan	2.28	2.39	2.50	2.76	2.91	3.16	3.31	3.45	3.73	4.01	4.27	4.38	4.49	4.53	4.53	4.61
Tibet	3.46	3.07	2.88	3.04	3.15	3.37	3.60	3.67	3.67	3.72	4.21	4.34	4.36	4.40	4.51	4.61
Shaanxi	2.51	2.68	2.83	3.04	3.22	3.39	3.46	3.60	3.86	4.12	4.28	4.35	4.42	4.40	4.51	4.61
Gansu	2.32	2.48	2.64	2.79	2.98	3.13	3.23	3.36	3.60	3.93	4.16	4.20	4.34	4.42	4.44	4.61
Qinghai	2.41	2.59	2.74	2.99	3.19	3.33	3.42	3.49	3.73	4.06	4.23	4.18	4.30	4.39	4.46	4.61
Ningxia	2.24	2.43	2.60	2.77	3.02	3.24	3.36	3.44	3.68	3.99	4.22	4.25	4.39	4.41	4.47	4.61
Xinjiang	2.23	2.38	2.58	2.81	3.02	3.18	3.36	3.49	3.76	4.07	4.40	4.33	4.39	4.41	4.41	4.61

Source: China Statistical Yearbook

Data 6.3 China nontradable prices (2000=100) - LpN2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	2.27	2.44	2.64	2.84	2.93	3.05	3.12	3.11	3.45	3.78	3.96	4.21	4.32	4.47	4.55	4.61
Tianjin	2.78	2.93	3.03	3.23	3.33	3.62	3.69	3.39	3.31	3.75	3.94	4.11	4.25	4.39	4.52	4.61
Hebei	2.37	2.53	2.63	2.85	2.82	3.07	3.16	3.21	3.40	3.65	3.84	4.12	4.28	4.38	4.49	4.61
Shanxi	2.81	2.99	3.15	3.29	3.33	3.45	3.56	3.53	3.59	3.94	4.05	4.22	4.35	4.49	4.57	4.61
Inner Mongolia	2.64	2.87	3.01	3.19	3.32	3.51	3.57	3.41	3.63	3.78	3.89	4.11	4.20	4.30	4.42	4.61
Liaoning	2.42	2.55	2.78	3.00	3.03	3.27	3.32	3.45	3.72	3.95	4.03	4.14	4.24	4.37	4.48	4.61
Jilin	2.73	2.86	3.14	3.26	3.21	3.63	3.38	3.33	3.67	3.83	3.97	4.18	4.26	4.36	4.45	4.61
Heilongjiang	2.69	2.78	2.75	3.18	3.42	3.55	3.38	3.48	3.66	3.86	3.97	4.13	4.27	4.38	4.46	4.61
Shanghai	2.48	2.66	2.87	3.06	3.04	3.25	3.38	3.28	3.27	3.82	3.99	4.18	4.37	4.46	4.50	4.61
Jiangsu	2.03	2.19	2.41	2.53	2.54	2.83	2.96	2.68	2.97	3.44	3.70	4.17	4.25	4.37	4.49	4.61
Zhejiang	1.66	1.82	2.09	2.38	2.41	2.59	2.60	2.49	2.83	3.23	3.54	4.13	4.22	4.30	4.44	4.61
Anhui	2.58	2.68	2.83	3.08	3.05	3.29	3.30	2.97	3.20	3.58	3.76	4.17	4.27	4.39	4.51	4.61
Fujian	1.91	2.16	2.24	2.57	2.71	2.73	2.91	2.68	3.21	3.58	3.80	4.11	4.27	4.42	4.51	4.61
Jiangxi	2.58	2.76	2.88	3.07	3.22	3.38	3.36	3.04	3.26	3.54	3.75	4.10	4.16	4.32	4.47	4.61
Shandong	2.36	2.49	2.65	2.88	2.84	3.11	3.21	2.81	3.04	3.46	3.69	4.20	4.32	4.42	4.53	4.61
Henan	2.66	2.84	2.90	3.24	3.25	3.42	3.47	3.15	3.28	3.51	3.74	4.13	4.30	4.40	4.48	4.61
Hubei	2.48	2.69	2.85	3.03	2.95	3.12	3.18	3.14	3.33	3.59	3.83	4.12	4.24	4.35	4.49	4.61
Hunan	2.53	2.67	2.85	3.13	3.07	3.22	3.34	3.05	3.29	3.66	3.83	4.24	4.34	4.44	4.51	4.61
Guangdong	2.33	2.49	2.66	2.91	3.03	3.13	3.20	3.01	3.38	3.60	3.91	4.18	4.33	4.44	4.52	4.61
Guangxi	2.45	2.62	2.79	2.98	2.97	3.12	3.11	3.18	3.60	3.86	4.02	4.32	4.41	4.48	4.56	4.61
Hainan	0.00	0.00	2.68	2.95	3.24	3.39	3.57	3.23	3.77	4.14	4.13	4.22	4.41	4.46	4.57	4.61
Sichuan (Chq)	2.29	2.45	2.60	2.89	2.95	3.13	3.24	2.94	3.15	3.46	3.65	4.13	4.29	4.44	4.52	4.61
Guizhou	2.87	3.07	3.09	3.31	3.37	3.51	3.56	3.46	3.61	3.74	3.83	4.03	4.17	4.26	4.48	4.61
Yunan	2.24	2.42	2.46	2.59	2.61	2.86	2.98	2.90	3.17	3.57	3.70	4.10	4.26	4.39	4.56	4.61
Tibet	2.99	4.19	3.28	3.65	3.54	3.99	3.88	3.52	3.39	3.27	3.45	3.84	4.13	4.33	4.64	4.61
Shaanxi	2.62	2.79	2.89	3.20	3.25	3.43	3.54	3.26	3.44	3.69	3.82	4.09	4.25	4.39	4.48	4.61
Gansu	2.86	2.96	3.25	3.41	3.61	3.81	3.82	3.55	3.52	3.72	3.87	4.26	4.35	4.46	4.52	4.61
Qinghai	3.08	3.28	3.38	3.56	3.47	3.62	3.65	3.47	3.56	3.75	3.91	4.18	4.28	4.40	4.50	4.61
Ningxia	2.75	2.91	2.98	3.15	3.19	3.40	3.55	3.43	3.45	3.62	3.76	4.04	4.24	4.37	4.50	4.61
Xinjiang	2.19	2.32	2.47	2.68	2.83	3.07	3.23	3.11	3.33	3.60	3.77	3.99	4.11	4.29	4.37	4.61

Source: China Statistical Yearbook

Data 6.4 China real GDP index for tradable sector (preceding year=100)

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993*	1994*	1995*	1996*	1997*	1998*	1999*	2000*
Beijing	109.67	100.26	110.19	115.26	112.18	104.90	108.41	112.86	111.62	112.83	109.47	106.11	107.27	108.69	110.99	110.63
Tianjin	114.49	109.01	106.55	114.82	106.78	103.92	105.77	109.14	112.24	113.60	113.57	113.55	111.23	107.32	110.50	110.75
Hebei	110.22	105.02	109.81	114.82	109.65	104.56	106.12	113.30	118.71	115.21	114.09	112.96	111.94	110.37	108.75	108.74
Shanxi	110.45	100.29	100.25	122.58	111.59	105.81	100.18	114.07	113.23	110.46	111.30	112.17	110.31	110.27	104.20	108.46
Inner Mongolia	106.78	101.71	108.08	114.02	112.99	109.34	107.51	107.82	110.22	108.66	112.53	116.44	108.82	108.28	106.28	108.12
Liaoning	111.62	108.29	108.83	113.58	108.49	104.27	104.77	111.42	115.20	111.14	109.96	109.06	108.27	108.94	107.69	108.29
Jilin	108.84	104.75	119.11	113.08	112.32	114.77	102.12	112.79	114.04	113.20	113.93	114.72	105.02	110.19	106.73	107.40
Heilongjiang	109.53	108.88	103.47	108.50	105.95	113.54	99.87	105.63	107.69	108.83	109.90	110.97	109.10	107.38	106.59	107.46
Shanghai	109.36	101.61	103.70	108.82	107.55	104.14	106.42	113.36	115.80	113.66	112.23	110.79	110.29	107.92	108.65	109.53
Jiangsu	114.05	109.27	108.09	118.10	112.14	105.72	108.20	129.58	119.09	117.81	114.43	111.07	110.68	109.59	109.72	109.99
Zhejiang	116.49	111.12	110.56	115.60	109.81	104.36	115.94	122.71	125.44	121.28	117.13	112.81	110.93	109.18	109.73	110.34
Anhui	115.18	110.23	106.96	111.52	109.73	105.88	98.90	123.24	124.66	122.04	117.95	114.47	112.50	106.58	107.30	106.50
Fujian	112.50	108.24	113.34	123.00	120.29	106.48	117.30	121.66	128.62	125.48	120.11	114.77	113.56	110.98	109.69	108.64
Jiangxi	108.86	106.90	110.37	113.14	112.09	106.09	108.04	117.36	115.77	116.80	115.15	113.11	110.19	106.12	106.43	106.73
Shandong	113.60	108.32	119.13	121.54	112.59	107.10	112.44	121.51	119.21	114.23	112.93	111.63	109.23	110.15	110.14	110.20
Henan	108.60	107.03	113.51	111.58	108.19	104.55	106.48	118.65	111.45	114.06	114.04	114.16	109.72	108.36	107.55	109.17
Hubei	112.25	104.98	108.53	110.28	107.80	102.24	105.15	114.06	114.21	115.85	114.46	113.04	112.65	108.83	107.45	108.61
Hunan	109.29	107.87	110.31	109.38	108.73	104.11	106.81	110.97	112.34	110.86	111.42	111.96	110.12	107.62	106.83	108.04
Guangdong	112.74	109.42	118.32	124.08	117.93	111.10	120.63	124.36	126.44	119.76	115.26	110.56	110.75	110.33	109.00	109.96
Guangxi	107.64	110.28	112.07	108.72	104.33	109.63	111.28	125.78	126.84	118.97	114.76	110.78	109.92	109.99	106.90	104.99
Hainan	0.00	0.00	111.71	115.96	116.24	109.58	115.72	124.69	127.49	114.67	109.33	104.28	106.89	108.53	109.93	109.39
Sichuan (Chq)	110.29	105.41	109.36	113.38	109.39	103.77	108.35	115.63	115.01	110.21	109.78	109.33	110.06	108.71	103.93	108.09
Guizhou	113.09	108.21	109.39	110.82	107.41	104.42	107.92	109.55	108.86	107.59	107.73	107.86	108.12	106.86	106.65	107.32
Yunan	108.39	104.62	112.74	113.44	117.28	110.44	105.26	108.86	109.50	111.66	110.43	109.18	108.51	107.14	106.20	105.72
Tibet	61.27	85.47	109.67	107.44	111.08	110.48	105.29	106.28	108.92	110.11	105.56	100.60	107.54	107.12	109.35	106.82
Shaanxi	112.37	106.74	108.93	113.14	112.96	104.87	110.82	112.01	114.49	108.63	110.17	111.76	109.20	110.75	107.01	108.14
Gansu	109.66	106.89	102.27	112.60	108.26	106.10	106.28	108.04	111.74	109.37	109.85	110.39	105.58	107.77	106.04	107.65
Qinghai	112.96	110.90	109.52	112.48	112.52	102.57	101.48	104.57	108.85	106.43	107.02	107.61	107.83	108.49	106.68	107.13
Ningxia	112.31	109.28	103.86	115.88	113.32	101.95	101.51	109.87	110.80	106.05	109.24	112.44	106.33	108.49	107.80	109.48
Xinjiang	111.89	109.66	108.99	112.50	109.77	110.03	111.97	108.73	108.79	110.65	108.36	106.03	112.15	106.92	105.46	107.47

Source: China Statistical Yearbook

Note: *We assume that the industry and construction sector grow at the same rate each year.

Data 6.5 China real GDP index for nontradable sector (preceding year=100)

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993*	1994*	1995*	1996*	1997*	1998*	1999*	2000*
Beijing	112.14	107.74	109.69	111.33	110.12	108.20	105.55	114.54	112.73	113.80	112.79	111.82	111.47	110.70	109.33	111.12
Tianjin	105.53	104.17	106.10	108.02	98.26	95.96	107.44	116.00	111.91	115.45	115.34	115.23	113.17	112.27	109.24	110.66
Hebei	111.12	107.17	110.99	115.65	117.80	101.05	119.48	111.20	118.12	114.28	113.94	113.62	112.90	110.87	109.22	110.31
Shanxi	118.51	113.39	106.87	106.39	102.12	107.65	112.27	104.46	110.95	108.00	108.61	109.24	110.95	107.08	106.85	106.87
Inner Mongolia	121.79	111.53	104.27	107.80	105.64	92.95	113.09	118.31	112.11	112.58	110.06	107.58	111.36	111.70	110.01	111.82
Liaoning	115.96	116.46	112.21	114.28	119.20	96.64	104.09	111.01	114.69	111.53	109.91	108.31	109.40	107.86	108.84	109.78
Jilin	115.15	116.40	101.38	109.28	121.19	77.28	115.28	124.66	111.87	115.85	114.03	112.19	116.23	107.95	109.84	111.93
Heilongjiang	103.61	108.75	134.93	110.00	109.46	84.02	120.95	106.77	107.83	108.64	109.09	109.55	112.19	111.21	109.49	111.42
Shanghai	110.77	105.50	111.21	111.32	114.19	101.37	102.98	113.39	113.83	115.54	116.16	116.82	116.78	113.54	112.51	112.59
Jiangsu	118.97	114.35	118.17	128.29	129.03	100.66	103.49	119.90	124.75	113.54	113.67	113.95	113.85	112.75	110.23	111.25
Zhejiang	123.90	119.59	115.98	111.93	112.46	95.68	116.68	112.31	118.97	117.93	114.91	111.90	110.91	111.37	110.10	111.83
Anhui	116.16	118.85	117.11	108.64	112.83	91.24	108.36	123.29	113.63	120.99	116.68	112.39	111.96	111.28	110.06	110.26
Fujian	111.64	99.17	107.64	101.21	101.89	104.73	110.36	135.63	122.91	117.02	116.36	115.87	115.53	111.39	110.03	110.31
Jiangxi	113.23	108.08	109.19	118.81	116.77	96.93	110.57	122.43	114.62	116.82	115.29	113.75	113.87	112.58	110.25	109.99
Shandong	112.56	112.12	110.82	114.26	123.12	91.37	112.40	122.54	118.66	120.06	116.51	112.93	114.18	111.66	109.78	110.65
Henan	115.69	109.89	121.84	109.04	112.28	102.06	116.59	112.01	111.69	114.57	113.89	113.24	111.82	109.36	109.02	109.68
Hubei	114.15	105.67	106.10	103.15	101.94	100.41	108.91	109.61	116.00	114.13	113.63	113.14	113.37	112.85	109.86	110.63
Hunan	112.76	110.78	111.65	109.58	113.81	100.80	110.26	119.32	116.55	111.09	112.16	113.24	111.77	111.22	110.69	110.64
Guangdong	112.70	107.93	109.86	108.72	109.74	104.27	116.83	124.44	118.83	117.77	114.01	110.30	109.63	109.25	109.72	111.82
Guangxi	113.75	108.18	106.46	110.71	112.12	97.57	117.15	121.82	119.09	113.43	111.22	109.03	107.48	107.35	109.20	111.19
Hainan	0.00	0.00	114.02	115.24	114.08	106.62	108.50	133.96	117.11	108.78	107.09	105.47	106.44	108.06	107.10	108.17
Sichuan (Chq)	113.36	109.05	114.17	108.08	109.02	102.62	106.41	117.45	115.59	113.14	111.68	110.23	109.88	109.39	108.76	110.30
Guizhou	113.61	106.45	121.67	112.76	110.89	100.30	108.91	106.63	113.12	110.20	109.95	109.70	109.73	110.71	110.86	110.50
Yunan	112.35	106.96	113.09	121.31	124.19	106.14	114.19	120.46	117.69	113.66	113.23	112.77	111.22	109.58	108.74	109.11
Tibet	127.64	43.42	122.22	106.11	130.91	99.64	143.41	110.94	107.95	125.70	129.04	132.44	116.43	115.68	110.66	112.96
Shaanxi	108.89	104.89	108.62	105.14	105.42	100.69	103.75	109.81	111.26	108.04	107.89	107.76	110.71	106.03	110.08	110.25
Gansu	125.92	130.88	115.83	126.00	120.78	103.15	108.60	113.65	111.48	112.16	112.57	112.96	112.35	110.92	111.29	109.73
Qinghai	110.04	102.27	103.00	103.25	109.68	105.05	111.39	111.29	111.58	110.52	110.07	109.57	110.22	109.26	109.77	111.28
Ningxia	115.16	112.36	118.62	114.43	117.05	103.73	108.02	105.57	109.68	111.36	109.96	108.55	109.23	108.74	110.05	110.85
Xinjiang	109.75	109.29	109.52	115.14	117.18	101.10	122.49	124.75	116.27	111.06	109.16	107.23	109.29	107.92	110.43	110.14

Source: China Statistical Yearbook

Note: *We assume that the industry and construction sector grow at the same rate each year.

Data 6.6 China tradable sector TFP at 2000 prices - LtfpT2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	0.78	0.88	1.02	0.97	1.41	1.48	1.61	1.73	0.85	1.64	2.00	1.98	1.42	1.29	1.25	1.29
Tianjin	0.74	0.86	0.98	1.17	1.29	1.30	1.30	1.36	1.67	1.88	2.35	2.37	1.55	1.41	1.40	1.36
Hebei	1.04	1.15	1.28	1.45	1.57	1.61	1.68	1.79	1.80	1.42	2.37	2.55	2.07	2.09	2.07	2.06
Shanxi	-0.15	-0.03	0.09	0.27	0.47	0.56	0.60	0.70	1.45	1.64	1.90	2.13	1.80	1.83	1.65	1.54
Inner Mongolia	0.10	0.24	0.37	0.61	0.68	0.77	0.83	0.87	1.31	1.51	1.74	1.82	1.62	1.66	1.54	1.48
Liaoning	1.05	1.17	1.28	1.43	1.49	1.49	1.53	1.62	1.59	1.66	2.13	2.14	1.73	1.81	1.70	1.72
Jilin	0.85	0.97	1.12	1.27	1.35	1.43	1.45	1.52	1.45	1.59	1.92	1.97	1.59	1.65	1.55	1.63
Heilongjiang	0.47	0.63	0.72	0.86	0.97	1.04	1.11	1.17	1.45	1.59	1.94	2.03	1.76	1.69	1.78	1.49
Shanghai	0.62	0.72	0.82	0.96	1.06	1.10	1.23	1.43	1.55	1.60	2.25	2.16	1.28	1.14	1.09	1.08
Jiangsu	1.32	1.47	1.62	1.84	1.92	1.99	2.06	2.31	1.83	2.16	3.21	3.08	1.98	1.93	1.93	1.96
Zhejiang	1.51	1.67	1.84	2.06	2.14	2.17	2.31	2.49	2.02	2.23	3.36	3.31	2.25	2.18	2.14	2.32
Anhui	0.82	0.96	1.09	1.29	1.41	1.47	1.48	1.63	1.33	2.00	2.74	2.70	2.09	2.13	2.05	2.03
Fujian	0.61	0.73	0.88	1.14	1.31	1.37	1.49	1.68	1.97	1.95	3.04	3.11	1.82	1.95	2.01	1.99
Jiangxi	0.76	0.90	1.04	1.24	1.35	1.42	1.50	1.64	1.95	2.26	2.32	2.44	2.09	2.14	2.09	1.99
Shandong	0.92	1.03	1.18	1.41	1.56	1.65	1.75	1.91	1.99	2.13	2.66	2.70	2.03	2.02	2.02	2.05
Henan	0.73	0.88	1.05	1.22	1.35	1.42	1.47	1.61	1.84	1.97	2.47	2.63	1.28	2.09	2.05	2.08
Hubei	0.89	1.02	1.17	1.34	1.46	1.51	1.57	1.63	0.78	1.89	2.36	2.45	2.09	2.10	2.08	2.05
Hunan	1.31	1.44	1.57	1.73	1.81	1.85	1.86	1.92	1.80	2.05	2.50	2.60	2.27	2.48	2.44	2.44
Guangdong	0.83	0.97	1.14	1.40	1.54	1.56	1.69	1.83	0.39	1.61	3.04	2.99	1.66	1.60	1.65	1.69
Guangxi	0.97	1.12	1.27	1.46	1.59	1.69	1.77	1.92	1.76	1.83	2.46	2.44	1.60	2.01	1.96	1.90
Hainan	0.00	0.00	0.00	0.63	0.72	0.79	0.87	0.96	1.50	1.54	2.17	2.01	1.44	1.44	1.28	1.29
Sichuan (Chq)	0.89	1.00	1.13	1.34	1.43	1.48	1.52	1.61	1.74	1.95	2.36	2.39	1.82	1.82	1.73	1.68
Guizhou	0.73	0.84	0.95	1.15	1.24	1.29	1.33	1.38	1.46	1.52	1.88	1.92	1.69	1.70	1.65	1.65
Yunan	0.54	0.66	0.81	1.02	1.18	1.32	1.37	1.45	1.59	1.77	2.11	2.15	1.76	1.71	1.66	1.64
Tibet	-0.45	-0.39	-0.27	-0.18	-0.03	0.08	1.01	0.16	1.20	1.11	1.36	1.28	1.05	0.97	0.70	0.40
Shaanxi	0.60	0.73	0.85	1.03	1.14	1.19	1.25	1.32	1.57	1.64	1.87	1.88	1.65	1.65	1.57	1.40
Gansu	0.55	0.69	0.77	0.91	1.03	1.08	1.12	1.19	1.35	1.56	1.70	1.81	1.56	1.68	1.60	1.55
Qinghai	-0.28	-0.13	-0.07	-0.01	0.08	0.11	0.14	0.19	1.07	1.28	1.32	1.30	1.04	1.03	0.98	1.00
Ningxia	-0.08	0.06	0.13	0.31	0.47	0.54	0.58	0.69	1.13	1.31	1.47	1.60	1.38	1.33	1.30	1.38
Xinjiang	0.27	0.43	0.52	0.61	0.70	0.77	0.80	0.72	1.29	1.41	1.86	1.75	1.59	1.44	1.30	1.30

Source: China Statistical Yearbook

Data 6.7 China nontradable sector TFP at 2000 prices - LtfpN2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	0.76	0.88	0.97	1.13	1.20	1.39	1.44	1.59	1.62	1.82	1.92	1.87	1.86	1.71	1.69	1.76
Tianjin	0.54	0.66	0.76	0.90	0.97	1.06	1.21	1.24	1.37	1.50	1.61	1.66	1.59	1.30	1.19	1.16
Hebei	0.97	1.10	1.20	1.38	1.40	1.45	1.56	1.59	1.69	1.70	1.59	1.49	1.29	1.04	0.86	0.79
Shanxi	0.28	0.41	0.50	0.62	0.72	0.83	0.92	0.98	1.12	1.21	1.22	1.15	1.07	0.88	0.77	0.72
Inner Mongolia	0.92	1.04	1.13	1.26	1.33	1.39	1.48	1.51	1.51	1.59	1.59	1.55	1.40	1.16	0.93	0.82
Liaoning	0.72	0.86	0.95	1.12	1.21	1.24	1.34	1.47	1.58	1.66	1.67	1.60	1.46	1.22	1.09	1.07
Jilin	1.52	1.65	1.73	1.87	1.93	1.89	2.03	2.10	1.94	1.94	2.05	2.02	1.89	1.47	1.24	1.07
Heilongjiang	0.90	1.04	1.17	1.24	1.30	1.31	1.45	1.50	1.50	1.53	1.61	1.54	1.44	1.26	1.14	1.07
Shanghai	0.93	1.05	1.17	1.32	1.40	1.45	1.57	1.73	1.94	1.93	1.94	1.80	1.62	1.40	1.35	1.33
Jiangsu	1.14	1.26	1.39	1.56	1.58	1.59	1.65	1.64	1.73	1.79	1.77	1.80	1.66	1.48	1.35	1.28
Zhejiang	1.05	1.18	1.32	1.52	1.58	1.57	1.66	1.63	1.76	1.79	1.73	1.75	1.60	1.41	1.30	1.23
Anhui	1.00	1.13	1.24	1.38	1.44	1.46	1.51	1.58	1.60	1.70	1.63	1.62	1.53	1.31	1.16	1.01
Fujian	0.87	0.99	1.11	1.26	1.35	1.39	1.49	1.50	1.50	1.45	1.31	1.20	1.12	1.00	0.89	0.89
Jiangxi	1.65	1.76	1.83	2.03	2.07	2.02	2.03	1.95	1.80	1.74	1.71	1.60	1.39	1.02	0.98	0.91
Shandong	0.42	0.55	0.69	0.92	0.99	1.03	1.20	1.14	1.20	1.33	1.38	1.47	1.44	1.23	1.07	0.99
Henan	1.06	1.20	1.35	1.51	1.59	1.66	1.78	1.69	1.65	1.69	1.71	1.68	1.58	1.36	1.20	1.10
Hubei	1.05	1.17	1.27	1.39	1.45	1.52	1.57	1.57	1.65	1.63	1.63	1.58	1.50	1.27	1.07	0.97
Hunan	1.39	1.52	1.65	1.81	1.84	1.88	1.94	1.89	1.83	1.75	1.72	1.61	1.47	1.24	1.11	0.98
Guangdong	0.22	0.36	0.50	0.72	0.86	0.90	1.08	1.12	1.30	1.31	1.21	1.09	1.02	0.95	0.90	0.87
Guangxi	0.75	0.89	1.02	1.20	1.25	1.29	1.38	1.45	1.51	1.50	1.45	1.26	1.07	0.83	0.69	0.61
Hainan	0.00	0.00	0.00	3.05	2.29	1.92	1.62	1.60	1.01	1.06	1.00	0.68	0.47	0.12	0.01	-0.07
Sichuan (Chq)	0.96	1.09	1.22	1.40	1.49	1.57	1.63	1.62	1.66	1.67	1.65	1.65	1.53	1.24	1.06	0.93
Guizhou	0.98	1.11	1.26	1.37	1.45	1.54	1.64	1.68	1.69	1.78	1.78	1.74	1.58	1.24	1.03	0.90
Yunan	0.66	0.81	0.95	1.12	1.22	1.30	1.39	1.44	1.46	1.45	1.48	1.45	1.30	1.03	0.86	0.70
Tibet	-0.18	-0.18	0.09	0.07	0.11	0.09	0.17	0.04	0.04	0.32	0.53	0.37	0.14	0.02	-0.20	-0.42
Shaanxi	0.94	1.07	1.19	1.34	1.43	1.49	1.51	1.56	1.60	1.64	1.65	1.55	1.39	1.10	0.90	0.80
Gansu	1.58	1.71	1.79	1.92	1.99	1.98	2.00	2.00	2.01	2.21	2.16	2.05	1.83	1.52	1.19	1.01
Qinghai	0.50	0.63	0.78	0.87	0.96	1.00	1.04	1.23	1.34	1.39	1.42	1.33	1.23	1.04	0.89	0.56
Ningxia	0.63	0.77	0.88	1.01	1.07	1.17	1.21	1.19	1.25	1.24	1.30	1.11	0.97	0.75	0.60	0.53
Xinjiang	0.82	0.97	1.06	1.12	1.16	1.24	1.35	1.44	1.51	1.49	1.43	1.34	1.18	0.89	0.77	0.93

Source: China Statistical Yearbook

Data 6.8 China gross output value of the nontradable sector (2000 constant prices) (100,000,000 Yuan) - LyN2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	2.44	2.40	2.42	2.43	2.42	2.40	2.38	2.46	2.44	2.45	2.45	2.44	2.43	2.43	2.41	2.43
Tianjin	1.70	1.69	1.71	1.73	1.63	1.61	1.72	1.80	1.76	1.79	1.79	1.79	1.77	1.76	1.74	1.75
Hebei	2.62	2.59	2.62	2.66	2.68	2.53	2.69	2.62	2.68	2.65	2.65	2.64	2.64	2.62	2.61	2.62
Shanxi	1.75	1.71	1.65	1.65	1.60	1.66	1.70	1.63	1.69	1.66	1.67	1.67	1.69	1.65	1.65	1.65
Inner Mongolia	1.50	1.42	1.35	1.38	1.36	1.23	1.43	1.47	1.42	1.42	1.40	1.38	1.41	1.42	1.40	1.42
Liaoning	2.81	2.82	2.78	2.80	2.84	2.63	2.71	2.77	2.80	2.78	2.76	2.75	2.76	2.74	2.75	2.76
Jilin	1.66	1.67	1.53	1.61	1.71	1.26	1.66	1.74	1.63	1.67	1.65	1.64	1.67	1.60	1.61	1.63
Heilongjiang	2.08	2.12	2.34	2.14	2.13	1.87	2.23	2.11	2.12	2.12	2.13	2.13	2.16	2.15	2.13	2.15
Shanghai	2.64	2.59	2.64	2.64	2.67	2.55	2.57	2.66	2.67	2.68	2.69	2.69	2.69	2.66	2.65	2.66
Jiangsu	3.45	3.41	3.45	3.53	3.53	3.29	3.31	3.46	3.50	3.41	3.41	3.41	3.41	3.40	3.38	3.39
Zhejiang	3.38	3.34	3.31	3.27	3.28	3.12	3.32	3.28	3.34	3.33	3.30	3.27	3.27	3.27	3.26	3.27
Anhui	2.13	2.15	2.14	2.06	2.10	1.89	2.06	2.19	2.11	2.17	2.13	2.10	2.09	2.09	2.07	2.08
Fujian	2.41	2.29	2.37	2.31	2.32	2.35	2.40	2.60	2.51	2.46	2.45	2.45	2.44	2.41	2.39	2.40
Jiangxi	1.63	1.58	1.59	1.67	1.66	1.47	1.60	1.70	1.64	1.66	1.64	1.63	1.63	1.62	1.60	1.60
Shandong	3.09	3.08	3.07	3.10	3.18	2.88	3.09	3.17	3.14	3.15	3.12	3.09	3.10	3.08	3.06	3.07
Henan	2.48	2.43	2.53	2.42	2.45	2.35	2.49	2.45	2.44	2.47	2.46	2.46	2.44	2.42	2.42	2.42
Hubei	2.48	2.40	2.40	2.38	2.36	2.35	2.43	2.44	2.49	2.48	2.47	2.47	2.47	2.47	2.44	2.45
Hunan	2.30	2.28	2.29	2.27	2.31	2.19	2.28	2.36	2.33	2.29	2.30	2.31	2.29	2.29	2.28	2.28
Guangdong	3.33	3.29	3.30	3.29	3.30	3.25	3.37	3.43	3.38	3.37	3.34	3.31	3.30	3.30	3.30	3.32
Guangxi	1.80	1.75	1.73	1.77	1.78	1.64	1.83	1.87	1.84	1.79	1.77	1.75	1.74	1.74	1.76	1.77
Hainan	0.00	0.00	0.43	0.44	0.43	0.37	0.38	0.59	0.46	0.39	0.37	0.35	0.36	0.38	0.37	0.38
Sichuan (Chq)	3.00	2.96	3.00	2.95	2.96	2.90	2.93	3.03	3.02	2.99	2.98	2.97	2.96	2.96	2.95	2.97
Guizhou	0.95	0.88	1.02	0.94	0.92	0.82	0.91	0.89	0.94	0.92	0.92	0.91	0.91	0.92	0.92	0.92
Yunan	1.87	1.82	1.87	1.94	1.97	1.81	1.88	1.94	1.91	1.88	1.88	1.87	1.86	1.84	1.84	1.84
Tibet	-0.98	-2.06	-1.03	-1.17	-0.96	-1.23	-0.87	-1.12	-1.15	-1.00	-0.97	-0.95	-1.08	-1.08	-1.13	-1.11
Shaanxi	1.62	1.58	1.62	1.59	1.59	1.54	1.57	1.63	1.64	1.61	1.61	1.61	1.64	1.59	1.63	1.63
Gansu	1.20	1.24	1.12	1.20	1.16	1.00	1.05	1.10	1.08	1.08	1.09	1.09	1.09	1.07	1.08	1.06
Qinghai	-0.17	-0.24	-0.24	-0.23	-0.17	-0.22	-0.16	-0.16	-0.16	-0.17	-0.17	-0.17	-0.17	-0.18	-0.17	-0.16
Ningxia	0.01	-0.02	0.04	0.00	0.03	-0.10	-0.05	-0.08	-0.04	-0.02	-0.04	-0.05	-0.04	-0.05	-0.04	-0.03
Xinjiang	1.55	1.55	1.55	1.60	1.62	1.47	1.66	1.68	1.61	1.57	1.55	1.53	1.55	1.54	1.56	1.56

Source: China Statistical Yearbook

Data 6.9 China gross output value of the tradable sector (2000 constant prices) (100,000,000 Yuan) - LyT2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	3.41	3.32	3.41	3.46	3.43	3.36	3.40	3.44	3.42	3.44	3.41	3.37	3.38	3.40	3.42	3.42
Tianjin	3.56	3.51	3.49	3.56	3.49	3.46	3.48	3.51	3.54	3.55	3.55	3.55	3.53	3.49	3.52	3.52
Hebei	4.58	4.53	4.58	4.62	4.58	4.53	4.54	4.61	4.66	4.63	4.62	4.61	4.60	4.58	4.57	4.57
Shanxi	3.38	3.28	3.28	3.48	3.39	3.33	3.28	3.41	3.40	3.38	3.38	3.39	3.37	3.37	3.32	3.36
Inner Mongolia	3.00	2.95	3.01	3.06	3.05	3.02	3.00	3.01	3.03	3.01	3.05	3.08	3.01	3.01	2.99	3.01
Liaoning	4.63	4.60	4.61	4.65	4.60	4.57	4.57	4.63	4.66	4.63	4.62	4.61	4.60	4.61	4.60	4.60
Jilin	3.40	3.36	3.49	3.44	3.43	3.45	3.33	3.43	3.44	3.44	3.44	3.45	3.36	3.41	3.38	3.38
Heilongjiang	3.81	3.80	3.75	3.80	3.78	3.85	3.72	3.77	3.79	3.80	3.81	3.82	3.81	3.79	3.78	3.79
Shanghai	4.28	4.20	4.22	4.27	4.26	4.23	4.25	4.31	4.33	4.31	4.30	4.29	4.28	4.26	4.27	4.28
Jiangsu	5.28	5.24	5.23	5.32	5.27	5.21	5.23	5.41	5.33	5.31	5.29	5.26	5.25	5.24	5.24	5.25
Zhejiang	5.19	5.14	5.14	5.18	5.13	5.08	5.18	5.24	5.26	5.23	5.19	5.16	5.14	5.12	5.13	5.13
Anhui	4.09	4.05	4.02	4.06	4.04	4.01	3.94	4.16	4.17	4.15	4.12	4.09	4.07	4.02	4.02	4.01
Fujian	4.26	4.22	4.27	4.35	4.33	4.20	4.30	4.34	4.39	4.37	4.32	4.28	4.27	4.24	4.23	4.22
Jiangxi	3.28	3.27	3.30	3.32	3.31	3.26	3.28	3.36	3.35	3.35	3.34	3.32	3.30	3.26	3.26	3.26
Shandong	5.11	5.06	5.16	5.18	5.10	5.05	5.10	5.18	5.16	5.11	5.10	5.09	5.07	5.08	5.08	5.08
Henan	4.46	4.45	4.50	4.49	4.46	4.42	4.44	4.55	4.49	4.51	4.51	4.51	4.47	4.46	4.45	4.46
Hubei	4.45	4.39	4.42	4.43	4.41	4.36	4.39	4.47	4.47	4.48	4.47	4.46	4.46	4.42	4.41	4.42
Hunan	4.17	4.15	4.18	4.17	4.16	4.12	4.14	4.18	4.19	4.18	4.19	4.19	4.17	4.15	4.14	4.15
Guangdong	5.27	5.24	5.32	5.37	5.32	5.26	5.34	5.37	5.39	5.33	5.30	5.25	5.26	5.25	5.24	5.25
Guangxi	3.31	3.33	3.35	3.32	3.28	3.33	3.34	3.46	3.47	3.41	3.37	3.34	3.33	3.33	3.30	3.28
Hainan	0.00	0.00	0.00	1.83	1.83	1.77	1.83	1.90	1.92	1.82	1.77	1.72	1.75	1.76	1.77	1.77
Sichuan (Chq)	4.32	4.28	4.31	4.35	4.31	4.26	4.30	4.37	4.36	4.32	4.32	4.31	4.32	4.31	4.26	4.30
Guizhou	2.69	2.65	2.66	2.67	2.64	2.61	2.65	2.66	2.65	2.64	2.64	2.65	2.65	2.64	2.63	2.64
Yunan	3.14	3.10	3.18	3.18	3.22	3.16	3.11	3.14	3.15	3.17	3.16	3.15	3.14	3.13	3.12	3.11
Tibet	-0.95	-0.61	-0.36	-0.39	-0.35	-0.36	-0.41	-0.40	-0.37	-0.36	-0.40	-0.45	-0.38	-0.39	-0.37	-0.39
Shaanxi	3.09	3.04	3.06	3.10	3.10	3.02	3.08	3.09	3.11	3.06	3.07	3.09	3.06	3.08	3.04	3.05
Gansu	2.85	2.82	2.78	2.88	2.84	2.82	2.82	2.84	2.87	2.85	2.85	2.86	2.81	2.83	2.82	2.83
Qinghai	1.14	1.12	1.11	1.14	1.14	1.05	1.04	1.07	1.11	1.08	1.09	1.09	1.10	1.10	1.09	1.09
Ningxia	1.35	1.32	1.27	1.38	1.36	1.25	1.25	1.33	1.34	1.29	1.32	1.35	1.30	1.32	1.31	1.32
Xinjiang	2.74	2.72	2.71	2.74	2.72	2.72	2.74	2.71	2.71	2.72	2.70	2.68	2.74	2.69	2.68	2.70

Source: China Statistical Yearbook

Data 6.10 China investment of the tradable sector (2000 constant prices) (100,000,000 Yuan) - LiT2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	0.01	-0.12	-0.09	0.56	-0.64	-0.67	-0.69	-0.19	0.09	0.19	0.24	0.46	0.47	0.50	0.51	-0.06
Tianjin	0.20	0.15	0.17	0.22	0.18	0.21	0.74	0.71	0.02	0.22	0.65	0.48	0.39	0.52	0.50	0.50
Hebei	0.92	1.05	1.25	1.32	1.00	0.93	0.85	1.07	1.03	0.87	0.95	1.02	1.07	1.02	0.76	0.84
Shanxi	1.13	0.95	0.85	0.89	0.57	0.62	0.77	0.80	0.66	0.40	-0.04	-0.04	0.19	0.34	0.28	0.41
Inner Mongolia	0.54	0.30	0.13	0.04	0.15	0.23	0.38	0.64	0.75	0.61	0.42	0.34	0.24	0.00	-0.60	-0.27
Liaoning	1.05	1.19	1.38	1.36	1.32	1.36	1.36	1.34	1.46	1.28	1.22	1.04	0.91	0.75	0.51	0.56
Jilin	0.04	0.07	0.22	0.14	-0.23	-0.23	-0.07	0.26	0.43	0.44	0.70	0.73	0.43	0.10	-0.07	0.00
Heilongjiang	0.97	0.92	0.95	0.87	0.59	0.68	0.49	0.61	0.71	0.49	0.57	0.66	1.00	0.47	0.35	0.26
Shanghai	0.99	1.00	1.16	1.29	1.15	1.05	0.77	0.59	0.86	0.71	1.02	1.34	1.33	1.40	1.12	0.85
Jiangsu	1.24	1.33	1.46	1.45	1.02	0.83	0.96	1.07	0.76	0.66	0.60	0.94	1.11	1.22	0.91	0.87
Zhejiang	0.96	0.87	0.88	0.93	0.79	0.70	0.69	0.84	0.70	0.74	0.69	1.06	1.12	1.09	0.94	0.80
Anhui	0.58	0.55	0.58	0.47	0.26	0.21	0.35	0.62	0.51	0.34	0.26	0.27	0.14	0.08	0.03	-0.14
Fujian	1.06	1.21	1.39	1.07	0.66	0.60	0.76	0.74	0.65	0.47	0.53	0.25	0.33	0.49	0.41	0.29
Jiangxi	-0.07	-0.20	-0.25	-0.36	-0.36	-0.42	-0.43	-0.41	-0.39	-0.61	-0.40	-0.44	-0.76	-0.76	-0.53	-0.34
Shandong	1.47	1.62	1.86	1.80	1.41	1.32	1.25	1.27	1.03	1.05	1.10	1.20	1.22	1.22	1.17	1.13
Henan	1.06	0.97	0.94	1.06	0.95	0.71	1.05	0.99	0.73	0.91	0.90	0.94	0.92	0.86	0.70	0.78
Hubei	0.93	0.80	0.81	0.86	0.40	0.52	0.62	1.13	1.25	1.34	1.42	1.29	1.05	1.03	0.88	0.97
Hunan	0.23	0.23	0.31	0.27	0.26	0.30	0.48	0.64	0.34	0.37	0.38	0.11	0.04	-0.24	-0.15	0.01
Guangdong	1.90	1.99	2.14	1.62	1.80	2.02	1.91	1.96	2.02	2.30	1.85	1.71	1.43	1.44	1.50	1.20
Guangxi	-0.28	-0.36	-0.42	-0.47	-0.67	-0.75	-0.57	-0.25	0.07	-0.05	-0.27	-0.60	-0.77	-0.30	-0.16	0.00
Hainan	0.00	0.00	0.00	-1.19	-0.76	-0.94	-0.92	-0.67	-0.31	-0.22	-0.19	-0.42	-0.76	-0.92	-0.73	-0.80
Sichuan (Chq)	0.77	0.77	0.87	0.84	0.83	0.79	0.96	0.97	0.87	0.74	0.75	0.91	1.03	0.95	0.78	0.86
Guizhou	-0.65	-0.61	-0.48	-0.61	-0.72	-0.56	-0.44	-0.38	-0.41	-0.47	-0.67	-0.38	-0.36	-0.65	-0.91	-0.66
Yunan	0.01	-0.14	-0.24	-0.41	-0.46	-0.52	-0.31	-0.09	-0.09	-0.04	-0.05	-0.15	-0.18	-0.29	-0.16	-0.15
Tibet	-3.18	-2.97	-3.06	-3.18	-3.18	-2.80	-2.50	-2.22	-2.13	-1.84	-1.88	-2.31	-2.08	-2.24	-2.40	-2.22
Shaanxi	-0.06	-0.10	-0.02	-0.04	-0.06	-0.11	-0.17	-0.19	-0.01	-0.10	-0.11	-0.23	-0.08	0.04	-0.02	0.01
Gansu	-0.16	-0.11	0.02	0.17	-0.11	-0.12	-0.04	-0.10	-0.42	-0.41	-0.34	0.00	-0.09	-0.18	-0.26	-0.25
Qinghai	-0.67	-0.53	-0.31	-0.39	-0.94	-1.14	-1.09	-0.97	-0.76	-1.11	-1.18	-0.58	-0.65	-0.65	-0.86	-1.09
Ningxia	-0.79	-0.72	-0.56	-1.02	-1.33	-1.26	-1.14	-1.28	-1.52	-1.54	-1.76	-1.33	-1.28	-1.38	-1.16	-1.20
Xinjiang	0.37	0.26	0.17	0.20	0.03	0.39	0.40	0.89	0.87	0.72	0.36	0.54	0.56	0.68	0.81	0.75

Source: China Statistical Yearbook

Data 6.11 China investment of the nontradable sector (2000 constant prices) (100,000,000 Yuan) - LiN2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	-0.25	-0.33	-0.35	-0.94	-0.86	-0.84	-0.51	-0.06	0.12	0.00	-0.20	-0.18	-0.17	-0.14	-0.65	-0.92
Tianjin	-1.10	-1.03	-0.88	-1.10	-1.46	-1.69	-1.71	-1.15	-0.89	-0.67	-0.90	-0.96	-0.58	-0.20	-0.42	-0.64
Hebei	-0.59	-0.59	-0.49	-0.54	-0.63	-1.01	-0.67	-0.51	-0.11	0.24	0.44	0.38	0.58	0.74	0.78	0.64
Shanxi	-0.72	-0.79	-0.81	-1.17	-1.26	-1.31	-1.43	-0.85	-0.88	-0.59	-0.25	-0.46	-0.44	-0.10	-0.16	-0.35
Inner Mongolia	-1.45	-1.60	-1.64	-1.88	-2.37	-2.41	-1.30	-0.52	-0.54	-0.66	-0.96	-0.99	-0.87	-0.58	-0.27	-0.25
Liaoning	0.10	-0.01	-0.16	-0.16	-0.46	-0.71	-0.55	-0.23	-0.13	0.07	-0.11	-0.06	0.43	0.72	0.58	0.21
Jilin	-1.97	-2.14	-2.32	-1.83	-1.98	-2.54	-1.78	-1.34	-0.69	-0.72	-1.62	-0.95	-0.90	-0.32	-0.13	-0.25
Heilongjiang	-0.80	-0.76	-0.53	-0.81	-1.03	-1.35	-0.64	-0.54	-0.24	-0.13	-0.31	-0.32	-0.02	0.16	0.14	0.17
Shanghai	-0.55	-0.43	-0.36	-0.62	-0.82	-1.10	-1.05	-0.83	-0.17	0.29	0.07	0.36	0.41	0.32	0.30	-0.10
Jiangsu	-0.02	0.02	0.03	-0.07	-0.11	-0.21	0.05	0.86	0.97	0.82	0.89	0.62	0.70	0.89	0.87	0.80
Zhejiang	-0.02	-0.17	-0.32	-0.30	-0.49	-0.33	0.01	0.42	0.91	1.05	1.02	0.69	0.68	0.88	0.86	0.93
Anhui	-1.18	-1.26	-1.34	-1.46	-1.46	-1.52	-1.10	-0.64	-0.84	-0.26	-0.03	-0.48	-0.47	-0.15	-0.15	0.02
Fujian	-0.68	-0.88	-0.83	-0.95	-0.96	-0.75	-0.68	0.01	0.31	0.56	0.64	0.57	0.38	0.25	0.19	-0.04
Jiangxi	-2.42	-2.22	-1.97	-2.43	-2.33	-2.09	-1.83	-0.94	-0.39	-0.26	-0.25	-0.55	-0.17	0.03	-0.46	-0.57
Shandong	0.20	-0.01	-0.28	-0.37	-0.52	-0.75	-0.17	0.89	0.99	0.69	0.64	0.31	0.27	0.82	0.91	0.81
Henan	-1.03	-1.41	-1.58	-1.45	-1.99	-1.89	-1.34	-0.52	0.23	0.41	0.23	-0.04	-0.07	0.32	0.31	0.57
Hubei	-0.82	-0.86	-0.77	-0.80	-1.16	-0.97	-0.40	-0.02	0.37	0.33	0.11	-0.14	-0.02	0.37	0.55	0.40
Hunan	-1.41	-1.61	-1.66	-1.61	-1.80	-1.85	-1.21	-0.35	0.13	0.15	0.14	0.00	-0.16	0.19	0.15	0.27
Guangdong	0.90	0.53	0.14	-0.08	0.34	0.44	-0.65	1.75	1.65	1.90	1.77	1.49	1.14	1.09	1.07	1.15
Guangxi	-1.12	-1.47	-1.84	-1.63	-1.82	-1.88	-1.20	-0.72	-0.32	-0.22	-0.26	-0.08	-0.15	0.14	-0.04	-0.19
Hainan	0.00	0.00	0.00	-2.25	-1.80	-1.84	-1.64	-0.91	-0.48	-0.68	-1.08	-0.76	-0.84	-0.47	-0.67	-0.88
Sichuan (Chq)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.81	-0.26	-0.43	-0.79
Guizhou	-0.77	-1.01	-1.00	-1.17	-1.13	-1.24	-0.68	-0.16	0.06	0.42	0.49	0.36	0.41	0.95	0.76	0.82
Yunan	-1.71	-1.98	-1.99	-2.18	-2.25	-2.78	-2.30	-1.58	-1.34	-1.26	-1.13	-1.28	-1.25	-0.48	-0.70	-0.66
Tibet	-1.64	-3.11	-2.53	-2.80	-2.60	-2.65	-2.07	-0.85	0.03	0.15	-0.02	-0.11	0.14	0.45	0.14	0.39
Shaanxi	-2.33	-2.65	-2.83	-2.86	-3.05	-2.52	-2.24	-1.76	-1.43	-1.86	-1.70	-1.67	-2.17	-1.65	-1.30	-1.33
Gansu	-1.71	-1.85	-2.11	-2.14	-2.41	-2.20	-1.59	-1.63	-0.81	-0.74	-0.76	-0.74	-0.52	0.09	0.13	0.07
Qinghai	-2.93	-2.88	-2.71	-2.74	-2.52	-2.54	-2.41	-1.94	-1.80	-1.75	-2.01	-1.67	-1.18	-0.89	-0.42	-0.35
Ningxia	-2.23	-2.63	-2.99	-3.11	-3.53	-2.87	-2.78	-2.61	-1.79	-2.15	-2.21	-2.23	-2.04	-1.75	-1.79	-0.89
Xinjiang	-2.40	-2.45	-2.42	-2.67	-2.91	-2.87	-2.48	-1.86	-1.74	-1.51	-1.72	-1.68	-1.42	-1.27	-1.18	-1.13

Source: China Statistical Yearbook

Data 6.12 China capital stock value of the tradable sector (2000 constant prices) (100,000,000 Yuan) - LkT2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	3.01	2.85	2.78	3.23	2.33	2.23	2.10	2.00	2.89	2.07	1.73	1.77	2.40	2.52	2.57	2.48
Tianjin	3.19	3.04	2.89	2.73	2.52	2.49	2.52	2.44	2.13	1.91	1.44	1.42	2.22	2.32	2.36	2.39
Hebei	3.91	3.76	3.64	3.49	3.30	3.21	3.13	3.06	3.06	3.41	2.42	2.21	2.67	2.62	2.61	2.62
Shanxi	4.12	3.96	3.83	3.86	3.46	3.31	3.22	3.19	2.31	2.06	1.80	1.54	1.84	1.77	1.91	2.06
Inner Mongolia	3.53	3.38	3.27	2.94	2.90	2.78	2.70	2.64	2.12	1.89	1.66	1.58	1.70	1.61	1.69	1.75
Liaoning	4.04	3.90	3.77	3.63	3.51	3.49	3.43	3.37	3.36	3.24	2.75	2.70	3.09	2.99	3.07	3.04
Jilin	3.03	2.90	2.82	2.59	2.49	2.43	2.28	2.28	2.33	2.16	1.85	1.83	2.13	2.04	2.09	1.98
Heilongjiang	3.96	3.79	3.61	3.50	3.35	3.30	3.10	3.07	2.75	2.57	2.21	2.11	2.34	2.39	2.30	2.55
Shanghai	3.99	3.83	3.76	3.65	3.53	3.47	3.34	3.21	3.09	2.99	2.29	2.39	3.28	3.37	3.44	3.45
Jiangsu	4.23	4.04	3.84	3.70	3.54	3.41	3.37	3.26	3.65	3.28	2.18	2.29	3.40	3.43	3.43	3.39
Zhejiang	3.95	3.74	3.53	3.34	3.19	3.11	3.06	2.91	3.39	3.12	1.92	1.93	2.98	3.02	3.07	2.88
Anhui	3.58	3.40	3.22	3.04	2.90	2.81	2.75	2.79	3.05	2.33	1.53	1.52	2.11	2.01	2.10	2.10
Fujian	4.05	3.90	3.75	3.51	3.31	3.13	3.09	2.92	2.61	2.58	1.43	1.31	2.62	2.44	2.37	2.37
Jiangxi	2.92	2.77	2.63	2.42	2.28	2.14	2.07	1.99	1.61	1.26	1.24	1.11	1.43	1.28	1.35	1.44
Shandong	4.47	4.32	4.23	4.01	3.75	3.61	3.54	3.43	3.29	3.10	2.58	2.52	3.18	3.19	3.19	3.15
Henan	4.06	3.91	3.76	3.55	3.37	3.27	3.22	3.17	2.84	2.71	2.19	2.03	3.37	2.50	2.53	2.51
Hubei	3.92	3.72	3.59	3.41	3.25	3.15	3.12	3.14	3.99	2.80	2.29	2.17	2.50	2.45	2.45	2.48
Hunan	3.23	3.08	2.94	2.75	2.65	2.58	2.58	2.54	2.66	2.35	1.88	1.74	2.04	1.79	1.82	1.83
Guangdong	4.90	4.73	4.56	4.29	4.10	4.00	3.94	3.80	5.27	3.93	2.41	2.41	3.76	3.81	3.74	3.70
Guangxi	2.72	2.61	2.43	2.18	1.96	1.92	1.83	1.77	1.93	1.76	1.08	1.05	1.87	1.48	1.51	1.56
Hainan	0.00	0.00	0.00	1.81	1.70	1.58	1.52	1.46	0.74	0.57	-0.13	-0.04	0.57	0.55	0.72	0.68
Sichuan (Chq)	3.77	3.63	3.51	3.33	3.19	3.09	3.08	3.02	2.85	2.56	2.14	2.13	2.71	2.68	2.72	2.81
Guizhou	2.34	2.20	2.08	1.85	1.72	1.67	1.66	1.62	1.49	1.44	1.06	0.99	1.23	1.18	1.22	1.23
Yunan	3.01	2.89	2.78	2.53	2.38	2.15	2.05	1.99	1.84	1.65	1.28	1.22	1.63	1.65	1.69	1.71
Tibet	-0.19	0.20	0.37	0.19	0.07	-0.13	-0.29	-0.27	-1.27	-1.13	-1.53	-1.45	-1.15	-1.08	-0.81	-0.54
Shaanxi	2.94	2.77	2.65	2.47	2.33	2.21	2.19	2.11	1.83	1.70	1.47	1.49	1.70	1.70	1.76	1.95
Gansu	2.84	2.69	2.56	2.46	2.31	2.22	2.18	2.11	1.96	1.69	1.52	1.42	1.61	1.45	1.50	1.54
Qinghai	2.33	2.17	2.06	1.87	1.69	1.57	1.51	1.47	0.54	0.23	0.19	0.27	0.49	0.44	0.48	0.41
Ningxia	2.21	2.04	1.90	1.75	1.50	1.31	1.24	1.20	0.67	0.42	0.29	0.19	0.36	0.41	0.41	0.31
Xinjiang	3.37	3.22	3.03	2.82	2.64	2.55	2.46	2.50	1.88	1.74	1.21	1.39	1.63	1.73	1.86	1.78

Source: China Statistical Yearbook

Data 6.13 China capital stock value of the nontradable sector (2000 constant prices) (100,000,000 Yuan) - LkN2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	2.74	2.58	2.40	2.19	2.10	1.98	1.96	2.04	1.85	1.68	1.62	1.52	1.56	1.56	1.54	1.53
Tianjin	1.89	1.75	1.68	1.51	1.42	1.14	1.08	1.40	1.53	1.20	1.11	1.03	1.06	1.16	1.20	1.23
Hebei	2.40	2.25	2.17	1.98	2.03	1.80	1.75	1.75	1.70	1.66	1.75	1.71	1.84	2.02	2.15	2.21
Shanxi	2.28	2.10	1.96	1.82	1.77	1.65	1.55	1.61	1.59	1.35	1.40	1.35	1.36	1.41	1.49	1.57
Inner Mongolia	1.55	1.32	1.19	1.02	0.88	0.68	0.71	1.05	1.02	1.02	1.01	0.90	0.94	1.02	1.13	1.17
Liaoning	3.10	2.96	2.74	2.54	2.51	2.27	2.23	2.15	1.96	1.86	1.88	1.87	1.96	2.08	2.15	2.13
Jilin	1.03	0.90	0.62	0.55	0.63	0.22	0.52	0.66	0.59	0.67	0.59	0.58	0.68	0.89	1.09	1.17
Heilongjiang	2.19	2.11	2.16	1.76	1.55	1.43	1.65	1.62	1.57	1.53	1.54	1.51	1.55	1.65	1.74	1.77
Shanghai	2.44	2.28	2.11	1.95	1.98	1.77	1.66	1.79	1.89	1.60	1.62	1.69	1.75	1.85	1.96	1.95
Jiangsu	2.97	2.82	2.63	2.53	2.54	2.29	2.23	2.64	2.53	2.28	2.26	2.02	2.15	2.28	2.36	2.41
Zhejiang	2.97	2.81	2.55	2.28	2.27	2.13	2.19	2.39	2.30	2.22	2.22	1.92	2.07	2.24	2.31	2.36
Anhui	1.81	1.71	1.57	1.33	1.37	1.15	1.20	1.59	1.41	1.24	1.31	1.08	1.15	1.26	1.34	1.46
Fujian	2.31	2.07	1.99	1.69	1.58	1.61	1.49	1.85	1.59	1.61	1.74	1.74	1.81	1.84	1.90	1.91
Jiangxi	0.57	0.42	0.35	0.18	0.08	0.00	0.12	0.62	0.74	0.82	0.93	0.82	1.06	1.21	1.22	1.21
Shandong	3.20	3.07	2.90	2.67	2.70	2.42	2.35	2.85	2.76	2.47	2.38	2.02	2.04	2.18	2.31	2.40
Henan	1.96	1.77	1.70	1.37	1.35	1.18	1.16	1.56	1.65	1.70	1.68	1.49	1.50	1.65	1.79	1.91
Hubei	2.18	1.98	1.85	1.70	1.79	1.64	1.67	1.82	1.84	1.79	1.73	1.58	1.62	1.75	1.87	1.94
Hunan	1.58	1.43	1.26	1.00	1.07	0.94	0.90	1.33	1.38	1.33	1.43	1.29	1.38	1.53	1.66	1.77
Guangdong	3.90	3.72	3.53	3.27	3.16	3.08	2.99	3.35	3.17	3.22	3.15	3.06	3.02	3.02	3.04	3.06
Guangxi	1.88	1.70	1.52	1.33	1.33	1.18	1.23	1.25	1.07	1.08	1.15	1.14	1.27	1.47	1.56	1.64
Hainan	0.00	0.00	0.00	-2.25	-1.42	-1.03	-0.74	0.03	0.17	0.25	0.46	0.60	0.63	0.84	0.91	0.99
Sichuan (Chq)	2.80	2.64	2.48	2.20	2.15	1.98	1.93	2.32	2.25	2.16	2.16	1.86	1.95	2.16	2.33	2.46
Guizhou	0.66	0.45	0.42	0.20	0.14	-0.02	-0.06	0.10	0.07	0.13	0.24	0.25	0.32	0.64	0.68	0.78
Yunan	2.09	1.90	1.84	1.69	1.65	1.41	1.33	1.54	1.54	1.34	1.38	1.17	1.29	1.50	1.58	1.77
Tibet	0.30	-0.91	-0.02	-0.38	-0.27	-0.68	-0.49	-0.04	0.26	0.48	0.44	0.22	0.01	-0.01	-0.08	0.16
Shaanxi	1.53	1.36	1.26	0.95	0.90	0.75	0.73	1.06	1.02	0.93	0.95	0.90	0.98	1.21	1.41	1.51
Gansu	0.29	0.20	-0.06	-0.17	-0.32	-0.47	-0.41	-0.04	0.11	0.05	-0.01	-0.21	-0.01	0.21	0.55	0.80
Qinghai	0.43	0.22	0.11	-0.09	-0.04	-0.17	-0.19	0.02	0.03	-0.09	-0.18	-0.36	-0.32	-0.25	-0.18	0.12
Ningxia	0.04	-0.12	-0.18	-0.34	-0.37	-0.55	-0.64	-0.38	-0.24	-0.17	-0.12	-0.21	-0.17	-0.03	0.07	0.22
Xinjiang	2.15	2.02	1.88	1.67	1.53	1.29	1.16	1.36	1.27	1.16	1.17	1.11	1.25	1.38	1.47	1.42

Source: China Statistical Yearbook

Data 6.14 China real wages of the nontradable sector (2000 constant prices) (100,000,000 Yuan) - LwN2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	0.51	0.50	0.44	0.42	0.41	0.53	0.57	0.78	0.65	0.70	0.76	0.63	0.65	0.47	0.42	0.48
Tianjin	-0.54	-0.53	-0.50	-0.52	-0.50	-0.73	-0.64	-0.21	0.03	-0.11	-0.09	-0.11	-0.16	-0.46	-0.58	-0.61
Hebei	0.45	0.45	0.49	0.50	0.59	0.44	0.45	0.55	0.58	0.58	0.51	0.32	0.15	-0.06	-0.18	-0.24
Shanxi	-0.39	-0.41	-0.43	-0.43	-0.36	-0.35	-0.36	-0.21	-0.10	-0.21	-0.16	-0.28	-0.40	-0.62	-0.69	-0.67
Inner Mongolia	-0.36	-0.43	-0.44	-0.46	-0.51	-0.60	-0.51	-0.16	-0.19	-0.13	-0.15	-0.27	-0.39	-0.67	-0.86	-1.01
Liaoning	0.89	0.91	0.83	0.83	0.89	0.72	0.80	0.85	0.78	0.77	0.81	0.70	0.62	0.32	0.17	0.07
Jilin	-0.16	-0.13	-0.28	-0.19	-0.06	-0.41	-0.02	0.18	-0.05	0.01	0.05	-0.01	-0.06	-0.41	-0.51	-0.69
Heilongjiang	0.28	0.35	0.52	0.25	0.09	0.06	0.39	0.43	0.37	0.36	0.45	0.34	0.27	0.09	0.04	-0.06
Shanghai	0.41	0.38	0.30	0.32	0.46	0.33	0.35	0.69	0.96	0.71	0.73	0.63	0.46	0.23	0.31	0.25
Jiangsu	1.10	1.10	1.01	1.09	1.14	0.95	0.94	1.40	1.38	1.19	1.12	0.76	0.71	0.54	0.42	0.33
Zhejiang	0.93	0.93	0.80	0.74	0.81	0.69	0.81	1.08	1.11	1.07	0.99	0.52	0.48	0.39	0.28	0.18
Anhui	-0.07	-0.01	-0.03	-0.10	0.03	-0.14	-0.07	0.41	0.26	0.19	0.18	-0.10	-0.15	-0.39	-0.56	-0.68
Fujian	0.18	0.09	0.14	-0.01	-0.03	0.06	0.01	0.42	0.12	0.09	0.06	-0.14	-0.18	-0.37	-0.49	-0.49
Jiangxi	-0.57	-0.59	-0.58	-0.55	-0.64	-0.69	-0.57	-0.10	-0.16	-0.14	-0.09	-0.30	-0.32	-0.69	-0.75	-0.89
Shandong	0.45	0.48	0.45	0.48	0.60	0.45	0.48	1.05	1.04	0.86	0.83	0.39	0.32	0.13	0.03	0.03
Henan	0.07	0.05	0.12	-0.02	0.06	-0.01	0.06	0.53	0.58	0.68	0.68	0.45	0.32	0.16	0.07	0.09
Hubei	0.35	0.31	0.28	0.29	0.46	0.40	0.48	0.64	0.74	0.67	0.61	0.39	0.32	0.09	-0.07	-0.18
Hunan	0.11	0.12	0.07	-0.02	0.11	0.07	0.06	0.50	0.48	0.34	0.40	0.08	-0.02	-0.24	-0.26	-0.35
Guangdong	1.05	1.05	1.00	0.98	1.03	1.00	1.11	1.52	1.55	1.59	1.44	1.23	1.09	0.95	0.90	0.86
Guangxi	-0.29	-0.30	-0.33	-0.32	-0.26	-0.34	-0.22	-0.11	-0.22	-0.21	-0.20	-0.47	-0.58	-0.72	-0.85	-0.89
Hainan	0.00	0.00	-2.68	-2.03	-2.02	-1.95	-2.04	-1.18	-1.74	-1.53	-1.42	-1.62	-1.87	-2.17	-2.26	-2.29
Sichuan (Chq)	0.84	0.85	0.82	0.74	0.81	0.73	0.75	1.15	1.14	1.06	1.04	0.64	0.57	0.34	0.28	0.22
Guizhou	-1.18	-1.22	-1.11	-1.19	-1.15	-1.18	-1.11	-0.87	-0.91	-0.75	-0.68	-0.70	-0.80	-0.90	-1.12	-1.18
Yunan	-0.21	-0.22	-0.13	-0.09	-0.02	-0.14	-0.12	0.12	0.14	-0.04	0.03	-0.22	-0.28	-0.40	-0.57	-0.56
Tibet	-2.95	-3.98	-2.95	-3.29	-3.18	-3.62	-3.45	-3.03	-2.86	-2.53	-2.41	-2.60	-2.94	-3.06	-3.38	-3.39
Shaanxi	-0.37	-0.38	-0.34	-0.48	-0.43	-0.51	-0.51	-0.12	-0.11	-0.16	-0.12	-0.28	-0.41	-0.56	-0.61	-0.64
Gansu	-0.90	-0.84	-1.00	-1.01	-1.10	-1.21	-1.11	-0.66	-0.52	-0.40	-0.48	-0.79	-0.87	-1.06	-1.12	-1.07
Qinghai	-1.98	-2.02	-1.97	-2.04	-1.91	-1.98	-1.95	-1.65	-1.58	-1.62	-1.65	-1.83	-1.90	-2.05	-2.17	-2.27
Ningxia	-2.30	-2.29	-2.24	-2.23	-2.19	-2.23	-2.29	-2.01	-1.82	-1.77	-1.68	-1.94	-2.05	-2.20	-2.30	-2.23
Xinjiang	-0.08	-0.06	-0.07	-0.13	-0.21	-0.32	-0.33	-0.06	-0.07	-0.18	-0.24	-0.38	-0.44	-0.67	-0.76	-0.60

Source: China Statistical Yearbook

Data 6.15 China real wages of the tradable sector (2000 constant prices) (100,000,000 Yuan) - LwT2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	0.47	0.49	0.55	1.16	0.41	0.47	0.42	0.41	0.32	0.33	0.52	0.62	0.65	0.58	0.55	0.41
Tianjin	0.58	0.60	0.56	0.56	0.46	0.45	0.50	0.41	0.36	0.33	0.40	0.37	0.23	0.11	0.16	0.10
Hebei	1.57	1.58	1.55	1.54	1.43	1.39	1.36	1.34	1.24	1.11	1.15	0.99	0.83	0.63	0.56	0.49
Shanxi	0.77	0.79	0.79	1.01	0.79	0.75	0.73	0.76	0.57	0.51	0.51	0.46	0.31	0.12	0.09	0.10
Inner Mongolia	0.50	0.53	0.56	0.39	0.48	0.46	0.46	0.44	0.31	0.31	0.27	0.22	0.07	-0.12	-0.23	-0.32
Liaoning	1.91	1.93	1.88	1.90	1.83	1.84	1.80	1.77	1.58	1.49	1.54	1.42	1.28	1.11	0.99	0.84
Jilin	0.76	0.80	0.83	0.75	0.75	0.74	0.63	0.65	0.58	0.52	0.61	0.70	0.58	0.33	0.19	0.10
Heilongjiang	1.39	1.38	1.32	1.34	1.31	1.31	1.19	1.22	1.16	1.04	1.07	1.04	0.88	0.78	0.80	0.57
Shanghai	1.14	1.15	1.19	1.22	1.21	1.19	1.20	1.28	1.22	1.12	1.11	1.15	1.00	0.85	0.90	0.84
Jiangsu	1.98	1.95	1.84	1.87	1.77	1.71	1.73	1.75	1.52	1.41	1.41	1.43	1.37	1.20	1.14	1.06
Zhejiang	1.85	1.81	1.72	1.71	1.61	1.56	1.58	1.49	1.36	1.23	1.04	0.96	0.83	0.63	0.57	0.41
Anhui	0.89	0.89	0.82	0.82	0.80	0.83	0.82	0.93	0.71	0.61	0.55	0.45	0.27	0.16	0.11	0.08
Fujian	1.22	1.22	1.15	1.11	1.06	0.99	1.06	1.02	0.86	0.70	0.70	0.64	0.59	0.46	0.42	0.35
Jiangxi	0.42	0.45	0.44	0.40	0.33	0.26	0.25	0.27	0.10	-0.09	0.21	0.24	0.10	-0.27	-0.20	-0.31
Shandong	1.77	1.79	1.78	1.79	1.61	1.58	1.56	1.52	1.24	1.17	1.40	1.36	1.32	1.21	1.19	1.14
Henan	1.33	1.36	1.33	1.28	1.20	1.21	1.19	1.23	1.02	0.96	0.92	0.93	0.83	0.69	0.63	0.59
Hubei	1.43	1.41	1.39	1.38	1.31	1.29	1.34	1.40	1.26	1.12	1.03	0.91	0.72	0.53	0.47	0.41
Hunan	1.23	1.25	1.22	1.16	1.12	1.11	1.12	1.12	1.01	0.91	0.88	0.63	0.46	0.26	0.23	0.15
Guangdong	2.39	2.38	2.30	2.20	2.16	2.08	2.12	2.08	1.94	1.82	1.74	1.64	1.54	1.43	1.39	1.30
Guangxi	0.38	0.45	0.40	0.30	0.16	0.21	0.19	0.22	0.13	-0.06	-0.14	-0.24	-0.40	-0.32	-0.32	-0.31
Hainan	0.00	0.00	0.00	-0.60	-0.61	-0.63	-0.63	-0.64	-0.97	-1.16	-1.17	-1.33	-1.36	-1.53	-1.58	-1.67
Sichuan(Chq)	1.28	1.32	1.31	1.34	1.27	1.24	1.28	1.24	1.08	0.93	0.98	1.07	1.00	0.83	0.75	0.80
Guizhou	-0.24	-0.21	-0.23	-0.32	-0.36	-0.29	-0.28	-0.27	-0.38	-0.31	-0.34	-0.42	-0.45	-0.60	-0.63	-0.64
Yunan	0.22	0.29	0.31	0.24	0.23	0.10	0.08	0.08	0.06	-0.01	-0.08	-0.04	-0.07	-0.17	-0.20	-0.18
Tibet	-4.16	-3.58	-3.26	-3.42	-3.40	-3.62	-2.35	-3.70	-3.49	-3.39	-3.74	-3.62	-3.60	-3.63	-3.74	-3.83
Shaanxi	0.33	0.34	0.33	0.32	0.27	0.22	0.25	0.20	0.11	0.03	0.07	0.11	0.07	-0.03	-0.02	-0.02
Gansu	0.22	0.25	0.21	0.23	0.23	0.20	0.21	0.21	0.19	0.13	0.07	0.10	-0.02	-0.18	-0.30	-0.37
Qinghai	-1.07	-1.06	-1.09	-1.24	-1.34	-1.43	-1.45	-1.45	-1.43	-1.60	-1.60	-1.48	-1.60	-1.78	-1.81	-2.00
Ningxia	-0.99	-0.99	-1.04	-1.03	-1.10	-1.21	-1.23	-1.18	-1.27	-1.34	-1.29	-1.24	-1.30	-1.37	-1.44	-1.49
Xinjiang	0.61	0.64	0.56	0.44	0.34	0.31	0.20	0.16	0.16	0.10	0.05	0.21	0.27	0.17	0.14	-0.08

Source: China Statistical Yearbook

Data 6.16 China returns to labour of the tradable sector - 1-alphaT

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	0.05	0.06	0.06	0.10	0.05	0.06	0.05	0.05	0.04	0.04	0.06	0.06	0.06	0.06	0.06	0.05
Tianjin	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03
Hebei	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02
Shanxi	0.07	0.08	0.08	0.08	0.07	0.08	0.08	0.07	0.06	0.06	0.06	0.05	0.05	0.04	0.04	0.04
Inner Mongolia	0.08	0.09	0.09	0.07	0.08	0.08	0.08	0.08	0.07	0.07	0.06	0.06	0.05	0.04	0.04	0.04
Liaoning	0.07	0.07	0.07	0.06	0.06	0.07	0.06	0.06	0.05	0.04	0.05	0.04	0.04	0.03	0.03	0.02
Jilin	0.07	0.08	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.05	0.06	0.06	0.06	0.05	0.04	0.04
Heilongjiang	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.07	0.06	0.06	0.06	0.05	0.05	0.05	0.04
Shanghai	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03
Jiangsu	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Zhejiang	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01
Anhui	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02
Fujian	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02
Jiangxi	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.04	0.03	0.04	0.05	0.04	0.03	0.03	0.03
Shandong	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Henan	0.04	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02
Hubei	0.05	0.05	0.05	0.05	0.04	0.05	0.05	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.02
Hunan	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.03	0.02	0.02	0.02	0.02
Guangdong	0.06	0.06	0.05	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02
Guangxi	0.05	0.06	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.02	0.03	0.03	0.03
Hainan	0.00	0.00	0.00	0.09	0.09	0.09	0.09	0.08	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.03
Sichuan (Chq)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.03	0.04	0.04	0.04	0.03	0.03	0.03
Guizhou	0.05	0.06	0.06	0.05	0.05	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04
Yunan	0.05	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Tibet	0.04	0.05	0.06	0.05	0.05	0.04	0.14	0.04	0.04	0.05	0.04	0.04	0.04	0.04	0.03	0.03
Shaanxi	0.06	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.04	0.05	0.05
Gansu	0.07	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.05	0.04	0.04
Qinghai	0.11	0.11	0.11	0.09	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.08	0.07	0.06	0.06	0.05
Ningxia	0.10	0.10	0.10	0.09	0.09	0.09	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.06
Xinjiang	0.12	0.13	0.12	0.10	0.09	0.09	0.08	0.08	0.08	0.07	0.07	0.08	0.09	0.08	0.08	0.06

Source: China Statistical Yearbook

Data 6.17 China returns to labour of the nontradable sector - 1-alphaN

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	0.15	0.15	0.14	0.13	0.13	0.15	0.16	0.19	0.17	0.17	0.18	0.16	0.17	0.14	0.14	0.14
Tianjin	0.11	0.11	0.11	0.11	0.12	0.10	0.09	0.13	0.18	0.15	0.15	0.15	0.15	0.11	0.10	0.09
Hebei	0.11	0.12	0.12	0.12	0.12	0.12	0.11	0.13	0.12	0.13	0.12	0.10	0.08	0.07	0.06	0.06
Shanxi	0.12	0.12	0.12	0.13	0.14	0.13	0.13	0.16	0.17	0.15	0.16	0.14	0.12	0.10	0.10	0.10
Inner Mongolia	0.15	0.16	0.17	0.16	0.15	0.16	0.14	0.20	0.20	0.21	0.21	0.19	0.16	0.12	0.10	0.09
Liaoning	0.15	0.15	0.14	0.14	0.14	0.15	0.15	0.15	0.13	0.13	0.14	0.13	0.12	0.09	0.08	0.07
Jilin	0.16	0.17	0.16	0.17	0.17	0.19	0.19	0.21	0.19	0.19	0.20	0.19	0.18	0.13	0.12	0.10
Heilongjiang	0.17	0.17	0.16	0.15	0.13	0.16	0.16	0.19	0.17	0.17	0.19	0.17	0.15	0.13	0.12	0.11
Shanghai	0.11	0.11	0.10	0.10	0.11	0.11	0.11	0.14	0.18	0.14	0.14	0.13	0.11	0.09	0.10	0.09
Jiangsu	0.10	0.10	0.09	0.09	0.09	0.10	0.09	0.13	0.12	0.11	0.10	0.07	0.07	0.06	0.05	0.05
Zhejiang	0.09	0.09	0.08	0.08	0.08	0.09	0.08	0.11	0.11	0.10	0.10	0.06	0.06	0.06	0.05	0.05
Anhui	0.11	0.11	0.11	0.12	0.13	0.13	0.12	0.17	0.16	0.14	0.14	0.11	0.11	0.08	0.07	0.06
Fujian	0.11	0.11	0.11	0.10	0.10	0.10	0.09	0.11	0.09	0.09	0.09	0.08	0.07	0.06	0.06	0.06
Jiangxi	0.11	0.11	0.11	0.11	0.10	0.12	0.11	0.16	0.17	0.17	0.18	0.14	0.14	0.10	0.10	0.08
Shandong	0.07	0.07	0.07	0.07	0.08	0.09	0.07	0.12	0.12	0.10	0.10	0.07	0.06	0.05	0.05	0.05
Henan	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.15	0.16	0.17	0.17	0.13	0.12	0.10	0.10	0.10
Hubei	0.12	0.12	0.12	0.12	0.15	0.14	0.14	0.17	0.17	0.16	0.16	0.13	0.12	0.09	0.08	0.07
Hunan	0.11	0.12	0.11	0.10	0.11	0.12	0.11	0.16	0.16	0.14	0.15	0.11	0.10	0.08	0.08	0.07
Guangdong	0.10	0.11	0.10	0.10	0.10	0.11	0.10	0.15	0.16	0.17	0.15	0.12	0.11	0.10	0.09	0.09
Guangxi	0.12	0.13	0.13	0.12	0.13	0.14	0.13	0.14	0.13	0.13	0.14	0.11	0.10	0.09	0.07	0.07
Hainan	0.00	0.00	0.00	0.08	0.09	0.10	0.09	0.17	0.11	0.15	0.17	0.14	0.11	0.08	0.07	0.07
Sichuan (Chq)	0.12	0.12	0.11	0.11	0.12	0.11	0.11	0.15	0.15	0.14	0.14	0.10	0.09	0.07	0.07	0.06
Guizhou	0.12	0.12	0.12	0.12	0.13	0.14	0.13	0.17	0.16	0.19	0.20	0.20	0.18	0.16	0.13	0.12
Yunan	0.13	0.13	0.13	0.13	0.14	0.14	0.13	0.16	0.17	0.15	0.16	0.12	0.12	0.11	0.09	0.09
Tibet	0.14	0.15	0.15	0.12	0.11	0.09	0.08	0.15	0.18	0.22	0.24	0.19	0.16	0.14	0.11	0.10
Shaanxi	0.14	0.14	0.14	0.13	0.13	0.13	0.12	0.17	0.17	0.17	0.18	0.15	0.13	0.12	0.11	0.10
Gansu	0.12	0.12	0.12	0.11	0.10	0.11	0.12	0.17	0.20	0.23	0.21	0.15	0.14	0.12	0.11	0.12
Qinghai	0.16	0.17	0.18	0.16	0.18	0.17	0.17	0.23	0.24	0.23	0.23	0.19	0.18	0.15	0.14	0.12
Ningxia	0.10	0.10	0.10	0.11	0.11	0.12	0.11	0.14	0.17	0.18	0.19	0.15	0.13	0.12	0.10	0.11
Xinjiang	0.19	0.20	0.20	0.18	0.16	0.17	0.14	0.18	0.19	0.17	0.17	0.15	0.14	0.11	0.10	0.12

Source: China Statistical Yearbook

Data 6.18 China log of the number of staffs and workers of tradable sector (100,000,000 persons) – LemT

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	-4.16	-4.16	-4.16	-4.16	-4.13	-4.09	-4.08	-4.11	-4.17	-4.15	-4.18	-4.22	-4.26	-4.47	-4.53	-4.62
Tianjin	-4.22	-4.22	-4.22	-4.22	-4.21	-4.20	-4.17	-4.18	-4.18	-4.19	-4.19	-4.23	-4.26	-4.64	-4.66	-4.70
Hebei	-3.59	-3.54	-3.50	-3.46	-3.45	-3.43	-3.41	-3.40	-3.37	-3.40	-3.40	-3.43	-3.48	-3.71	-3.78	-3.85
Shanxi	-3.92	-3.89	-3.86	-3.82	-3.81	-3.79	-3.77	-3.75	-3.74	-3.73	-3.76	-3.77	-3.81	-4.02	-4.07	-4.12
Inner Mongolia	-4.16	-4.13	-4.10	-4.06	-4.04	-4.00	-3.97	-3.96	-3.97	-3.97	-3.98	-4.00	-4.06	-4.30	-4.39	-4.45
Liaoning	-2.91	-2.89	-2.88	-2.87	-2.86	-2.84	-2.83	-2.83	-2.86	-2.87	-2.87	-2.91	-2.95	-3.38	-3.49	-3.58
Jilin	-3.71	-3.67	-3.64	-3.63	-3.60	-3.59	-3.59	-3.58	-3.54	-3.58	-3.61	-3.63	-3.67	-4.05	-4.14	-4.24
Heilongjiang	-3.11	-3.07	-3.04	-3.02	-3.01	-2.99	-2.99	-2.99	-2.97	-2.98	-3.01	-3.07	-3.12	-3.47	-3.55	-3.65
Shanghai	-3.55	-3.54	-3.54	-3.54	-3.55	-3.55	-3.54	-3.57	-3.63	-3.69	-3.72	-3.80	-3.91	-4.19	-4.28	-4.37
Jiangsu	-3.15	-3.11	-3.07	-3.03	-3.05	-3.03	-3.02	-3.02	-3.02	-3.04	-3.03	-3.06	-3.10	-3.35	-3.42	-3.49
Zhejiang	-3.76	-3.72	-3.69	-3.66	-3.70	-3.69	-3.66	-3.69	-3.71	-3.74	-3.78	-3.83	-3.90	-4.14	-4.24	-4.35
Anhui	-3.92	-3.87	-3.83	-3.79	-3.77	-3.76	-3.73	-3.71	-3.77	-3.76	-3.71	-3.75	-3.78	-4.03	-4.09	-4.16
Fujian	-4.34	-4.30	-4.27	-4.23	-4.23	-4.20	-4.16	-4.10	-4.08	-4.05	-4.11	-4.11	-4.09	-4.18	-4.21	-4.21
Jiangxi	-4.00	-3.96	-3.93	-3.90	-3.90	-3.89	-3.86	-3.84	-3.84	-3.84	-3.86	-3.88	-3.91	-4.27	-4.36	-4.45
Shandong	-3.44	-3.38	-3.33	-3.26	-3.25	-3.20	-3.15	-3.13	-3.12	-3.10	-3.03	-3.05	-3.05	-3.22	-3.25	-3.29
Henan	-3.55	-3.51	-3.48	-3.44	-3.42	-3.41	-3.37	-3.35	-3.34	-3.32	-3.30	-3.28	-3.32	-3.48	-3.54	-3.60
Hubei	-3.44	-3.40	-3.37	-3.35	-3.34	-3.33	-3.32	-3.30	-3.30	-3.33	-3.32	-3.35	-3.37	-3.65	-3.73	-3.82
Hunan	-3.73	-3.68	-3.64	-3.61	-3.61	-3.58	-3.56	-3.55	-3.56	-3.57	-3.56	-3.59	-3.62	-3.98	-4.03	-4.11
Guangdong	-3.31	-3.26	-3.21	-3.35	-3.33	-3.29	-3.24	-3.22	-3.26	-3.27	-3.21	-3.25	-3.28	-3.42	-3.47	-3.53
Guangxi	-4.42	-4.38	-4.34	-4.32	-4.31	-4.29	-4.27	-4.24	-4.27	-4.26	-4.27	-4.29	-4.33	-4.50	-4.57	-4.64
Hainan	0.00	0.00	0.00	-5.05	-5.05	-5.06	-5.05	-5.08	-5.08	-5.15	-5.19	-5.26	-5.29	-5.54	-5.58	-5.62
Sichuan (Chq)	-3.25	-3.21	-3.18	-3.15	-3.13	-3.12	-3.09	-3.08	-3.08	-3.09	-3.09	-3.10	-3.14	-3.44	-3.53	-3.62
Guizhou	-4.75	-4.72	-4.69	-4.69	-4.67	-4.64	-4.61	-4.61	-4.72	-4.65	-4.68	-4.70	-4.69	-4.89	-4.96	-5.03
Yunan	-4.49	-4.47	-4.45	-4.44	-4.42	-4.40	-4.37	-4.36	-4.36	-4.39	-4.40	-4.40	-4.43	-4.56	-4.64	-4.69
Tibet	-7.88	-8.00	-8.14	-8.11	-8.14	-8.17	-8.14	-8.11	-8.15	-8.18	-8.22	-8.18	-8.15	-8.22	-8.27	-8.36
Shaanxi	-4.13	-4.10	-4.07	-4.05	-4.02	-4.00	-3.98	-3.98	-3.97	-4.01	-4.00	-4.02	-4.04	-4.29	-4.31	-4.37
Gansu	-4.64	-4.60	-4.56	-4.52	-4.50	-4.46	-4.41	-4.40	-4.41	-4.41	-4.43	-4.44	-4.47	-4.63	-4.76	-4.84
Qinghai	-5.97	-5.94	-5.92	-5.93	-5.91	-5.89	-5.89	-5.91	-5.84	-5.91	-5.90	-5.93	-6.00	-6.20	-6.33	-6.56
Ningxia	-5.87	-5.83	-5.79	-5.76	-5.71	-5.70	-5.66	-5.63	-5.63	-5.64	-5.62	-5.65	-5.64	-5.78	-5.85	-5.89
Xinjiang	-4.21	-4.19	-4.17	-4.16	-4.14	-4.11	-4.08	-4.07	-4.02	-4.05	-4.04	-4.07	-4.09	-4.22	-4.28	-4.41

Source: China Statistical Yearbook

Data 6.19 China log of the number of staffs and workers of nontradable sector (100,000,000 persons) – LemN

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	-4.57	-4.53	-4.49	-4.45	-4.46	-4.33	-4.27	-4.22	-4.33	-4.33	-4.31	-4.33	-4.29	-4.42	-4.49	-4.52
Tianjin	-4.93	-4.94	-4.95	-4.95	-4.95	-4.96	-4.95	-4.89	-4.91	-4.92	-4.96	-4.96	-4.97	-5.31	-5.40	-5.51
Hebei	-4.20	-4.17	-4.13	-4.10	-4.10	-4.08	-4.04	-4.01	-4.02	-4.03	-4.08	-4.06	-4.13	-4.34	-4.43	-4.51
Shanxi	-4.61	-4.57	-4.53	-4.53	-4.52	-4.50	-4.48	-4.45	-4.50	-4.51	-4.50	-4.52	-4.55	-4.77	-4.85	-4.88
Inner Mongolia	-4.70	-4.67	-4.64	-4.62	-4.63	-4.60	-4.56	-4.52	-4.52	-4.58	-4.61	-4.65	-4.72	-5.08	-5.23	-5.35
Liaoning	-3.79	-3.75	-3.71	-3.67	-3.69	-3.69	-3.66	-3.63	-3.61	-3.64	-3.64	-3.69	-3.73	-4.18	-4.32	-4.42
Jilin	-4.43	-4.40	-4.36	-4.34	-4.32	-4.30	-4.25	-4.22	-4.26	-4.30	-4.32	-4.36	-4.39	-4.81	-4.89	-4.97
Heilongjiang	-3.92	-3.93	-3.94	-3.91	-3.92	-3.89	-3.85	-3.83	-3.91	-3.93	-3.94	-3.95	-3.96	-4.32	-4.39	-4.47
Shanghai	-4.46	-4.45	-4.44	-4.44	-4.46	-4.46	-4.44	-4.43	-4.50	-4.50	-4.50	-4.54	-4.56	-4.81	-4.88	-5.00
Jiangsu	-3.94	-3.90	-3.87	-3.85	-3.86	-3.84	-3.81	-3.81	-3.81	-3.80	-3.81	-3.81	-3.83	-4.03	-4.11	-4.22
Zhejiang	-4.51	-4.48	-4.46	-4.42	-4.42	-4.44	-4.39	-4.37	-4.31	-4.29	-4.27	-4.27	-4.31	-4.47	-4.57	-4.66
Anhui	-4.35	-4.32	-4.29	-4.27	-4.27	-4.28	-4.26	-4.24	-4.32	-4.35	-4.37	-4.34	-4.34	-4.59	-4.67	-4.74
Fujian	-4.86	-4.85	-4.84	-4.85	-4.86	-4.85	-4.83	-4.79	-4.80	-4.81	-4.84	-4.84	-4.83	-5.02	-5.15	-5.18
Jiangxi	-4.81	-4.79	-4.78	-4.73	-4.75	-4.75	-4.71	-4.68	-4.66	-4.66	-4.68	-4.67	-4.66	-5.00	-5.07	-5.14
Shandong	-4.19	-4.15	-4.12	-4.06	-4.07	-4.06	-4.00	-3.92	-3.93	-3.93	-3.95	-3.93	-3.95	-4.15	-4.23	-4.29
Henan	-4.14	-4.09	-4.04	-4.01	-4.00	-3.99	-3.94	-3.91	-3.88	-3.84	-3.82	-3.81	-3.81	-4.01	-4.09	-4.10
Hubei	-4.12	-4.10	-4.08	-4.05	-4.06	-4.04	-4.00	-3.97	-3.94	-3.96	-3.96	-3.98	-3.98	-4.29	-4.37	-4.48
Hunan	-4.40	-4.38	-4.36	-4.33	-4.33	-4.31	-4.28	-4.24	-4.24	-4.24	-4.23	-4.22	-4.23	-4.58	-4.65	-4.73
Guangdong	-3.80	-3.79	-3.77	-3.82	-3.82	-3.81	-3.76	-3.71	-3.63	-3.64	-3.65	-3.67	-3.70	-3.89	-3.98	-4.08
Guangxi	-4.84	-4.84	-4.84	-4.83	-4.84	-4.87	-4.83	-4.79	-4.74	-4.76	-4.78	-4.80	-4.84	-5.01	-5.13	-5.22
Hainan	0.00	0.00	0.00	-6.43	-6.41	-6.35	-6.34	-6.12	-6.34	-6.06	-6.07	-6.15	-6.18	-6.56	-6.65	-6.73
Sichuan (Chq)	-3.74	-3.73	-3.72	-3.68	-3.69	-3.68	-3.65	-3.63	-3.61	-3.64	-3.64	-3.66	-3.68	-3.93	-4.00	-4.12
Guizhou	-5.14	-5.15	-5.15	-5.15	-5.17	-5.13	-5.11	-5.08	-5.17	-5.13	-5.18	-5.14	-5.16	-5.32	-5.43	-5.44
Yunan	-4.94	-4.94	-4.94	-4.94	-4.93	-4.93	-4.89	-4.87	-4.86	-4.83	-4.86	-4.86	-4.87	-4.96	-5.04	-5.12
Tibet	-7.50	-7.50	-7.49	-7.53	-7.63	-7.66	-7.67	-7.63	-7.71	-7.85	-7.78	-7.80	-7.85	-7.93	-8.04	-8.14
Shaanxi	-4.70	-4.68	-4.67	-4.66	-4.66	-4.66	-4.63	-4.62	-4.64	-4.67	-4.69	-4.66	-4.67	-4.92	-4.98	-5.01
Gansu	-5.21	-5.19	-5.18	-5.19	-5.20	-5.17	-5.08	-5.05	-5.05	-5.12	-5.14	-5.14	-5.17	-5.36	-5.48	-5.49
Qinghai	-6.25	-6.24	-6.24	-6.24	-6.27	-6.25	-6.23	-6.21	-6.33	-6.36	-6.36	-6.36	-6.39	-6.58	-6.67	-6.79
Ningxia	-6.63	-6.61	-6.60	-6.58	-6.57	-6.53	-6.50	-6.48	-6.45	-6.45	-6.43	-6.50	-6.48	-6.62	-6.72	-6.77
Xinjiang	-5.15	-5.14	-5.14	-5.11	-5.13	-5.07	-5.03	-5.01	-5.02	-5.06	-5.10	-5.13	-5.15	-5.29	-5.41	-5.39

Source: China Statistical Yearbook

Data 6.20 China official and black market exchange rate (in RMB/USD)

Year	LCHNXRAT	LCHNBXRAT
1980	0.40	0.66
1981	0.53	0.71
1982	0.64	0.81
1983	0.68	0.87
1984	0.84	0.99
1985	1.08	1.11
1986	1.24	1.39
1987	1.31	1.48
1988	1.31	1.92
1989	1.33	2.45
1990	1.57	2.60
1991	1.67	2.43
1992	1.71	2.15
1993	1.75	2.30
1994	2.15	2.27
1995	2.12	2.23
1996	2.12	2.16
1997	2.12	2.16
1998	2.11	2.15
1999	2.11	2.22
2000	2.11	2.28

Source:

LCHNXRAT International Financial Statistics

LCHNBXRAT World Currency Yearbook

World Development Indicator

Data 6.21 China GDP deflator (2000=100)

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	11.09	11.70	12.88	15.82	19.55	21.27	24.77	28.45	34.49	42.76	55.57	66.25	73.95	82.02	88.32	100.00
Tianjin	14.28	15.70	17.61	15.10	18.84	19.79	33.53	24.88	32.31	42.87	54.11	65.17	74.46	82.61	89.04	100.00
Hebei	8.22	8.88	10.21	12.05	15.45	16.85	20.02	23.79	30.90	40.95	53.82	65.44	75.60	82.70	90.05	100.00
Shanxi	12.62	14.05	15.42	16.18	21.97	24.85	28.37	32.84	41.18	51.17	64.48	77.27	87.83	96.31	94.00	100.00
Inner Mongolia	9.88	10.90	12.04	16.31	19.67	20.74	22.16	29.73	37.70	48.48	59.75	68.39	78.47	85.15	92.11	100.00
Liaoning	12.38	13.74	15.90	17.03	21.03	22.45	28.09	30.66	40.83	51.65	60.85	67.84	76.76	83.63	89.94	100.00
Jilin	13.17	13.84	15.83	18.30	22.58	22.82	26.99	29.81	38.15	49.12	61.70	70.49	79.42	85.66	92.54	100.00
Heilongjiang	11.11	12.69	13.79	15.57	18.45	20.21	23.76	26.91	37.19	49.48	61.14	72.32	81.90	87.00	89.69	100.00
Shanghai	12.59	14.19	16.11	14.75	16.46	17.52	26.94	23.60	32.02	41.99	52.53	62.51	72.57	81.53	89.12	100.00
Jiangsu	9.72	10.70	12.97	11.80	15.62	16.23	25.49	21.85	32.02	44.89	57.59	68.98	76.89	83.61	90.11	100.00
Zhejiang	7.58	8.49	10.43	11.09	14.61	14.81	19.95	21.10	28.79	40.88	55.56	67.67	76.79	83.32	89.70	100.00
Anhui	9.64	11.10	13.18	16.31	19.45	20.95	23.61	24.44	31.51	43.94	62.46	72.87	84.42	92.14	95.88	100.00
Fujian	5.01	5.32	6.21	8.08	10.92	12.16	13.42	18.28	25.28	38.67	52.37	62.52	73.17	83.48	90.13	100.00
Jiangxi	9.43	10.64	12.36	15.12	18.64	21.44	22.41	26.89	34.29	43.69	56.74	72.13	82.93	92.28	98.17	100.00
Shandong	7.96	8.57	10.04	10.97	14.93	16.36	22.01	24.31	30.34	43.07	56.66	68.72	77.36	83.62	89.98	100.00
Henan	9.17	9.61	10.87	13.87	16.85	18.26	20.99	23.98	30.59	41.64	55.72	68.48	78.71	85.38	90.22	100.00
Hubei	10.33	11.39	13.11	14.21	17.47	19.75	21.85	24.37	31.84	41.67	53.32	67.04	78.01	85.81	91.04	100.00
Hunan	9.22	10.31	12.09	15.56	18.26	19.95	20.29	26.20	33.36	45.06	58.44	69.40	79.74	86.89	90.72	100.00
Guangdong	6.81	6.92	8.10	10.01	14.06	15.17	18.75	21.56	30.25	40.84	53.72	67.55	75.87	82.42	88.69	100.00
Guangxi	8.27	9.13	10.59	14.26	17.77	19.21	19.21	28.60	38.58	56.02	72.89	80.55	87.96	91.27	94.89	100.00
Hainan	0.00	0.00	8.29	13.94	17.29	18.21	16.95	27.19	44.77	62.04	73.24	77.96	80.57	85.01	91.06	100.00
Sichuan (Chq)	10.03	11.03	12.56	15.84	18.91	21.52	23.09	28.08	35.83	48.67	62.54	73.62	82.49	89.38	95.69	100.00
Guizhou	11.28	12.65	14.45	20.94	24.63	26.70	24.47	34.39	41.40	52.53	64.10	71.67	79.56	84.86	92.04	100.00
Yunan	8.04	8.54	9.40	12.67	16.34	19.96	18.90	30.57	38.60	47.82	59.45	74.03	82.35	91.01	94.83	100.00
Tibet	11.19	10.64	9.87	17.79	18.78	20.91	20.66	28.95	32.09	36.93	44.23	53.29	64.42	77.07	89.72	100.00
Shaanxi	24.95	27.93	13.92	17.48	21.60	23.58	25.09	32.79	38.90	49.40	60.22	70.01	78.15	83.12	90.13	100.00
Gansu	12.01	13.88	15.96	18.11	22.03	24.55	28.28	31.97	36.87	45.23	55.66	70.81	79.61	88.05	95.09	100.00
Qinghai	11.49	12.74	14.03	20.43	24.66	26.41	23.09	33.68	41.34	52.81	63.27	69.87	76.62	83.49	91.11	100.00
Ningxia	9.96	11.70	13.64	17.60	21.26	24.31	25.78	31.64	38.97	51.17	64.36	67.76	81.01	86.64	91.82	100.00
Xinjiang	7.03	7.96	9.42	13.20	16.29	18.29	19.79	28.22	36.36	48.18	60.02	68.00	75.04	82.55	86.57	100.00

Source: China Statistical Yearbook

Data 6.22 China index of GDP (preceding year=100)

Region	1985**	1986**	1987**	1988**	1989*	1990*	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	97.80	105.50	113.20	116.10	104.40	105.38	107.50	111.60	112.10	113.50	112.40	109.20	109.60	109.80	110.23	110.98
Tianjin	103.20	106.80	110.40	116.20	101.60	102.52	106.00	111.70	112.10	114.30	114.90	114.30	112.10	109.30	110.04	110.77
Hebei	102.20	107.70	113.20	116.80	104.30	104.65	109.00	115.60	117.70	114.90	113.90	113.50	112.50	110.70	109.15	109.47
Shanxi	103.10	105.40	107.70	120.10	104.50	105.09	103.30	113.80	112.20	109.40	111.10	111.00	110.50	109.00	105.10	107.78
Inner Mongolia	100.80	104.00	107.20	112.70	102.30	108.16	107.50	111.00	110.60	110.10	109.10	112.70	109.70	109.60	107.76	109.66
Liaoning	107.00	109.70	112.40	115.10	102.30	100.30	105.50	112.10	114.90	111.20	107.10	108.60	108.90	108.30	108.22	108.94
Jilin	99.30	107.50	115.70	113.90	95.90	103.45	104.80	112.20	112.80	114.30	109.70	113.70	109.20	109.00	108.14	109.16
Heilongjiang	109.10	108.70	108.30	110.00	105.00	104.45	103.90	106.80	107.60	108.80	109.60	110.50	110.00	108.30	107.45	108.20
Shanghai	105.00	106.00	107.00	110.70	103.00	103.45	107.00	114.90	114.90	114.30	114.10	113.00	112.70	110.10	110.19	110.77
Jiangsu	112.20	116.00	119.80	123.70	101.40	104.40	106.50	126.00	120.70	116.50	115.40	112.20	112.00	111.00	110.12	110.64
Zhejiang	115.90	117.70	119.50	119.70	99.40	103.96	115.40	119.00	122.00	120.00	116.70	112.70	111.10	110.10	110.02	111.03
Anhui	114.50	113.10	111.70	112.00	104.80	103.17	96.30	116.80	121.00	120.70	114.30	114.40	112.70	108.50	108.10	108.27
Fujian	102.20	109.60	117.00	122.40	106.50	107.01	114.70	120.30	125.20	121.70	115.20	115.40	114.50	111.40	110.00	109.47
Jiangxi	109.30	110.30	111.30	114.60	105.10	104.88	108.20	114.80	113.70	117.00	114.50	113.40	111.50	108.20	107.80	107.99
Shandong	105.50	111.50	117.50	123.90	104.00	105.34	113.90	116.90	118.50	116.30	114.20	112.20	111.20	110.80	110.14	110.50
Henan	99.70	108.30	116.90	113.30	104.40	104.50	107.00	113.70	115.80	113.80	114.80	113.90	110.40	108.70	108.05	109.45
Hubei	104.80	108.20	111.60	112.40	102.50	102.52	104.50	114.10	114.30	115.20	114.60	113.20	113.00	110.30	108.27	109.26
Hunan	108.20	110.10	112.00	110.80	103.60	103.96	107.80	112.40	113.10	111.00	110.90	112.60	110.80	109.10	108.25	108.98
Guangdong	99.80	111.80	123.80	125.90	107.00	111.32	117.30	122.00	122.30	119.10	114.90	110.70	110.60	110.20	109.46	110.83
Guangxi	105.70	109.00	112.30	110.20	102.90	107.00	112.70	118.30	121.20	116.00	115.30	110.30	108.10	109.10	107.71	107.27
Hainan	0.00	0.00	112.00	112.50	105.40	109.46	112.40	140.20	120.90	111.90	104.30	104.80	106.70	108.30	108.55	108.75
Sichuan (Chq)	104.60	108.20	111.80	113.70	102.80	103.70	107.70	112.60	113.90	111.10	110.00	110.10	110.20	109.10	105.60	109.00
Guizhou	107.00	108.60	110.20	110.40	104.60	104.24	109.90	108.10	109.90	108.50	107.50	108.90	109.00	108.50	108.35	108.65
Yunan	98.10	105.10	112.10	116.00	105.80	108.71	106.60	110.90	110.60	111.60	111.20	110.40	109.40	108.00	107.22	107.12
Tibet	77.90	93.20	108.50	106.00	108.40	108.92	101.60	107.10	108.20	115.60	117.90	113.20	111.30	110.20	109.64	109.41
Shaanxi	107.30	109.10	110.90	113.40	103.30	104.34	110.90	108.20	113.30	108.50	109.00	110.20	109.20	109.10	108.35	109.03
Gansu	113.30	111.50	109.70	117.10	108.80	105.54	106.50	109.90	111.60	110.40	109.90	111.50	108.50	109.20	108.35	108.71
Qinghai	102.40	105.10	107.80	111.20	101.20	103.72	104.70	107.40	109.60	108.20	108.00	108.60	109.00	109.00	108.16	108.96
Ningxia	115.50	111.90	108.30	111.80	108.40	103.79	105.10	108.60	110.10	108.20	109.00	118.10	107.60	108.50	108.70	109.76
Xinjiang	109.90	110.40	110.90	113.50	105.90	109.22	113.90	113.10	110.30	110.90	110.30	106.40	111.00	107.30	107.07	108.22

Source: China Statistical Yearbook

Notes: ** Index of total output value of society; *Index of gross national product

Data 6.23 China real parallel exchange rate (2000=100) - RER2000B

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	2.95	3.20	3.22	3.49	3.84	3.94	3.66	3.26	3.25	3.01	2.73	2.51	2.41	2.32	2.32	2.28
Tianjin	2.70	2.90	2.91	3.53	3.88	4.02	3.36	3.39	3.31	3.01	2.76	2.53	2.40	2.31	2.31	2.28
Hebei	3.25	3.47	3.45	3.76	4.08	4.18	3.87	3.44	3.36	3.06	2.77	2.52	2.39	2.31	2.30	2.28
Shanxi	2.82	3.02	3.04	3.47	3.72	3.79	3.52	3.12	3.07	2.83	2.58	2.36	2.24	2.16	2.26	2.28
Inner Mongolia	3.07	3.27	3.29	3.46	3.83	3.97	3.77	3.22	3.16	2.89	2.66	2.48	2.35	2.28	2.28	2.28
Liaoning	2.84	3.04	3.01	3.41	3.77	3.89	3.53	3.18	3.08	2.83	2.64	2.49	2.37	2.30	2.30	2.28
Jilin	2.78	3.03	3.01	3.34	3.70	3.87	3.57	3.21	3.15	2.88	2.63	2.45	2.34	2.27	2.28	2.28
Heilongjiang	2.95	3.12	3.15	3.50	3.90	4.00	3.70	3.32	3.17	2.87	2.64	2.42	2.31	2.26	2.31	2.28
Shanghai	2.82	3.01	3.00	3.56	4.01	4.14	3.58	3.45	3.32	3.03	2.79	2.57	2.43	2.32	2.31	2.28
Jiangsu	3.08	3.29	3.21	3.78	4.07	4.22	3.63	3.52	3.32	2.97	2.70	2.47	2.37	2.30	2.30	2.28
Zhejiang	3.33	3.52	3.43	3.84	4.13	4.31	3.88	3.56	3.43	3.06	2.73	2.49	2.37	2.30	2.31	2.28
Anhui	3.09	3.25	3.20	3.46	3.85	3.96	3.71	3.41	3.34	2.99	2.62	2.42	2.28	2.20	2.24	2.28
Fujian	3.75	3.99	3.95	4.16	4.42	4.50	4.27	3.70	3.56	3.11	2.79	2.57	2.42	2.30	2.30	2.28
Jiangxi	3.11	3.29	3.26	3.53	3.89	3.94	3.76	3.32	3.25	2.99	2.71	2.43	2.30	2.20	2.22	2.28
Shandong	3.28	3.51	3.47	3.85	4.11	4.21	3.78	3.42	3.37	3.01	2.71	2.48	2.37	2.30	2.30	2.28
Henan	3.14	3.40	3.39	3.62	3.99	4.10	3.83	3.43	3.37	3.04	2.73	2.48	2.35	2.28	2.30	2.28
Hubei	3.02	3.23	3.20	3.60	3.95	4.02	3.79	3.41	3.33	3.04	2.77	2.50	2.36	2.27	2.29	2.28
Hunan	3.14	3.33	3.28	3.50	3.91	4.01	3.86	3.34	3.28	2.96	2.68	2.47	2.34	2.26	2.30	2.28
Guangdong	3.44	3.72	3.68	3.95	4.17	4.28	3.94	3.54	3.38	3.06	2.77	2.49	2.39	2.31	2.32	2.28
Guangxi	3.24	3.45	3.41	3.59	3.94	4.05	3.91	3.25	3.13	2.74	2.46	2.32	2.24	2.21	2.25	2.28
Hainan	0.00	0.00	3.66	3.61	3.96	4.10	4.04	3.31	2.99	2.64	2.46	2.35	2.33	2.28	2.29	2.28
Sichuan (Chq)	3.05	3.26	3.24	3.49	3.87	3.93	3.73	3.27	3.21	2.88	2.61	2.41	2.30	2.23	2.24	2.28
Guizhou	2.93	3.12	3.10	3.21	3.61	3.72	3.67	3.07	3.06	2.81	2.59	2.43	2.34	2.28	2.28	2.28
Yunan	3.27	3.51	3.53	3.71	4.02	4.01	3.93	3.19	3.13	2.90	2.67	2.40	2.30	2.21	2.25	2.28
Tibet	2.94	3.29	3.49	3.37	3.88	3.96	3.84	3.24	3.32	3.16	2.96	2.73	2.55	2.38	2.31	2.28
Shaanxi	2.14	2.33	3.14	3.39	3.74	3.84	3.65	3.12	3.13	2.87	2.65	2.46	2.36	2.30	2.30	2.28
Gansu	2.87	3.03	3.00	3.35	3.72	3.80	3.53	3.14	3.18	2.96	2.73	2.45	2.34	2.25	2.25	2.28
Qinghai	2.92	3.11	3.13	3.23	3.61	3.73	3.73	3.09	3.06	2.80	2.60	2.46	2.38	2.30	2.29	2.28
Ningxia	3.06	3.20	3.16	3.38	3.76	3.81	3.62	3.15	3.12	2.83	2.59	2.49	2.32	2.26	2.28	2.28
Xinjiang	3.41	3.58	3.53	3.67	4.02	4.10	3.88	3.27	3.19	2.90	2.66	2.49	2.40	2.31	2.34	2.28

Source: China Statistical Yearbook

Data 6.24 US Data

Year	LPC2000	LPT2000	LPN2000	LVA2000T	LVA2000N	LTFP2000T	LTFP2000N	LKT2000	LKN2000	LEMT	LEMN	1-ALPHAT	1-ALPHAN	LWN2000	LWT2000	LIT2000	LIN2000
Unit	N/A	N/A	N/A	1USD	1USD			1USD	1USD	1p	1p	N/A	N/A	1USD	1USD	1USD	1USD
1985	4.24	4.50	4.13	27.84	29.14	6.30	12.50	24.83	25.89	17.03	19.23	0.42	1.39	24.78	22.52	21.83	22.90
1986	4.27	4.49	4.17	27.84	29.17	6.34	12.40	24.84	25.85	17.01	19.25	0.43	1.38	24.81	22.56	21.82	22.90
1987	4.29	4.48	4.21	27.91	29.19	6.31	12.50	24.84	25.81	17.01	19.29	0.42	1.40	24.85	22.59	21.84	22.90
1988	4.33	4.50	4.25	27.97	29.24	6.32	12.60	24.82	25.78	17.03	19.32	0.41	1.41	24.90	22.63	21.86	22.90
1989	4.36	4.55	4.29	27.96	29.27	6.32	12.40	24.78	25.75	17.03	19.35	0.41	1.39	24.93	22.62	21.86	22.90
1990	4.40	4.58	4.33	27.97	29.29	6.35	12.40	24.75	25.72	17.02	19.36	0.41	1.39	24.95	22.62	21.78	22.90
1991	4.44	4.59	4.37	27.94	29.29	6.42	12.20	24.73	25.68	16.99	19.36	0.42	1.37	24.94	22.61	21.66	22.80
1992	4.46	4.61	4.40	27.95	29.31	6.46	12.20	24.71	25.66	16.97	19.36	0.42	1.36	24.97	22.62	21.68	22.80
1993	4.48	4.62	4.44	27.98	29.33	6.44	12.10	24.70	25.64	16.97	19.39	0.41	1.35	24.98	22.64	21.75	22.90
1994	4.50	4.63	4.46	28.04	29.36	6.41	12.10	24.71	25.64	16.99	19.42	0.40	1.35	25.00	22.68	21.89	23.00
1995	4.52	4.62	4.49	28.09	29.38	6.43	12.20	24.73	25.63	17.00	19.44	0.40	1.36	25.04	22.73	21.93	23.00
1996	4.54	4.64	4.51	28.12	29.43	6.42	12.20	24.73	25.64	17.00	19.46	0.39	1.36	25.08	22.75	21.98	23.10
1997	4.56	4.63	4.54	28.16	29.47	6.49	12.20	24.75	25.65	17.01	19.49	0.40	1.36	25.13	22.81	22.07	23.10
1998	4.57	4.62	4.56	28.20	29.53	6.56	12.40	24.79	25.67	17.01	19.51	0.41	1.39	25.19	22.88	22.15	23.20
1999	4.58	4.60	4.58	28.25	29.57	6.55	12.60	24.83	25.69	17.00	19.54	0.40	1.42	25.24	22.93	22.23	23.30
2000	4.61	4.61	4.61	28.28	29.62	6.61	12.80	24.86	25.71	16.99	19.56	0.40	1.45	25.30	22.98	22.29	23.30

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Notes:

LPC2000	US FDP deflator (2000=100);	LPT2000	US tradable price deflator (2000=100)
LPN 2000	US nontradable price deflator (2000=100);	LVA2000T	US real value added of the tradable sector (2000=100)
LVA2000N	US real value added of the nontradable sector (2000=100);	LTFP2000T	US total factor productivity of the tradable sector (2000=100)
LTFP2000N	US total factor productivity of the nontradable sector (2000=100);	LKT2000	US real capital stock of the tradable sector (2000=100)
LKN2000	US real capital stock of the nontradable sector (2000=100);	LEMT	US total employment of the tradable sector
LEMN	US total employment of the nontradable sector;	1-ALPHAT	US returns to labour of the tradable sector
1-ALPHAN	US returns to labour of the nontradable sector;	LWT2000	US real wages of the tradable sector (2000=100)
LWN2000	US real wages of the nontradable sector (2000=100);	LIT2000	US real investment of the tradable sector (2000=100)
LIN	US real investment of the nontradable sector (2000=100)		

Data 6.25 China relative price of nontradables (2000 constant prices) - LpNLpT2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	-0.24	-0.23	-0.11	0.52	-0.29	-0.27	-0.35	-0.52	-0.51	-0.48	-0.27	-0.03	0.03	0.17	0.19	0.00
Tianjin	0.51	0.51	0.44	0.44	0.28	0.48	0.45	-0.06	-0.45	-0.26	-0.22	-0.18	-0.22	-0.02	0.05	0.00
Hebei	0.55	0.54	0.47	0.47	0.20	0.30	0.26	0.15	0.00	-0.13	-0.09	-0.03	-0.04	-0.02	0.00	0.00
Shanxi	0.48	0.50	0.52	0.69	0.33	0.29	0.27	0.16	-0.14	-0.10	-0.19	-0.17	-0.17	-0.03	0.02	0.00
Inner Mongolia	0.42	0.50	0.54	0.38	0.46	0.50	0.44	0.12	0.05	-0.06	-0.11	-0.05	-0.14	-0.11	-0.09	0.00
Liaoning	0.26	0.23	0.28	0.31	0.15	0.30	0.21	0.18	0.11	0.02	-0.01	-0.02	-0.07	0.03	0.07	0.00
Jilin	0.30	0.27	0.45	0.31	0.14	0.47	0.03	-0.11	-0.03	-0.17	-0.14	-0.03	-0.06	0.00	-0.02	0.00
Heilongjiang	0.27	0.18	-0.05	0.25	0.32	0.39	-0.01	0.02	0.00	-0.10	-0.18	-0.11	-0.10	0.03	0.07	0.00
Shanghai	-0.04	-0.03	0.09	0.12	-0.06	0.04	0.02	-0.24	-0.54	-0.26	-0.29	-0.10	-0.03	0.02	0.02	0.00
Jiangsu	0.12	0.07	0.05	-0.04	-0.21	-0.08	-0.04	-0.50	-0.69	-0.57	-0.52	-0.08	-0.07	-0.01	0.02	0.00
Zhejiang	0.27	0.20	0.24	0.30	0.14	0.19	0.10	-0.24	-0.31	-0.33	-0.37	0.10	0.02	0.00	0.06	0.00
Anhui	0.51	0.43	0.37	0.42	0.22	0.35	0.25	-0.11	-0.27	-0.29	-0.45	-0.20	-0.28	-0.13	-0.03	0.00
Fujian	0.56	0.64	0.52	0.57	0.49	0.30	0.40	-0.09	0.03	-0.09	-0.06	0.07	0.07	0.06	0.06	0.00
Jiangxi	0.18	0.20	0.18	0.14	0.13	0.12	-0.01	-0.45	-0.56	-0.75	-0.47	-0.22	-0.31	-0.19	-0.07	0.00
Shandong	0.55	0.51	0.53	0.48	0.13	0.21	0.17	-0.40	-0.66	-0.59	-0.45	-0.04	-0.02	0.04	0.08	0.00
Henan	0.66	0.69	0.58	0.68	0.46	0.50	0.44	0.00	-0.28	-0.35	-0.45	-0.20	-0.13	-0.08	-0.04	0.00
Hubei	0.45	0.45	0.46	0.44	0.18	0.22	0.22	0.11	-0.02	-0.17	-0.23	-0.12	-0.19	-0.16	-0.06	0.00
Hunan	0.45	0.44	0.47	0.52	0.31	0.32	0.36	-0.06	-0.12	-0.08	-0.14	0.01	-0.03	0.01	0.01	0.00
Guangdong	0.89	0.86	0.83	0.79	0.65	0.56	0.48	0.04	0.05	-0.10	-0.10	0.04	0.04	0.07	0.05	0.00
Guangxi	0.25	0.31	0.29	0.20	-0.04	0.04	-0.10	-0.17	-0.09	-0.29	-0.40	-0.22	-0.27	-0.04	0.03	0.00
Hainan	0.00	0.00	0.00	0.29	0.43	0.43	0.51	0.04	0.18	0.15	-0.08	-0.14	0.01	0.02	0.06	0.00
Sichuan (Chq)	-0.13	-0.12	-0.10	-0.03	-0.16	-0.14	-0.12	-0.55	-0.70	-0.79	-0.72	-0.24	-0.19	-0.08	-0.04	0.00
Guizhou	0.44	0.49	0.37	0.31	0.19	0.23	0.18	-0.05	-0.10	-0.23	-0.33	-0.26	-0.21	-0.19	-0.03	0.00
Yunan	-0.03	0.03	-0.04	-0.16	-0.29	-0.31	-0.33	-0.55	-0.56	-0.43	-0.57	-0.28	-0.23	-0.14	0.03	0.00
Tibet	-0.48	1.12	0.41	0.61	0.38	0.62	0.28	-0.15	-0.29	-0.45	-0.76	-0.51	-0.23	-0.07	0.13	0.00
Shaanxi	0.11	0.10	0.06	0.16	0.03	0.04	0.07	-0.34	-0.42	-0.43	-0.46	-0.26	-0.17	-0.01	-0.03	0.00
Gansu	0.54	0.49	0.62	0.62	0.62	0.69	0.60	0.19	-0.08	-0.22	-0.29	0.06	0.01	0.03	0.09	0.00
Qinghai	0.67	0.69	0.63	0.57	0.28	0.28	0.24	-0.03	-0.17	-0.31	-0.32	0.00	-0.03	0.01	0.04	0.00
Ningxia	0.51	0.48	0.38	0.38	0.16	0.16	0.19	-0.01	-0.23	-0.36	-0.46	-0.21	-0.15	-0.05	0.03	0.00
Xinjiang	-0.04	-0.06	-0.11	-0.13	-0.19	-0.11	-0.12	-0.38	-0.43	-0.48	-0.63	-0.34	-0.28	-0.12	-0.05	0.00

Source: China Statistical Yearbook

Data 6.26 China relative productivity of the tradable sector (2000 constant prices) - LtTLtN2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	0.02	0.00	0.05	-0.16	0.21	0.09	0.17	0.14	-0.77	-0.18	0.09	0.11	-0.45	-0.42	-0.44	-0.47
Tianjin	0.21	0.20	0.23	0.27	0.32	0.24	0.09	0.13	0.30	0.38	0.75	0.71	-0.04	0.11	0.21	0.21
Hebei	0.06	0.06	0.09	0.08	0.16	0.16	0.12	0.20	0.12	-0.28	0.79	1.05	0.78	1.05	1.21	1.27
Shanxi	-0.44	-0.44	-0.41	-0.35	-0.25	-0.27	-0.32	-0.27	0.33	0.43	0.68	0.98	0.73	0.95	0.88	0.82
Inner Mongolia	-0.82	-0.80	-0.76	-0.65	-0.65	-0.63	-0.65	-0.64	-0.20	-0.08	0.15	0.27	0.22	0.50	0.61	0.66
Liaoning	0.32	0.32	0.33	0.31	0.28	0.25	0.18	0.15	0.01	0.00	0.46	0.54	0.27	0.59	0.62	0.64
Jilin	-0.67	-0.68	-0.61	-0.60	-0.57	-0.46	-0.58	-0.58	-0.49	-0.36	-0.13	-0.05	-0.30	0.17	0.30	0.57
Heilongjiang	-0.43	-0.41	-0.44	-0.38	-0.33	-0.28	-0.35	-0.33	-0.05	0.06	0.33	0.50	0.32	0.42	0.63	0.42
Shanghai	-0.32	-0.33	-0.35	-0.36	-0.34	-0.35	-0.34	-0.31	-0.39	-0.33	0.32	0.37	-0.34	-0.26	-0.26	-0.25
Jiangsu	0.18	0.21	0.23	0.28	0.34	0.40	0.41	0.67	0.10	0.37	1.44	1.28	0.32	0.45	0.58	0.67
Zhejiang	0.46	0.49	0.51	0.53	0.56	0.60	0.65	0.86	0.26	0.44	1.63	1.57	0.66	0.78	0.84	1.09
Anhui	-0.18	-0.18	-0.16	-0.09	-0.03	0.01	-0.04	0.05	-0.26	0.30	1.11	1.09	0.57	0.82	0.89	1.03
Fujian	-0.26	-0.26	-0.24	-0.12	-0.05	-0.03	0.00	0.18	0.47	0.50	1.72	1.91	0.69	0.96	1.12	1.10
Jiangxi	-0.90	-0.86	-0.79	-0.78	-0.72	-0.60	-0.54	-0.32	0.15	0.51	0.61	0.84	0.70	1.12	1.11	1.08
Shandong	0.50	0.48	0.50	0.49	0.57	0.62	0.55	0.77	0.79	0.80	1.29	1.23	0.60	0.79	0.95	1.06
Henan	-0.33	-0.32	-0.30	-0.29	-0.24	-0.24	-0.31	-0.08	0.19	0.28	0.76	0.95	-0.30	0.73	0.86	0.99
Hubei	-0.16	-0.15	-0.10	-0.05	0.01	0.00	0.00	0.06	-0.88	0.27	0.73	0.87	0.60	0.83	1.00	1.09
Hunan	-0.08	-0.08	-0.07	-0.08	-0.03	-0.03	-0.08	0.03	-0.04	0.30	0.79	0.99	0.81	1.24	1.33	1.45
Guangdong	0.61	0.61	0.64	0.67	0.68	0.66	0.61	0.70	-0.91	0.31	1.84	1.90	0.65	0.66	0.76	0.82
Guangxi	0.22	0.23	0.25	0.26	0.34	0.39	0.39	0.47	0.25	0.33	1.01	1.18	0.54	1.18	1.27	1.29
Hainan	0.00	0.00	0.00	-2.42	-1.56	-1.13	-0.75	-0.65	0.50	0.48	1.17	1.32	0.98	1.32	1.27	1.37
Sichuan (Chq)	-0.07	-0.08	-0.09	-0.05	-0.06	-0.09	-0.11	-0.01	0.07	0.28	0.71	0.74	0.29	0.57	0.66	0.75
Guizhou	-0.25	-0.27	-0.30	-0.22	-0.20	-0.25	-0.31	-0.30	-0.23	-0.26	0.10	0.18	0.11	0.45	0.62	0.75
Yunan	-0.12	-0.15	-0.14	-0.09	-0.04	0.02	-0.02	0.01	0.13	0.33	0.63	0.71	0.46	0.68	0.80	0.94
Tibet	-0.26	-0.21	-0.35	-0.25	-0.14	-0.01	0.84	0.12	1.17	0.79	0.83	0.92	0.91	0.94	0.90	0.82
Shaanxi	-0.34	-0.34	-0.34	-0.31	-0.29	-0.30	-0.26	-0.24	-0.04	0.00	0.22	0.33	0.26	0.55	0.67	0.60
Gansu	-1.03	-1.02	-1.02	-1.01	-0.96	-0.90	-0.88	-0.80	-0.66	-0.65	-0.46	-0.24	-0.27	0.16	0.40	0.54
Qinghai	-0.77	-0.77	-0.84	-0.88	-0.88	-0.90	-0.90	-1.04	-0.27	-0.11	-0.11	-0.03	-0.19	-0.01	0.09	0.44
Ningxia	-0.72	-0.71	-0.75	-0.70	-0.60	-0.63	-0.62	-0.50	-0.12	0.06	0.17	0.49	0.40	0.58	0.70	0.85
Xinjiang	-0.55	-0.54	-0.55	-0.51	-0.45	-0.47	-0.56	-0.72	-0.22	-0.08	0.43	0.41	0.42	0.56	0.53	0.38

Source: China Statistical Yearbook

Data 6.27 China PPP exchange rate (2000 constant prices) - LpTLPT2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	-1.99	-1.81	-1.74	-2.19	-1.33	-1.25	-1.13	-0.98	-0.66	-0.37	-0.39	-0.40	-0.33	-0.32	-0.24	0.00
Tianjin	-2.23	-2.06	-1.88	-1.72	-1.50	-1.44	-1.36	-1.15	-0.86	-0.61	-0.46	-0.35	-0.16	-0.20	-0.13	0.00
Hebei	-2.68	-2.50	-2.32	-2.12	-1.93	-1.81	-1.70	-1.55	-1.23	-0.84	-0.69	-0.49	-0.32	-0.22	-0.11	0.00
Shanxi	-2.17	-1.99	-1.86	-1.90	-1.55	-1.41	-1.30	-1.24	-0.89	-0.59	-0.38	-0.24	-0.11	-0.10	-0.06	0.00
Inner Mongolia	-2.28	-2.12	-2.01	-1.69	-1.69	-1.56	-1.46	-1.32	-1.04	-0.79	-0.62	-0.47	-0.29	-0.21	-0.10	0.00
Liaoning	-2.34	-2.17	-1.99	-1.82	-1.67	-1.60	-1.49	-1.35	-1.01	-0.70	-0.59	-0.47	-0.32	-0.28	-0.19	0.00
Jilin	-2.06	-1.90	-1.79	-1.55	-1.48	-1.42	-1.24	-1.16	-0.92	-0.64	-0.51	-0.42	-0.30	-0.26	-0.12	0.00
Heilongjiang	-2.08	-1.88	-1.68	-1.57	-1.45	-1.41	-1.20	-1.15	-0.96	-0.67	-0.47	-0.40	-0.26	-0.27	-0.22	0.00
Shanghai	-1.98	-1.79	-1.70	-1.57	-1.44	-1.37	-1.23	-1.09	-0.82	-0.56	-0.35	-0.36	-0.24	-0.17	-0.12	0.00
Jiangsu	-2.59	-2.37	-2.12	-1.94	-1.80	-1.67	-1.60	-1.44	-0.97	-0.62	-0.40	-0.39	-0.31	-0.24	-0.14	0.00
Zhejiang	-3.10	-2.86	-2.63	-2.42	-2.27	-2.18	-2.10	-1.88	-1.48	-1.07	-0.71	-0.61	-0.43	-0.32	-0.22	0.00
Anhui	-2.43	-2.23	-2.02	-1.84	-1.72	-1.64	-1.55	-1.54	-1.16	-0.76	-0.41	-0.26	-0.08	-0.11	-0.06	0.00
Fujian	-3.15	-2.96	-2.76	-2.50	-2.32	-2.15	-2.08	-1.84	-1.44	-0.97	-0.77	-0.60	-0.42	-0.25	-0.15	0.00
Jiangxi	-2.09	-1.93	-1.78	-1.57	-1.46	-1.31	-1.22	-1.12	-0.80	-0.34	-0.40	-0.33	-0.16	-0.11	-0.06	0.00
Shandong	-2.68	-2.50	-2.36	-2.10	-1.83	-1.67	-1.56	-1.40	-0.93	-0.57	-0.48	-0.40	-0.29	-0.24	-0.15	0.00
Henan	-2.49	-2.33	-2.16	-1.94	-1.76	-1.66	-1.57	-1.46	-1.06	-0.77	-0.43	-0.31	-0.20	-0.13	-0.08	0.00
Hubei	-2.46	-2.24	-2.09	-1.90	-1.78	-1.68	-1.64	-1.58	-1.28	-0.87	-0.56	-0.40	-0.20	-0.11	-0.05	0.00
Hunan	-2.43	-2.26	-2.09	-1.88	-1.78	-1.68	-1.62	-1.49	-1.22	-0.89	-0.65	-0.42	-0.26	-0.19	-0.11	0.00
Guangdong	-3.06	-2.86	-2.64	-2.38	-2.17	-2.01	-1.87	-1.64	-1.29	-0.93	-0.61	-0.49	-0.34	-0.24	-0.14	0.00
Guangxi	-2.30	-2.17	-1.98	-1.73	-1.53	-1.50	-1.38	-1.25	-0.93	-0.48	-0.21	-0.10	0.06	-0.10	-0.07	0.00
Hainan	-4.50	-4.49	-4.48	-1.84	-1.74	-1.62	-1.53	-1.42	-1.03	-0.63	-0.41	-0.27	-0.23	-0.17	-0.09	0.00
Sichuan(Chq)	-2.08	-1.92	-1.78	-1.58	-1.44	-1.31	-1.24	-1.12	-0.77	-0.38	-0.25	-0.27	-0.15	-0.11	-0.03	0.00
Guizhou	-2.07	-1.90	-1.75	-1.50	-1.37	-1.29	-1.22	-1.10	-0.91	-0.67	-0.46	-0.35	-0.25	-0.17	-0.09	0.00
Yunan	-2.22	-2.10	-1.98	-1.75	-1.64	-1.41	-1.28	-1.16	-0.89	-0.62	-0.35	-0.26	-0.14	-0.09	-0.07	0.00
Tibet	-1.04	-1.42	-1.60	-1.46	-1.39	-1.21	-1.00	-0.94	-0.95	-0.90	-0.42	-0.30	-0.27	-0.22	-0.09	0.00
Shaanxi	-1.99	-1.80	-1.65	-1.47	-1.33	-1.18	-1.13	-1.01	-0.76	-0.51	-0.34	-0.29	-0.21	-0.21	-0.10	0.00
Gansu	-2.18	-2.01	-1.84	-1.71	-1.56	-1.45	-1.37	-1.25	-1.03	-0.69	-0.46	-0.43	-0.29	-0.19	-0.17	0.00
Qinghai	-2.09	-1.90	-1.74	-1.51	-1.36	-1.24	-1.18	-1.12	-0.90	-0.57	-0.39	-0.46	-0.33	-0.23	-0.14	0.00
Ningxia	-2.26	-2.06	-1.88	-1.73	-1.52	-1.34	-1.24	-1.17	-0.94	-0.64	-0.41	-0.39	-0.24	-0.21	-0.13	0.00
Xinjiang	-2.27	-2.11	-1.90	-1.69	-1.53	-1.40	-1.24	-1.12	-0.86	-0.55	-0.22	-0.31	-0.24	-0.21	-0.19	0.00

Source: China Statistical Yearbook

Data 6.28 Relative TFP differential between US and China (2000 constant prices) - LTTNLtTN2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	-5.14	-4.82	-4.93	-4.81	-4.96	-4.57	-4.28	-4.17	-3.14	-3.36	-3.74	-3.77	-3.14	-3.31	-3.50	-3.61
Tianjin	-5.33	-5.02	-5.11	-5.24	-5.07	-4.72	-4.20	-4.16	-4.21	-3.92	-4.40	-4.37	-3.55	-3.84	-4.15	-4.29
Hebei	-5.18	-4.88	-4.97	-5.05	-4.91	-4.64	-4.23	-4.23	-4.03	-3.26	-4.44	-4.71	-4.37	-4.78	-5.15	-5.35
Shanxi	-4.68	-4.38	-4.47	-4.62	-4.50	-4.21	-3.79	-3.76	-4.24	-3.97	-4.33	-4.64	-4.32	-4.68	-4.82	-4.90
Inner Mongolia	-4.30	-4.02	-4.12	-4.32	-4.10	-3.85	-3.46	-3.39	-3.71	-3.46	-3.80	-3.93	-3.81	-4.23	-4.55	-4.74
Liaoning	-5.44	-5.14	-5.21	-5.28	-5.03	-4.73	-4.29	-4.18	-3.92	-3.54	-4.11	-4.20	-3.86	-4.32	-4.56	-4.72
Jilin	-4.45	-4.14	-4.27	-4.37	-4.18	-4.02	-3.53	-3.45	-3.42	-3.18	-3.52	-3.61	-3.29	-3.90	-4.24	-4.65
Heilongjiang	-4.69	-4.41	-4.44	-4.59	-4.42	-4.20	-3.76	-3.70	-3.86	-3.60	-3.98	-4.16	-3.91	-4.15	-4.57	-4.50
Shanghai	-4.80	-4.49	-4.53	-4.61	-4.41	-4.13	-3.77	-3.72	-3.52	-3.21	-3.97	-4.03	-3.25	-3.47	-3.68	-3.83
Jiangsu	-5.30	-5.03	-5.11	-5.25	-5.09	-4.88	-4.52	-4.70	-4.01	-3.91	-5.09	-4.94	-3.91	-4.18	-4.52	-4.75
Zhejiang	-5.58	-5.31	-5.39	-5.50	-5.31	-5.08	-4.76	-4.89	-4.17	-3.98	-5.28	-5.23	-4.25	-4.51	-4.78	-5.17
Anhui	-4.94	-4.64	-4.72	-4.88	-4.72	-4.49	-4.07	-4.08	-3.65	-3.84	-4.76	-4.75	-4.16	-4.55	-4.83	-5.11
Fujian	-4.86	-4.56	-4.64	-4.85	-4.70	-4.45	-4.11	-4.21	-4.38	-4.04	-5.37	-5.57	-4.28	-4.69	-5.06	-5.18
Jiangxi	-4.22	-3.96	-4.09	-4.19	-4.03	-3.88	-3.57	-3.71	-4.06	-4.05	-4.26	-4.50	-4.29	-4.85	-5.05	-5.16
Shandong	-5.62	-5.30	-5.38	-5.46	-5.32	-5.10	-4.66	-4.80	-4.70	-4.34	-4.94	-4.89	-4.19	-4.52	-4.89	-5.14
Henan	-4.79	-4.50	-4.58	-4.68	-4.51	-4.24	-3.80	-3.95	-4.10	-3.82	-4.41	-4.61	-3.29	-4.46	-4.80	-5.07
Hubei	-4.96	-4.67	-4.78	-4.92	-4.76	-4.48	-4.11	-4.09	-3.03	-3.81	-4.38	-4.53	-4.19	-4.56	-4.94	-5.17
Hunan	-5.04	-4.74	-4.81	-4.89	-4.72	-4.45	-4.03	-4.06	-3.87	-3.84	-4.44	-4.65	-4.40	-4.97	-5.27	-5.53
Guangdong	-5.73	-5.43	-5.52	-5.64	-5.43	-5.14	-4.72	-4.73	-3.00	-3.85	-5.49	-5.56	-4.24	-4.39	-4.70	-4.90
Guangxi	-5.34	-5.05	-5.13	-5.23	-5.09	-4.87	-4.50	-4.50	-4.16	-3.87	-4.66	-4.84	-4.13	-4.91	-5.21	-5.37
Hainan	-5.12	-4.82	-4.88	-2.55	-3.19	-3.35	-3.36	-3.38	-4.41	-4.02	-4.82	-4.98	-4.57	-5.05	-5.21	-5.45
Sichuan (Chq)	-5.05	-4.74	-4.79	-4.92	-4.69	-4.39	-4.00	-4.02	-3.98	-3.82	-4.36	-4.40	-3.88	-4.30	-4.60	-4.83
Guizhou	-4.87	-4.55	-4.58	-4.75	-4.55	-4.23	-3.80	-3.73	-3.68	-3.28	-3.75	-3.84	-3.70	-4.18	-4.56	-4.83
Yunan	-5.00	-4.67	-4.74	-4.88	-4.71	-4.50	-4.09	-4.04	-4.04	-3.87	-4.28	-4.37	-4.05	-4.41	-4.74	-5.02
Tibet	-4.86	-4.61	-4.53	-4.72	-4.61	-4.47	-4.95	-4.15	-5.08	-4.33	-4.48	-4.58	-4.50	-4.67	-4.84	-4.90
Shaanxi	-4.78	-4.48	-4.54	-4.66	-4.46	-4.18	-3.85	-3.79	-3.87	-3.54	-3.87	-3.99	-3.85	-4.28	-4.61	-4.68
Gansu	-4.09	-3.80	-3.86	-3.96	-3.79	-3.58	-3.23	-3.23	-3.25	-2.89	-3.19	-3.42	-3.32	-3.89	-4.34	-4.62
Qinghai	-4.35	-4.05	-4.04	-4.09	-3.87	-3.58	-3.21	-2.99	-3.64	-3.43	-3.54	-3.63	-3.40	-3.72	-4.03	-4.52
Ningxia	-4.40	-4.11	-4.13	-4.27	-4.15	-3.85	-3.49	-3.53	-3.79	-3.60	-3.82	-4.15	-3.99	-4.31	-4.64	-4.93
Xinjiang	-4.57	-4.28	-4.33	-4.46	-4.30	-4.01	-3.55	-3.31	-3.69	-3.46	-4.08	-4.07	-4.01	-4.29	-4.47	-4.46

Source: China Statistical Yearbook

Data 6.29 Relative price differential between US and China (2000 constant prices) - LPNTLpNT2000

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	-0.13	-0.09	-0.16	-0.77	0.02	0.02	0.13	0.31	0.33	0.31	0.14	-0.10	-0.12	-0.23	-0.21	0.00
Tianjin	-0.88	-0.83	-0.70	-0.70	-0.54	-0.73	-0.68	-0.14	0.26	0.10	0.09	0.05	0.13	-0.03	-0.07	0.00
Hebei	-0.92	-0.86	-0.74	-0.72	-0.47	-0.54	-0.48	-0.36	-0.19	-0.03	-0.04	-0.10	-0.05	-0.04	-0.02	0.00
Shanxi	-0.85	-0.82	-0.79	-0.94	-0.60	-0.54	-0.49	-0.37	-0.04	-0.06	0.07	0.05	0.08	-0.03	-0.04	0.00
Inner Mongolia	-0.80	-0.82	-0.81	-0.63	-0.72	-0.75	-0.66	-0.33	-0.24	-0.10	-0.02	-0.07	0.05	0.06	0.07	0.00
Liaoning	-0.63	-0.55	-0.55	-0.56	-0.41	-0.55	-0.44	-0.39	-0.29	-0.19	-0.12	-0.10	-0.02	-0.09	-0.09	0.00
Jilin	-0.67	-0.59	-0.72	-0.56	-0.40	-0.72	-0.25	-0.09	-0.15	0.00	0.02	-0.09	-0.03	-0.05	0.00	0.00
Heilongjiang	-0.65	-0.50	-0.22	-0.50	-0.58	-0.64	-0.21	-0.23	-0.19	-0.06	0.05	-0.01	0.01	-0.08	-0.09	0.00
Shanghai	-0.33	-0.29	-0.36	-0.37	-0.20	-0.29	-0.24	0.03	0.35	0.09	0.16	-0.02	-0.06	-0.07	-0.04	0.00
Jiangsu	-0.49	-0.39	-0.32	-0.22	-0.05	-0.17	-0.19	0.29	0.50	0.40	0.39	-0.04	-0.02	-0.05	-0.04	0.00
Zhejiang	-0.64	-0.52	-0.51	-0.56	-0.40	-0.44	-0.32	0.03	0.13	0.16	0.24	-0.22	-0.11	-0.06	-0.08	0.00
Anhui	-0.88	-0.75	-0.64	-0.67	-0.48	-0.60	-0.47	-0.10	0.08	0.12	0.32	0.08	0.19	0.07	0.01	0.00
Fujian	-0.94	-0.96	-0.79	-0.82	-0.75	-0.55	-0.62	-0.12	-0.22	-0.08	-0.07	-0.20	-0.16	-0.11	-0.08	0.00
Jiangxi	-0.55	-0.52	-0.45	-0.39	-0.39	-0.37	-0.22	0.24	0.37	0.59	0.34	0.09	0.22	0.14	0.05	0.00
Shandong	-0.92	-0.83	-0.80	-0.73	-0.39	-0.46	-0.40	0.19	0.47	0.43	0.32	-0.08	-0.07	-0.10	-0.10	0.00
Henan	-1.03	-1.00	-0.85	-0.93	-0.72	-0.75	-0.66	-0.21	0.09	0.19	0.32	0.08	0.04	0.02	0.02	0.00
Hubei	-0.82	-0.77	-0.73	-0.69	-0.44	-0.47	-0.45	-0.32	-0.17	0.01	0.11	0.00	0.10	0.10	0.04	0.00
Hunan	-0.83	-0.76	-0.73	-0.77	-0.57	-0.57	-0.59	-0.14	-0.07	-0.08	0.01	-0.14	-0.06	-0.07	-0.03	0.00
Guangdong	-1.26	-1.18	-1.09	-1.04	-0.91	-0.81	-0.70	-0.24	-0.24	-0.07	-0.03	-0.16	-0.13	-0.13	-0.08	0.00
Guangxi	-0.62	-0.63	-0.56	-0.46	-0.22	-0.29	-0.13	-0.03	-0.09	0.13	0.27	0.09	0.18	-0.02	-0.06	0.00
Hainan	-0.37	-0.32	-0.27	-0.54	-0.69	-0.68	-0.73	-0.25	-0.37	-0.31	-0.04	0.02	-0.10	-0.07	-0.08	0.00
Sichuan (Chq)	-0.24	-0.20	-0.17	-0.22	-0.10	-0.11	-0.11	0.35	0.51	0.63	0.59	0.11	0.10	0.02	0.02	0.00
Guizhou	-0.81	-0.80	-0.63	-0.57	-0.45	-0.48	-0.41	-0.15	-0.08	0.06	0.21	0.14	0.12	0.13	0.01	0.00
Yunan	-0.34	-0.35	-0.23	-0.09	0.03	0.06	0.11	0.34	0.37	0.27	0.44	0.16	0.14	0.08	-0.05	0.00
Tibet	0.10	-1.44	-0.68	-0.86	-0.64	-0.87	-0.51	-0.06	0.10	0.29	0.63	0.38	0.14	0.01	-0.15	0.00
Shaanxi	-0.48	-0.42	-0.32	-0.41	-0.29	-0.29	-0.30	0.14	0.23	0.26	0.33	0.14	0.08	-0.05	0.00	0.00
Gansu	-0.92	-0.80	-0.88	-0.87	-0.88	-0.94	-0.82	-0.40	-0.11	0.05	0.17	-0.18	-0.10	-0.09	-0.11	0.00
Qinghai	-1.05	-1.01	-0.90	-0.82	-0.54	-0.53	-0.46	-0.18	-0.02	0.15	0.19	-0.12	-0.06	-0.07	-0.06	0.00
Ningxia	-0.88	-0.80	-0.65	-0.63	-0.42	-0.41	-0.42	-0.19	0.05	0.20	0.33	0.09	0.06	-0.01	-0.05	0.00
Xinjiang	-0.33	-0.26	-0.16	-0.12	-0.07	-0.14	-0.10	0.17	0.24	0.31	0.50	0.22	0.19	0.06	0.02	0.00

Source: China Statistical Yearbook

Data 6.30 China capital-output ratio of the tradable sector (100,000,000 Yuan) – LkTLyT

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	-0.40	-0.47	-0.63	-0.22	-1.10	-1.14	-1.30	-1.43	-0.54	-1.36	-1.68	-1.60	-0.98	-0.88	-0.85	-0.94
Tianjin	-0.36	-0.47	-0.60	-0.83	-0.97	-0.98	-0.96	-1.07	-1.41	-1.64	-2.11	-2.13	-1.31	-1.18	-1.16	-1.13
Hebei	-0.67	-0.77	-0.94	-1.14	-1.28	-1.32	-1.41	-1.55	-1.59	-1.22	-2.19	-2.40	-1.93	-1.97	-1.96	-1.95
Shanxi	0.75	0.68	0.55	0.38	0.08	-0.02	-0.05	-0.21	-1.09	-1.31	-1.59	-1.85	-1.53	-1.61	-1.41	-1.30
Inner Mongolia	0.54	0.43	0.26	-0.12	-0.15	-0.24	-0.30	-0.36	-0.91	-1.12	-1.39	-1.50	-1.32	-1.40	-1.30	-1.26
Liaoning	-0.59	-0.71	-0.84	-1.02	-1.09	-1.08	-1.14	-1.26	-1.30	-1.39	-1.87	-1.91	-1.52	-1.62	-1.53	-1.56
Jilin	-0.37	-0.46	-0.67	-0.84	-0.94	-1.03	-1.06	-1.16	-1.11	-1.28	-1.60	-1.62	-1.23	-1.37	-1.29	-1.40
Heilongjiang	0.15	-0.02	-0.14	-0.30	-0.43	-0.54	-0.62	-0.70	-1.04	-1.24	-1.60	-1.71	-1.47	-1.40	-1.48	-1.24
Shanghai	-0.29	-0.38	-0.47	-0.62	-0.73	-0.76	-0.90	-1.10	-1.25	-1.32	-2.01	-1.89	-1.01	-0.89	-0.83	-0.83
Jiangsu	-1.05	-1.20	-1.38	-1.62	-1.72	-1.79	-1.86	-2.15	-1.68	-2.03	-3.10	-2.97	-1.85	-1.81	-1.81	-1.85
Zhejiang	-1.23	-1.41	-1.60	-1.84	-1.94	-1.97	-2.13	-2.33	-1.87	-2.11	-3.27	-3.23	-2.16	-2.10	-2.06	-2.25
Anhui	-0.52	-0.65	-0.80	-1.02	-1.15	-1.19	-1.19	-1.37	-1.12	-1.82	-2.59	-2.57	-1.96	-2.00	-1.92	-1.91
Fujian	-0.20	-0.32	-0.52	-0.84	-1.02	-1.07	-1.21	-1.42	-1.78	-1.78	-2.89	-2.97	-1.65	-1.80	-1.87	-1.85
Jiangxi	-0.36	-0.49	-0.66	-0.90	-1.03	-1.12	-1.21	-1.37	-1.73	-2.10	-2.10	-2.21	-1.87	-1.98	-1.91	-1.83
Shandong	-0.64	-0.74	-0.93	-1.16	-1.35	-1.44	-1.55	-1.74	-1.86	-2.01	-2.53	-2.57	-1.89	-1.89	-1.89	-1.92
Henan	-0.40	-0.54	-0.74	-0.93	-1.09	-1.15	-1.22	-1.37	-1.65	-1.80	-2.32	-2.48	-1.10	-1.95	-1.92	-1.96
Hubei	-0.53	-0.66	-0.83	-1.02	-1.16	-1.21	-1.27	-1.33	-0.48	-1.68	-2.18	-2.29	-1.95	-1.98	-1.96	-1.94
Hunan	-0.94	-1.07	-1.23	-1.42	-1.51	-1.54	-1.56	-1.64	-1.54	-1.83	-2.30	-2.45	-2.14	-2.36	-2.33	-2.33
Guangdong	-0.38	-0.52	-0.76	-1.08	-1.22	-1.26	-1.41	-1.57	-0.12	-1.40	-2.88	-2.84	-1.49	-1.45	-1.50	-1.55
Guangxi	-0.59	-0.73	-0.91	-1.14	-1.31	-1.41	-1.51	-1.69	-1.55	-1.65	-2.29	-2.29	-1.46	-1.85	-1.79	-1.73
Hainan	0.00	0.00	0.00	-0.02	-0.13	-0.19	-0.31	-0.44	-1.18	-1.25	-1.90	-1.76	-1.18	-1.22	-1.06	-1.09
Sichuan (Chq)	-0.55	-0.65	-0.80	-1.02	-1.12	-1.17	-1.23	-1.34	-1.51	-1.76	-2.18	-2.18	-1.61	-1.63	-1.54	-1.49
Guizhou	-0.35	-0.45	-0.58	-0.82	-0.92	-0.94	-0.99	-1.05	-1.16	-1.21	-1.59	-1.66	-1.42	-1.46	-1.41	-1.41
Yunan	-0.13	-0.21	-0.40	-0.66	-0.83	-1.01	-1.06	-1.15	-1.31	-1.52	-1.88	-1.92	-1.51	-1.48	-1.43	-1.40
Tibet	0.76	0.81	0.73	0.58	0.42	0.23	0.11	0.13	-0.90	-0.77	-1.12	-1.00	-0.77	-0.69	-0.44	-0.15
Shaanxi	-0.15	-0.27	-0.42	-0.63	-0.76	-0.81	-0.89	-0.98	-1.28	-1.36	-1.60	-1.60	-1.36	-1.38	-1.28	-1.10
Gansu	-0.01	-0.13	-0.22	-0.41	-0.53	-0.60	-0.64	-0.72	-0.91	-1.16	-1.34	-1.44	-1.20	-1.38	-1.32	-1.29
Qinghai	1.18	1.04	0.95	0.73	0.56	0.52	0.48	0.41	-0.57	-0.86	-0.90	-0.82	-0.60	-0.66	-0.60	-0.68
Ningxia	0.86	0.72	0.63	0.36	0.14	0.06	-0.01	-0.13	-0.66	-0.87	-1.04	-1.16	-0.93	-0.91	-0.90	-1.01

Source: China Statistical Yearbook

Data 6.31 China capital-output ratio of the nontradable sector (100,000,000 Yuan) – LkNLyN

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	0.30	0.18	-0.02	-0.24	-0.32	-0.42	-0.42	-0.42	-0.59	-0.78	-0.82	-0.91	-0.88	-0.87	-0.87	-0.90
Tianjin	0.19	0.06	-0.03	-0.21	-0.21	-0.47	-0.64	-0.39	-0.23	-0.59	-0.69	-0.76	-0.71	-0.60	-0.54	-0.52
Hebei	-0.22	-0.34	-0.45	-0.68	-0.65	-0.73	-0.95	-0.87	-0.99	-0.99	-0.90	-0.93	-0.80	-0.60	-0.46	-0.40
Shanxi	0.52	0.39	0.31	0.17	0.17	0.00	-0.15	-0.01	-0.09	-0.31	-0.27	-0.32	-0.33	-0.24	-0.16	-0.08
Inner Mongolia	0.05	-0.09	-0.16	-0.36	-0.48	-0.55	-0.72	-0.42	-0.40	-0.40	-0.39	-0.48	-0.47	-0.40	-0.27	-0.25
Liaoning	0.28	0.14	-0.04	-0.26	-0.33	-0.36	-0.47	-0.62	-0.85	-0.91	-0.88	-0.88	-0.79	-0.66	-0.60	-0.63
Jilin	-0.64	-0.77	-0.91	-1.06	-1.09	-1.05	-1.14	-1.08	-1.04	-0.99	-1.06	-1.06	-0.99	-0.71	-0.52	-0.47
Heilongjiang	0.12	-0.01	-0.18	-0.38	-0.58	-0.44	-0.58	-0.48	-0.55	-0.59	-0.58	-0.63	-0.61	-0.50	-0.39	-0.38
Shanghai	-0.19	-0.31	-0.54	-0.69	-0.69	-0.78	-0.90	-0.87	-0.78	-1.08	-1.07	-1.01	-0.94	-0.82	-0.69	-0.71
Jiangsu	-0.48	-0.59	-0.82	-1.00	-0.99	-1.00	-1.09	-0.82	-0.97	-1.13	-1.15	-1.39	-1.26	-1.12	-1.02	-0.97
Zhejiang	-0.40	-0.53	-0.76	-0.99	-1.01	-0.98	-1.12	-0.88	-1.04	-1.11	-1.08	-1.35	-1.20	-1.03	-0.95	-0.91
Anhui	-0.31	-0.44	-0.57	-0.74	-0.73	-0.74	-0.86	-0.60	-0.69	-0.93	-0.83	-1.02	-0.94	-0.82	-0.73	-0.61
Fujian	-0.10	-0.22	-0.38	-0.62	-0.74	-0.73	-0.90	-0.75	-0.91	-0.85	-0.71	-0.70	-0.64	-0.57	-0.50	-0.49
Jiangxi	-1.05	-1.16	-1.24	-1.49	-1.58	-1.47	-1.48	-1.08	-0.90	-0.84	-0.72	-0.81	-0.57	-0.41	-0.38	-0.38
Shandong	0.11	-0.02	-0.18	-0.44	-0.48	-0.46	-0.73	-0.32	-0.38	-0.69	-0.74	-1.07	-1.06	-0.90	-0.76	-0.67
Henan	-0.51	-0.65	-0.83	-1.04	-1.10	-1.17	-1.33	-0.88	-0.79	-0.77	-0.78	-0.97	-0.94	-0.77	-0.63	-0.51
Hubei	-0.30	-0.42	-0.56	-0.68	-0.58	-0.71	-0.76	-0.62	-0.65	-0.68	-0.75	-0.88	-0.85	-0.71	-0.57	-0.50
Hunan	-0.72	-0.85	-1.04	-1.27	-1.24	-1.25	-1.38	-1.03	-0.95	-0.96	-0.87	-1.01	-0.91	-0.75	-0.62	-0.52
Guangdong	0.57	0.44	0.23	-0.02	-0.14	-0.17	-0.38	-0.08	-0.21	-0.15	-0.19	-0.25	-0.28	-0.28	-0.26	-0.26
Guangxi	0.08	-0.05	-0.21	-0.44	-0.45	-0.46	-0.60	-0.61	-0.77	-0.71	-0.62	-0.61	-0.47	-0.27	-0.20	-0.13
Hainan	0.00	0.00	0.00	-2.69	-1.86	-1.40	-1.13	-0.56	-0.28	-0.14	0.09	0.25	0.27	0.46	0.54	0.61
Sichuan (Chq)	-0.19	-0.32	-0.52	-0.75	-0.81	-0.92	-1.01	-0.71	-0.76	-0.83	-0.82	-1.11	-1.02	-0.80	-0.63	-0.51
Guizhou	-0.29	-0.43	-0.59	-0.74	-0.78	-0.85	-0.96	-0.78	-0.87	-0.79	-0.67	-0.66	-0.60	-0.28	-0.24	-0.14
Yunan	0.22	0.09	-0.03	-0.25	-0.31	-0.40	-0.56	-0.39	-0.37	-0.54	-0.50	-0.70	-0.57	-0.34	-0.26	-0.07
Tibet	1.28	1.15	1.01	0.79	0.69	0.55	0.38	1.09	1.41	1.48	1.42	1.17	1.08	1.07	1.04	1.26
Shaanxi	-0.09	-0.22	-0.36	-0.63	-0.69	-0.79	-0.84	-0.57	-0.62	-0.68	-0.66	-0.71	-0.66	-0.38	-0.22	-0.13
Gansu	-0.91	-1.03	-1.17	-1.37	-1.47	-1.47	-1.46	-1.13	-0.97	-1.04	-1.09	-1.30	-1.10	-0.86	-0.52	-0.26
Qinghai	0.60	0.47	0.34	0.14	0.14	0.04	-0.03	0.18	0.19	0.07	-0.01	-0.18	-0.15	-0.07	0.00	0.28
Ningxia	0.03	-0.10	-0.22	-0.34	-0.39	-0.46	-0.58	-0.31	-0.20	-0.14	-0.09	-0.16	-0.12	0.01	0.10	0.24
Xinjiang	0.60	0.47	0.32	0.07	-0.09	-0.18	-0.51	-0.33	-0.34	-0.40	-0.38	-0.42	-0.30	-0.15	-0.09	-0.14

Source: China Statistical Yearbook

Data 6.32 China investment-output ratio of the tradable sector (100,000,000 Yuan) – LiTLyT

Region	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Beijing	-3.40	-3.44	-3.51	-2.89	-4.07	-4.04	-4.09	-3.62	-3.34	-3.25	-3.16	-2.92	-2.92	-2.90	-2.90	-3.47
Tianjin	-3.36	-3.36	-3.32	-3.34	-3.30	-3.25	-2.74	-2.80	-3.51	-3.33	-2.90	-3.07	-3.14	-2.97	-3.02	-3.02
Hebei	-3.66	-3.49	-3.33	-3.30	-3.58	-3.60	-3.69	-3.54	-3.63	-3.76	-3.67	-3.59	-3.53	-3.56	-3.81	-3.72
Shanxi	-2.25	-2.33	-2.43	-2.59	-2.81	-2.71	-2.51	-2.61	-2.74	-2.98	-3.42	-3.43	-3.19	-3.03	-3.04	-2.95
Inner Mongolia	-2.46	-2.64	-2.88	-3.02	-2.90	-2.79	-2.62	-2.37	-2.28	-2.41	-2.63	-2.74	-2.77	-3.01	-3.59	-3.28
Liaoning	-3.59	-3.42	-3.23	-3.29	-3.29	-3.21	-3.21	-3.29	-3.20	-3.35	-3.40	-3.57	-3.69	-3.86	-4.09	-4.04
Jilin	-3.36	-3.29	-3.27	-3.30	-3.66	-3.69	-3.41	-3.17	-3.02	-3.00	-2.74	-2.72	-2.93	-3.32	-3.44	-3.39
Heilongjiang	-2.84	-2.88	-2.80	-2.93	-3.19	-3.17	-3.23	-3.16	-3.09	-3.31	-3.24	-3.16	-2.80	-3.32	-3.43	-3.54
Shanghai	-3.28	-3.21	-3.06	-2.98	-3.11	-3.17	-3.48	-3.72	-3.48	-3.60	-3.28	-2.95	-2.96	-2.86	-3.15	-3.43
Jiangsu	-4.05	-3.91	-3.77	-3.87	-4.25	-4.37	-4.27	-4.34	-4.57	-4.65	-4.69	-4.31	-4.14	-4.02	-4.34	-4.38
Zhejiang	-4.23	-4.27	-4.26	-4.25	-4.34	-4.38	-4.49	-4.40	-4.57	-4.49	-4.51	-4.10	-4.02	-4.03	-4.19	-4.33
Anhui	-3.51	-3.50	-3.44	-3.59	-3.79	-3.80	-3.59	-3.54	-3.66	-3.81	-3.86	-3.82	-3.93	-3.94	-3.99	-4.16
Fujian	-3.20	-3.01	-2.88	-3.28	-3.67	-3.60	-3.54	-3.59	-3.75	-3.90	-3.79	-4.03	-3.94	-3.75	-3.82	-3.93
Jiangxi	-3.35	-3.46	-3.55	-3.68	-3.68	-3.68	-3.70	-3.77	-3.73	-3.96	-3.74	-3.76	-4.06	-4.02	-3.79	-3.60
Shandong	-3.64	-3.44	-3.30	-3.38	-3.69	-3.73	-3.85	-3.91	-4.13	-4.06	-4.00	-3.89	-3.85	-3.86	-3.91	-3.94
Henan	-3.40	-3.48	-3.56	-3.43	-3.50	-3.71	-3.39	-3.55	-3.76	-3.60	-3.61	-3.57	-3.55	-3.59	-3.75	-3.69
Hubei	-3.53	-3.58	-3.61	-3.58	-4.01	-3.84	-3.77	-3.34	-3.22	-3.15	-3.05	-3.17	-3.41	-3.40	-3.53	-3.45
Hunan	-3.93	-3.93	-3.87	-3.90	-3.90	-3.82	-3.66	-3.54	-3.85	-3.81	-3.81	-4.08	-4.14	-4.39	-4.29	-4.14
Guangdong	-3.37	-3.25	-3.19	-3.75	-3.52	-3.24	-3.43	-3.41	-3.37	-3.04	-3.45	-3.54	-3.83	-3.81	-3.74	-4.05
Guangxi	-3.59	-3.69	-3.77	-3.78	-3.95	-4.07	-3.91	-3.72	-3.40	-3.45	-3.64	-3.94	-4.10	-3.63	-3.46	-3.29
Hainan	0.00	0.00	0.00	-3.02	-2.59	-2.72	-2.75	-2.57	-2.23	-2.04	-1.96	-2.15	-2.51	-2.68	-2.50	-2.57
Sichuan (Chq)	-3.55	-3.50	-3.44	-3.51	-3.49	-3.47	-3.34	-3.40	-3.50	-3.58	-3.56	-3.40	-3.29	-3.35	-3.48	-3.44
Guizhou	-3.34	-3.26	-3.14	-3.29	-3.36	-3.17	-3.09	-3.04	-3.06	-3.11	-3.32	-3.03	-3.01	-3.28	-3.54	-3.30
Yunan	-3.13	-3.24	-3.42	-3.59	-3.68	-3.68	-3.42	-3.24	-3.24	-3.21	-3.21	-3.30	-3.32	-3.42	-3.28	-3.27
Tibet	-2.24	-2.36	-2.70	-2.79	-2.83	-2.44	-2.10	-1.82	-1.75	-1.48	-1.47	-1.85	-1.69	-1.86	-2.03	-1.83
Shaanxi	-3.15	-3.14	-3.09	-3.14	-3.16	-3.14	-3.24	-3.28	-3.12	-3.16	-3.18	-3.31	-3.15	-3.04	-3.07	-3.04
Gansu	-3.01	-2.94	-2.76	-2.71	-2.94	-2.93	-2.86	-2.94	-3.29	-3.25	-3.19	-2.85	-2.90	-3.01	-3.08	-3.08
Qinghai	-1.81	-1.66	-1.42	-1.53	-2.08	-2.18	-2.13	-2.03	-1.86	-2.20	-2.27	-1.67	-1.75	-1.75	-1.95	-2.18
Ningxia	-2.14	-2.04	-1.83	-2.41	-2.69	-2.52	-2.39	-2.61	-2.85	-2.83	-3.08	-2.68	-2.57	-2.69	-2.47	-2.52
Xinjiang	-2.37	-2.46	-2.53	-2.54	-2.68	-2.33	-2.33	-1.82	-1.84	-2.00	-2.34	-2.14	-2.18	-2.01	-1.87	-1.94

Source: China Statistical Yearbook

Table 8.1 Unit Root Tests for China's Relative Prices of Nontradables $\ln(\frac{p_N}{p_T})$

Region	PP t(phro-1) test w/intercept	PP t-test w/ intercept	PP t-test w/ intercept & trend	ADF t-test w/intercept	No. of lags
Beijing	-7.16	-2.05	-2.10	-2.52	4
Tianjin	-3.10	-1.53	-1.41	-1.42	0
Hebei	-2.10	-1.54	-1.41	-1.42	0
Shanxi	-2.09	-1.22	-1.56	-1.13	0
Inner Mongolia	-0.95	-0.64	-2.36	-0.59	0
Liaoning	-2.98	-1.39	-2.51	-1.28	0
Jilin	-5.29	-1.88	-2.96	-1.74	0
Heilongjiang	-6.57	-2.24	-2.38	-2.08	0
Shanghai	-5.51	-1.82	-1.75	-1.69	0
Jiangsu	-4.28	-1.68	-1.26	-1.55	0
Zhejiang	-4.34	-1.75	-1.51	-1.62	0
Anhui	-2.66	-1.60	-0.98	-1.49	0
Fujian	-3.02	-1.47	-2.11	-1.37	0
Jiangxi	-2.82	-1.41	-0.85	-1.30	0
Shandong	-3.03	-1.57	-0.92	-1.45	0
Henan	-1.79	-1.24	-0.94	-1.15	0
Hubei	-1.75	-1.29	-1.33	-1.20	0
Hunan	-2.66	-1.37	-1.85	-1.27	0
Guangdong	-1.60	-1.34	-0.93	-1.24	0
Guangxi	-3.40	-1.64	-0.81	-1.51	0
Hainan	-3.91	-1.56	-2.89	-1.42	0
Sichuan (Chq)	-3.36	-1.33	-1.01	-1.23	0
Guizhou	-1.93	-1.53	0.00	-1.41	0
Yunan	-2.89	-1.17	-0.20	-2.03	3
Tibet	-7.55	-2.39	-4.24 **	-1.47	3
Shaanxi	-3.34	-1.49	-1.03	-2.53	3
Gansu	-1.99	-1.10	-1.43	-1.37	3
Qinghai	-2.23	-1.59	-0.72	-2.14	3
Ningxia	-2.50	-1.70	-0.35	-1.88	3
Xinjiang	-3.69	-1.46	-0.68	-2.00	3
	IPS t-bar panel unit root test with constant				
All provinces	-1.47				0

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Phillips-Perron unit root test critical value:
   t(phro-1) test with intercept 5%=-12.5
   t-test with intercept 5%= -3.082
   t-test with intercept and trend 5%= -3.761
3. We put 0 lags in all three Phillips-Perron unit root tests.
4. ADF t-test critical value: 5%=-3.00
5. IPS panel unit root test critical value: 5%=-1.74

Table 8.2 Unit Root Tests for China's Relative TFP $\ln \frac{\theta_T}{\theta_N}$

Region	PP t(phro-1) test w/intercept	PP t-test w/ intercept	PP t-test w/ intercept & trend	ADF t-test w/intercept	No. of lags
Beijing	-10.40	-2.69	-3.79 **	-0.50	3
Tianjin	-9.72	-2.68	-2.66	-2.50	0
Hebei	-2.18	-0.82	-2.60	-0.76	0
Shanxi	-0.92	-0.69	-2.14	-0.64	0
Inner Mongolia	0.36	0.36	-2.26	0.34	0
Liaoning	-4.80	-1.43	-2.08	-1.33	0
Jilin	1.70	0.85	-1.42	0.79	0
Heilongjiang	-0.93	-0.66	-2.48	-0.61	0
Shanghai	-8.95	-2.54	-2.72	-2.36	0
Jiangsu	-9.57	-2.70	-3.15	-1.59	2
Zhejiang	-9.55	-2.62	-3.30	-1.41	2
Anhui	-2.27	-0.96	-2.68	-0.40	2
Fujian	-3.50	-1.46	-2.67	-0.96	2
Jiangxi	-0.17	-0.20	-2.22	-0.73	2
Shandong	-5.77	-1.83	-3.13	-1.05	2
Henan	-5.34	-1.61	-4.26 **	-0.20	2
Hubei	-4.03	-1.33	-2.91	-0.46	2
Hunan	0.79	0.58	-1.85	0.63	2
Guangdong	-10.90	-2.92	-3.02	-2.24	2
Guangxi	-3.39	-1.16	-3.58	0.56	2
Hainan	-2.43	-2.77	-1.78	-1.80	2
Sichuan (Chq)	-1.45	-0.66	-2.69	-0.21	2
Guizhou	1.99	1.19	-0.99	1.96	2
Yunan	0.51	0.36	-2.50	0.37	2
Tibet	-4.75	-1.83	-3.69	-1.39	2
Shaanxi	0.35	0.30	-2.45	1.32	2
Gansu	2.13	2.39	-0.85	9.64 **	2
Qinghai	-0.06	-0.03	-2.31	-0.07	2
Ningxia	0.79	0.88	-2.40	0.22	2
Xinjiang	-1.14	-0.72	-2.03	-1.14	2
	IPS t-bar panel unit root test with constant				
All provinces	-0.89				0

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Phillips-Perron unit root test critical value:
   - t(phro-1) test with intercept 5%=-12.5
   - t-test with intercept 5%= -3.066
   - t-test with intercept and trend 5%= -3.735
3. We put 0 lags in all three Phillips-Perron unit root tests.
4. ADF t-test critical value: 5%=-3.00
5. IPS panel unit root test critical value: 5%=-1.74

Table 8.3 Test for Cointegration of China Relative Price of Nontradables and Relative TFP

$$\ln \frac{p^N}{p^T} = \alpha + \beta \ln \frac{\theta^T}{\theta^N}$$

Region	$T(\hat{\rho}-1)$	$t_{\hat{\rho}}(PP)$	$t_{\hat{\rho}}(ADF)$	No. of lags
Beijing	-7.81	-2.30	-3.61 **	4
Tianjin	-4.47	-1.78	-1.72	0
Hebei	-4.82	-1.98	-1.88	0
Shanxi	-5.69	-1.82	-1.76	0
Inner Mongolia	-6.40	-1.75	-1.74	0
Liaoning	-4.87	-1.82	-1.76	0
Jilin	-8.29	-2.38	-2.30 **	0
Heilongjiang	-10.70	-2.95	-2.84 **	0
Shanghai	-6.24	-1.96	-1.90	0
Jiangsu	-4.85	-1.74	-1.67	0
Zhejiang	-5.28	-1.89	-1.82	0
Anhui	-5.32	-1.84	-1.73	1
Fujian	-9.67	-2.73	-2.64 **	0
Jiangxi	-2.95	-1.08	-1.08	0
Shandong	-6.29	-2.03	-2.21 **	1
Henan	-7.23	-2.14	-2.06 **	0
Hubei	-4.64	-1.77	-1.69	0
Hunan	-4.43	-1.68	-1.61	0
Guangdong	-1.70	-1.37	-1.29	0
Guangxi	-4.72	-1.73	-1.66	0
Hainan	-12.07	-3.29	-3.18 **	0
Sichuan (Chq)	-3.18	-1.21	-1.19	0
Guizhou	-2.34	-1.27	-1.57	4
Yunan	-3.07	-1.32	-2.26 **	4
Tibet	-16.48	-5.21 **	-1.80	4
Shaanxi	-3.52	-1.38	-1.54	4
Gansu	-3.51	-1.36	-1.49	4
Qinghai	-4.01	-1.67	-2.56 **	4
Ningxia	-2.91	-1.26	-1.29	4
Xinjiang	-3.05	-1.15	-1.51	4

	With constant	With constant and trend	With constant, trend and time dummy	
panel v-stat	0.48	-1.39	-0.71	0
panel rho-stat	0.10	2.64 **	-0.45	0
panel pp-stat	-0.78	2.03 **	-5.59 **	0
panel adf-stat	0.12	3.57 **	-5.06 **	0
group rho-stat	2.32 **	4.34 **	1.63	0
group pp-stat	0.74	3.52 **	-5.14 **	0
group adf-stat	1.97 **	5.27 **	-4.11 **	0

1. Statistical significance at the 95% level or greater are signified by **.

2. The $T(\hat{\rho}-1)$ and $t_{\hat{\rho}}(PP)$ statistics are Phillips-Perron tests applied to the residuals from the first regression and are computed with 0 lags.

   The Phillips and Ouliaris (1990) critical values for residual based tests for cointegration with constant and one explanatory variable are:
   $\hat{Z}_\alpha$ 5%=-20.4935 $\hat{Z}_t$ 5%=-3.3654

3. The $t_{\hat{\rho}}(ADF)$ is the augmented Dickey-Fuller statistic with no constant or trend.

   The MacKinnon critical values for rejecting of the hypothesis of a unit root is: 5%=-1.95.

4. The panel cointegration tests are those proposed by Pedroni (1995), which is the source of the critical value: 5%=1.65.

Table 8.4 Test for Unit Roots in $\gamma = \ln\frac{p^N}{p^T} - \ln\frac{\theta^T}{\theta^N}$

Region	PP t(phro-1) test w/intercept	PP t-test w/ intercept	PP t-test w/ intercept & trend	ADF t-test w/intercept	No. of lags
Beijing	-8.40	-2.22	-2.95	-2.07	0
Tianjin	-4.16	-1.70	-1.60	-1.58	0
Hebei	-0.89	-0.47	-3.35	-0.44	0
Shanxi	-1.22	-0.93	-1.63	-0.87	0
Inner Mongolia	0.24	0.28	-2.40	0.26	0
Liaoning	-2.44	-0.97	-2.31	-0.90	0
Jilin	0.03	0.02	-3.80 **	0.02	0
Heilongjiang	-0.44	-0.33	-2.06	-0.30	0
Shanghai	-6.99	-2.14	-2.18	-1.99	0
Jiangsu	-7.04	-2.31	-2.27	-2.15	0
Zhejiang	-7.38	-2.34	-2.69	-2.18	0
Anhui	-2.08	-1.21	-2.00	-1.22	3
Fujian	-2.29	-1.17	-2.42	-1.13	3
Jiangxi	-0.97	-0.96	-0.99	-1.21	3
Shandong	-3.21	-1.57	-1.48	-2.26	3
Henan	-2.69	-1.21	-2.86	-0.95	3
Hubei	-2.47	-1.06	-3.23	-0.99	0
Hunan	0.11	0.09	-2.94	-0.27	3
Guangdong	-8.06	-2.39	-3.15	-1.50	2
Guangxi	-2.72	-1.24	-3.62	-0.78	2
Hainan	-1.91	-3.20 **	-0.31	-2.32	2
Sichuan (Chq)	-2.80	-1.30	-1.71	-1.30	2
Guizhou	-0.39	-0.32	-3.24	0.18	2
Yunan	-2.27	-1.45	-1.36	-1.82	2
Tibet	-3.48	-1.40	-2.51	-1.31	0
Shaanxi	-0.35	-0.28	-2.20	-0.26	0
Gansu	0.70	0.71	-2.30	0.66	0
Qinghai	-1.18	-0.83	-1.78	-0.77	0
Ningxia	-0.66	-0.72	-1.39	-0.67	0
Xinjiang	-1.88	-1.14	-1.62	-1.06	0
	IPS t-bar panel unit root test with constant				
All provinces	-1.05				0

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Phillips-Perron unit root test critical value:
   - t(phro-1) test with intercept 5%=-12.5
   - t-test with intercept 5%= -3.082
   - t-test with intercept and trend 5%= -3.761
3. We put 0 lags in all three Phillips-Perron unit root tests.
4. ADF t-test critical value: 5%=-3.00
5. IPS panel unit root test critical value: 5%=-1.74

Table 8.5 Estimates of the Cointegrating Slope Coefficient of $\ln\frac{p^N}{p^T} = \alpha + \beta \ln\frac{\theta^T}{\theta^N}$

Region	$\hat{\beta}_{OLS}$	$t(\beta_{OLS}=1)$	$\hat{\beta}_{FMOLS}$	$t(\beta_{FMOLS}=1)$	No. of lags
Beijing	-0.30	-5.10 **	-0.24	-3.65 **	3
Tianjin	-0.50	-3.68 **	-0.33	-2.31 **	3
Hebei	-0.26	-11.70 **	-0.11	-7.48 **	3
Shanxi	-0.42	-20.03 **	-0.39	-12.97 **	3
Inner Mongolia	-0.45	-24.25 **	-0.38	-16.54 **	3
Liaoning	-0.15	-7.12 **	0.05	-3.85 **	3
Jilin	-0.27	-9.84 **	-0.16	-6.50 **	3
Heilongjiang	-0.22	-12.19 **	-0.17	-10.18 **	3
Shanghai	-0.15	-5.93 **	0.04	-3.67 **	3
Jiangsu	-0.14	-6.29 **	0.04	-3.80 **	3
Zhejiang	-0.13	-7.58 **	0.09	-4.27 **	3
Anhui	-0.38	-10.91 **	-0.23	-6.96 **	3
Fujian	-0.27	-18.61 **	-0.21	-14.06 **	3
Jiangxi	-0.20	-13.95 **	-0.14	-8.57 **	3
Shandong	-0.85	-5.68 **	-0.63	-3.75 **	3
Henan	-0.55	-10.78 **	-0.51	-7.58 **	3
Hubei	-0.27	-12.59 **	-0.15	-7.85 **	3
Hunan	-0.25	-14.35 **	-0.09	-8.41 **	3
Guangdong	-0.08	-6.48 **	0.05	-3.75 **	3
Guangxi	-0.16	-8.86 **	-0.04	-5.47 **	3
Hainan	-0.01	-39.56 **	-0.01	-30.18 **	3
Sichuan (Chq)	-0.07	-5.20 **	0.19	-2.59 **	3
Guizhou	-0.30	-6.99 **	0.05	-3.42 **	3
Yunan	0.10	-5.73 **	0.32	-2.91 **	3
Tibet	-0.50	-7.34 **	-0.78	-9.22 **	3
Shaanxi	-0.17	-7.88 **	0.06	-4.15 **	3
Gansu	-0.37	-9.90 **	-0.21	-5.64 **	3
Qinghai	-0.44	-9.57 **	-0.26	-5.92 **	3
Ningxia	-0.31	-12.53 **	-0.14	-7.36 **	3
Xinjiang	-0.07	-10.50 **	0.04	-6.36 **	3

Panel Tests of $\beta = 1$

	$\hat{\beta}_{PANEL}$	$\sqrt{N}\,\bar{t}_{\hat{\beta}}$
All provinces	-0.14	-40.05 **

Panel Tests of $\beta = 1$ with Common Time Dummies

	$\hat{\beta}_{PANEL}$	$\sqrt{N}\,\bar{t}_{\hat{\beta}}$
All provinces	-0.19	-48.82 **

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Critical values of the t-values with n-k=16-2=14 degrees of freedom
   5% = 2.145 10%=1.761
3. $\sqrt{N}\,\bar{t}_{\hat{\beta}}$ is the group mean t-ratio which is distributed as standard normal under the null.
   Panel test critical value: 5% = 1.96

Table 8.6 Unit Root Tests for China Black Market Exchange Rate lnXRb

Region	PP t(phro-1) test w/intercept	PP t-test w/ intercept	PP t-test w/ intercept & trend	ADF t-test w/intercept	No. of lags
Beijing	-4.85	-3.19 6	-2.30	-2.72	1
Tianjin	-4.85	-3.19	-2.30	-2.69	4
Hebei	-4.85	-3.19	-2.30	-2.69	4
Shanxi	-4.85	-3.19	-2.30	-2.69	4
Inner Mongolia	-4.85	-3.19	-2.30	-2.69	4
Liaoning	-4.85	-3.19	-2.30	-2.69	4
Jilin	-4.85	-3.19	-2.30	-2.69	4
Heilongjiang	-4.85	-3.19	-2.30	-2.69	4
Shanghai	-4.85	-3.19	-2.30	-2.69	4
Jiangsu	-4.85	-3.19	-2.30	-2.69	4
Zhejiang	-4.85	-3.19	-2.30	-2.69	4
Anhui	-4.85	-3.19	-2.30	-2.69	4
Fujian	-4.85	-3.19	-2.30	-2.69	4
Jiangxi	-4.85	-3.19	-2.30	-2.69	4
Shandong	-4.85	-3.19	-2.30	-2.69	4
Henan	-4.85	-3.19	-2.30	-2.69	4
Hubei	-4.85	-3.19	-2.30	-2.69	4
Hunan	-4.85	-3.19	-2.30	-2.69	4
Guangdong	-4.85	-3.19	-2.30	-2.69	4
Guangxi	-4.85	-3.19	-2.30	-2.69	4
Hainan	-4.85	-3.19	-2.30	-2.69	4
Sichuan (Chq)	-4.85	-3.19	-2.30	-2.69	4
Guizhou	-4.85	-3.19	-2.30	-2.69	4
Yunan	-4.85	-3.19	-2.30	-2.69	4
Tibet	-4.85	-3.19	-2.30	-2.69	4
Shaanxi	-4.85	-3.19	-2.30	-2.69	4
Gansu	-4.85	-3.19	-2.30	-2.69	4
Qinghai	-4.85	-3.19	-2.30	-2.69	4
Ningxia	-4.85	-3.19	-2.30	-2.69	4
Xinjiang	-4.85	-3.19	-2.30	-2.69	4
	IPS t-bar panel unit root test with constant				
All provinces	-1.78 6				0

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Phillips-Perron unit root test critical value:
   - t(phro-1) test with intercept 5%=-12.5
   - t-test with intercept 5%= -3.066
   - t-test with intercept and trend 5%= -3.735
3. We put 0 lags in all three Phillips-Perron unit root tests.
4. ADF t-test critical value: 1%=-3.75 5%=-3.00
5. IPS panel unit root test critical value: 5%=-1.74
6. Insignificant at 4% level

Table 8.7 Unit Root Tests for China Official Exchange Rate lnXR

Region	PP t(phro-1) test w/intercept	PP t-test w/ intercept	PP t-test w/ intercept & trend	ADF t-test w/intercept	No. of lags
Beijing	-1.80	-1.67	-1.51	-1.56	0
Tianjin	-1.80	-1.67	-1.51	-1.56	0
Hebei	-1.80	-1.67	-1.51	-1.56	0
Shanxi	-1.80	-1.67	-1.51	-1.56	0
Inner Mongolia	-1.80	-1.67	-1.51	-1.56	0
Liaoning	-1.80	-1.67	-1.51	-2.09	4
Jilin	-1.80	-1.67	-1.51	-2.09	4
Heilongjiang	-1.80	-1.67	-1.51	-2.09	4
Shanghai	-1.80	-1.67	-1.51	-2.09	4
Jiangsu	-1.80	-1.67	-1.51	-2.09	4
Zhejiang	-1.80	-1.67	-1.51	-2.09	4
Anhui	-1.80	-1.67	-1.51	-2.09	4
Fujian	-1.80	-1.67	-1.51	-2.09	4
Jiangxi	-1.80	-1.67	-1.51	-2.09	4
Shandong	-1.80	-1.67	-1.51	-2.09	4
Henan	-1.80	-1.67	-1.51	-2.09	4
Hubei	-1.80	-1.67	-1.51	-2.09	4
Hunan	-1.80	-1.67	-1.51	-2.09	4
Guangdong	-1.80	-1.67	-1.51	-2.09	4
Guangxi	-1.80	-1.67	-1.51	-2.09	4
Hainan	-1.80	-1.67	-1.51	-2.09	4
Sichuan (Chq)	-1.80	-1.67	-1.51	-2.09	4
Guizhou	-1.80	-1.67	-1.51	-2.09	4
Yunan	-1.80	-1.67	-1.51	-2.09	4
Tibet	-1.80	-1.67	-1.51	-2.09	4
Shaanxi	-1.80	-1.67	-1.51	-2.09	4
Gansu	-1.80	-1.67	-1.51	-2.09	4
Qinghai	-1.80	-1.67	-1.51	-2.09	4
Ningxia	-1.80	-1.67	-1.51	-2.09	4
Xinjiang	-1.80	-1.67	-1.51	-2.09	4
	IPS t-bar panel unit root test with constant				
All provinces	-1.56				0

Notes:

1. Statistical significance at the 95% or greater are signified by **.
2. Phillips-Perron unit root test critical value:
   - t(phro-1) test with intercept 5%=-12.5
   - t-test with intercept 5%= -3.066
   - t-test with intercept and trend 5%= -3.735
3. We put 0 lags in all three Phillips-Perron unit root tests.
4. ADF t-test critical value: 5%=-3.00
5. IPS panel unit root test critical value: 5%=-1.74

Table 8.8 Unit Root Tests for the China PPP exchange rate $\ln(\frac{p_T}{P_T})$

Region	PP t(phro-1) test w/intercept	PP t-test w/ intercept	PP t-test w/ intercept & trend	ADF t-test w/intercept	No. of lags
Beijing	-1.65	-1.12	-2.77	-1.03	0
Tianjin	-0.63	-1.45	-1.00	-1.34	0
Hebei	-0.18	-0.51	-1.62	-0.47	0
Shanxi	-0.45	-0.75	-1.85	-0.69	0
Inner Mongolia	-0.17	-0.38	-2.27	-0.35	0
Liaoning	-0.44	-1.03	-1.32	-0.96	0
Jilin	-0.35	-0.78	-1.99	-0.72	0
Heilongjiang	-0.74	-1.53	-1.48	-1.41	0
Shanghai	-0.46	-1.00	-1.20	-0.92	0
Jiangsu	-0.69	-1.32	-1.22	-0.93	1
Zhejiang	-0.25	-0.58	-1.36	-0.71	1
Anhui	-0.44	-0.73	-1.43	-0.81	1
Fujian	-0.18	-0.45	-1.60	-0.79	1
Jiangxi	-0.73	-1.10	-1.97	-0.96	1
Shandong	-0.67	-1.39	-0.79	-1.24	1
Henan	-0.38	-0.81	-1.31	-0.95	1
Hubei	-0.13	-0.26	-1.47	-0.60	1
Hunan	-0.09	-0.23	-1.44	-0.72	1
Guangdong	-0.37	-1.17	-0.76	-1.24	1
Guangxi	-0.75	-1.19	-0.92	-1.32	1
Hainan	-2.59	-1.81	-2.02	-2.26	1
Sichuan (Chq)	-0.64	-1.15	-1.26	-0.99	1
Guizhou	-0.49	-1.46	-1.40	-0.99	1
Yunan	-0.45	-1.12	-0.73	-1.27	1
Tibet	0.36	0.23	-5.46 **	-0.44	1
Shaanxi	-0.74	-1.84	-1.01	-0.98	1
Gansu	-0.45	-1.00	-1.41	-0.86	1
Qinghai	-0.80	-1.51	-2.00	-1.05	1
Ningxia	-0.70	-1.73	-1.16	-1.18	1
Xinjiang	-0.94	-1.77	-0.58	-1.52	1
	IPS t-bar panel unit uoot test with constant				
All provinces	-1.21				0

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Phillips-Perron unit root test critical value:
   - t(phro-1) test with intercept 5%=-12.5
   - t-test with intercept 5%= -3.082
   - t-test with intercept and trend 5%= -3.761
3. We put 0 lags in all three Phillips-Perron unit root tests.
4. ADF t-test critical value: 5%=-3.00
5. IPS panel unit root test critical value: 5%=-1.74

Table 8.9 **Test for Cointegration of China Black Market Exchange Rate and the PPP exchange rate**

$$\ln XRb = \alpha + \beta \ln \frac{p^T}{P^T}$$

Region	$T(\hat{\rho}-1)$	$t_{\hat{\rho}}(PP)$	$t_{\hat{\rho}}(ADF)$	No. of lags
Beijing	-4.79	-2.25	-3.57 **	2
Tianjin	-4.39	-2.11	-2.35 **	1
Hebei	-4.43	-2.18	-2.34 **	1
Shanxi	-4.41	-2.21	-2.66 **	4
Inner Mongolia	-4.46	-2.19	-3.11 **	4
Liaoning	-4.39	-2.14	-2.75 **	4
Jilin	-4.41	-2.13	-2.88 **	4
Heilongjiang	-4.41	-2.08	-2.52 **	4
Shanghai	-4.44	-2.17	-2.59 **	4
Jiangsu	-4.33	-2.09	-2.96 **	4
Zhejiang	-4.45	-2.21	-2.68 **	4
Anhui	-4.38	-2.21	-3.23 **	4
Fujian	-4.48	-2.21	-2.78 **	4
Jiangxi	-4.43	-2.12	-2.65 **	4
Shandong	-4.34	-2.10	-2.94 **	4
Henan	-4.39	-2.19	-3.12 **	4
Hubei	-4.39	-2.24	-2.90 **	4
Hunan	-4.46	-2.23	-2.99 **	4
Guangdong	-4.46	-2.16	-2.73 **	4
Guangxi	-4.47	-2.19	-2.86 **	4
Hainan	-5.56	-2.10	-4.43 **	4
Sichuan (Chq)	-4.38	-2.13	-2.84 **	4
Guizhou	-4.31	-2.06	-2.78 **	4
Yunan	-4.52	-2.19	-3.18 **	4
Tibet	-5.53	-3.19	-2.70 **	4
Shaanxi	-4.27	-2.02	-2.81 **	4
Gansu	-4.42	-2.15	-2.49 **	4
Qinghai	-4.19	-1.98	-2.40 **	4
Ningxia	-4.28	-2.03	-2.57 **	4
Xinjiang	-4.44	-2.07	-2.59 **	4

	With constant	With constant and trend	With constant, trend and time dummy	
panel v-stat	1.92 **	-2.86 **	-3.19 **	0
panel rho-stat	-0.67	3.21 **	-3.41 **	0
panel pp-stat	-2.90 **	0.39	-20.36 **	0
panel adf-stat	-1.78 **	1.77 **	-15.24 **	0
group rho-stat	2.14 **	5.15 **	-0.59	0
group pp-stat	-1.44	2.11 **	-20.16 **	0
group adf-stat	-0.13	3.59 **	-14.64 **	0

1. Statistical significance at the 95% level or greater are signified by **.

2. The $T(\hat{\rho}-1)$ and $t_{\hat{\rho}}(PP)$ statistics are Phillips-Perron tests applied to the residuals from the first regression and are computed with 0 lags.

   The Phillips and Ouliaris (1990) critical values for residual based tests for cointegration with constant and one explanatory variable are:
   $\hat{Z}_{\alpha}$ 5%=-20.4935 $\hat{Z}_{t}$ 5%=-3.3654

3. The $t_{\hat{\rho}}(ADF)$ is the augmented Dickey-Fuller statistic with no constant or trend.

   The MacKinnon critical values for rejecting of the hypothesis of a unit root is: 5%=-1.95.

4. The panel cointegration tests are those proposed by Pedroni (1995), which is the source of the critical value: 5%=1.65.

Table 8.10 Test for Cointegration of China Official Exchange Rate and the PPP Exchange Rate

$\ln XR = \alpha + \beta \ln \frac{p^T}{P^T}$

Region	$T(\hat{\rho}-1)$	$t_{\hat{\rho}}(PP)$	$t_{\hat{\rho}}(ADF)$	No. of lags
Beijing	-18.02 *	-4.68 **	-3.77 **	4
Tianjin	-10.76	-2.71	-1.97 **	4
Hebei	-7.01	-1.98	-2.37 **	4
Shanxi	-11.26	-2.96	-2.13 **	4
Inner Mongolia	-7.19	-2.02	-1.94	4
Liaoning	-8.54	-2.17	-1.86	4
Jilin	-8.08	-2.09	-2.02 **	4
Heilongjiang	-8.35	-2.06	-2.08 **	4
Shanghai	-10.52	-2.62	-1.50	4
Jiangsu	-11.39	-2.80	-1.50	4
Zhejiang	-7.41	-2.03	-1.94	4
Anhui	-7.35	-2.18	-2.44 **	4
Fujian	-7.30	-2.04	-1.93	4
Jiangxi	-8.44	-2.26	-1.89	4
Shandong	-12.79	-3.12	-1.51	4
Henan	-9.89	-2.64	-1.93	4
Hubei	-5.59	-1.80	-2.64 **	4
Hunan	-6.20	-1.88	-2.43 **	4
Guangdong	-9.65	-2.49	-1.85	4
Guangxi	-11.40	-3.05	-2.50 **	4
Hainan	-8.35	-2.40	-2.35 **	4
Sichuan (Chq)	-11.28	-2.89	-1.52	4
Guizhou	-7.76	-2.11	-2.40 **	4
Yunan	-11.15	-2.90	-1.63	4
Tibet	-10.22	-4.14 **	-1.26	4
Shaanxi	-10.40	-2.57	-1.96 **	4
Gansu	-7.59	-2.01	-1.98 **	4
Qinghai	-7.77	-2.00	-2.10 **	4
Ningxia	-9.27	-2.33	-2.21 **	4
Xinjiang	-15.19	-3.61 **	-1.48	4

	With constant	With constant and trend	With constant, trend and time dummy	
panel v-stat	0.60	-4.00 **	-1.82 **	0
panel rho-stat	-3.80 **	-0.09	-9.86 **	0
panel pp-stat	-4.81 **	-4.34 **	-27.13 **	0
panel adf-stat	-4.50 **	-4.09 **	-24.36 **	0
group rho-stat	-0.84	2.36 **	-6.31 **	0
group pp-stat	-4.04 **	-2.97 **	-28.86 **	0
group adf-stat	-3.53 **	-2.21 **	-24.88 **	0

1. Statistical significance at the 95% level or greater are signified by **.

2. The $T(\hat{\rho}-1)$ and $t_{\hat{\rho}}(PP)$ statistics are Phillips-Perron tests applied to the residuals from the first regression and are computed with 0 lags.

   The Phillips and Ouliaris (1990) critical values for residual based tests for cointegration with constant and one explanatory variable are:
   $\hat{Z}_\alpha$ 5%=-20.4935 $\hat{Z}_t$ 5%=-3.3654

3. The $t_{\hat{\rho}}(ADF)$ is the augmented Dickey-Fuller statistic with no constant or trend.

   The MacKinnon critical values for rejecting of the hypothesis of a unit root is: 5%=-1.95.

4. The panel cointegration tests are those proposed by Pedroni (1995), which is the source of the critical value: 5%=1.65.

Table 8.11 Test for Unit Roots in $\zeta = \ln XRb - \ln \frac{p^T}{P^T}$

Region	PP t(phro-1) test w/intercept	PP t-test w/ intercept	PP t-test w/ intercept & trend	ADF t-test w/intercept	No. of lags
Beijing	-1.63	-0.77	-2.54	-4.56 **	3
Tianjin	-0.17	-0.12	-2.12	-0.83	2
Hebei	0.40	0.35	-2.24	-0.72	2
Shanxi	-0.12	-0.09	-2.22	-1.32	2
Inner Mongolia	0.19	0.13	-2.21	-0.52	2
Liaoning	0.01	0.01	-2.11	-0.66	2
Jilin	0.00	0.00	-2.20	-0.45	2
Heilongjiang	-0.65	-0.39	-2.02	-0.67	2
Shanghai	-0.41	-0.26	-2.12	-0.79	2
Jiangsu	-0.01	-0.01	-1.91	-0.49	2
Zhejiang	0.26	0.24	-1.97	-0.52	2
Anhui	-0.06	-0.05	-1.92	-0.74	2
Fujian	0.36	0.35	-2.20	-0.84	2
Jiangxi	-0.40	-0.26	-2.15	-1.00	2
Shandong	0.09	0.08	-2.13	-0.83	2
Henan	0.09	0.08	-2.12	-0.68	2
Hubei	0.19	0.16	-2.01	-0.82	2
Hunan	0.22	0.17	-2.13	-0.75	2
Guangdong	0.24	0.24	-2.14	-0.50	2
Guangxi	-0.40	-0.30	-1.95	-1.09	2
Hainan	-2.39	-1.42	-2.90	-1.78	1
Sichuan (Chq)	-0.20	-0.14	-2.12	-1.16	1
Guizhou	-0.06	-0.04	-2.16	-0.93	1
Yunan	-0.21	-0.15	-2.27	-1.17	1
Tibet	-2.84	-1.32	-4.07 **	-1.12	1
Shaanxi	-0.14	-0.09	-2.12	-0.96	1
Gansu	-0.29	-0.20	-2.12	-1.08	1
Qinghai	-0.12	-0.08	-2.12	-0.84	1
Ningxia	-0.03	-0.03	-2.15	-0.87	1
Xinjiang	-0.56	-0.38	-2.01	-1.13	1
	IPS t-bar panel unit root test with constant				
All provinces	-0.13				0

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Phillips-Perron unit root test critical value:
   - t(phro-1) test with intercept 5%=-12.5
   - t-test with intercept 5%= -3.082
   - t-test with intercept and trend 5%= -3.761
3. We put 0 lags in all three Phillips-Perron unit root tests.
4. ADF t-test critical value: 5%=-3.00
5. IPS panel unit root test critical value: 5%=-1.74

Table 8.12 Estimates of the Cointegrating Slope Coefficient of $\ln XRb = \alpha + \beta \ln \frac{p^T}{P^T}$

Region	$\hat{\beta}_{OLS}$	$t(\beta_{OLS} = 1)$	$\hat{\beta}_{FMOLS}$	$t(\beta_{FMOLS} = 1)$	No. of lags
Beijing	0.36	-5.11 **	0.26	-4.90 **	3
Tianjin	0.32	-5.74 **	0.24	-5.12 **	3
Hebei	0.25	-7.50 **	0.16	-6.85 **	3
Shanxi	0.29	-6.09 **	0.20	-5.63 **	3
Inner Mongolia	0.29	-5.91 **	0.18	-5.61 **	3
Liaoning	0.30	-5.87 **	0.20	-5.45 **	3
Jilin	0.34	-4.95 **	0.22	-4.73 **	3
Heilongjiang	0.36	-4.63 **	0.21	-4.51 **	3
Shanghai	0.34	-4.86 **	0.23	-4.64 **	3
Jiangsu	0.27	-7.09 **	0.18	-6.36 **	3
Zhejiang	0.21	-8.73 **	0.12	-8.00 **	3
Anhui	0.25	-6.92 **	0.14	-6.53 **	3
Fujian	0.21	-9.27 **	0.14	-8.32 **	3
Jiangxi	0.33	-5.49 **	0.25	-4.92 **	3
Shandong	0.27	-7.69 **	0.24	-6.38 **	3
Henan	0.26	-7.12 **	0.17	-6.49 **	3
Hubei	0.25	-6.88 **	0.13	-6.54 **	3
Hunan	0.26	-6.56 **	0.15	-6.23 **	3
Guangdong	0.22	-8.98 **	0.17	-7.82 **	3
Guangxi	0.27	-6.80 **	0.19	-6.16 **	3
Hainan	0.21	-19.39 **	0.22	-13.20 **	3
Sichuan (Chq)	0.32	-5.64 **	0.23	-5.10 **	3
Guizhou	0.36	-4.96 **	0.22	-4.73 **	3
Yunan	0.30	-6.19 **	0.24	-5.47 **	3
Tibet	0.26	-3.89 **	0.02	-5.17 **	3
Shaanxi	0.38	-4.72 **	0.28	-4.25 **	3
Gansu	0.32	-5.34 **	0.21	-5.04 **	3
Qinghai	0.39	-4.73 **	0.26	-4.34 **	3
Ningxia	0.34	-5.65 **	0.27	-4.86 **	3
Xinjiang	0.33	-5.80 **	0.27	-4.94 **	3

Panel Tests of $\beta = 1$

	$\hat{\beta}_{PANEL}$	$\sqrt{N}\,\bar{t}_{\hat{\beta}}$
All provinces	0.20	-32.55 **

Panel Tests of $\beta = 1$ with Common Time Dummies

	$\hat{\beta}_{PANEL}$	$\sqrt{N}\,\bar{t}_{\hat{\beta}}$
All provinces	-0.001	-9.35E+15 **

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Critical values of the t-values with n-k=16-2=14 degrees of freedom
   5% = 2.145 10%=1.761
3. $\sqrt{N}\,\bar{t}_{\hat{\beta}}$ is the group mean t-ratio which is distributed as standard normal under the null.
   Panel test critical value: 5% = 1.96

Table 8.13 Test for Unit Roots in $\delta = \ln XR - \ln \frac{p^T}{P^T}$

Region	PP t(phro-1) test w/intercept	PP t-test w/ intercept	PP t-test w/ intercept & trend	ADF t-test w/intercept	No. of lags
Beijing	-4.92	-1.66	-4.64 **	-0.58	4
Tianjin	-0.88	-0.64	-3.65	0.44	3
Hebei	0.33	0.43	-2.26	1.31	4
Shanxi	-0.56	-0.42	-3.86 **	-0.18	4
Inner Mongolia	0.28	0.21	-2.27	2.12	4
Liaoning	-0.16	-0.14	-2.93	1.69	4
Jilin	0.31	0.20	-2.49	4.89 **	4
Heilongjiang	-1.05	-0.69	-3.01	1.29	4
Shanghai	-0.52	-0.34	-3.61	1.32	4
Jiangsu	-0.65	-0.60	-3.07	0.41	4
Zhejiang	-0.01	-0.01	-2.15	0.60	4
Anhui	-0.47	-0.40	-2.01	0.61	4
Fujian	0.16	0.25	-2.41	0.70	4
Jiangxi	-0.50	-0.47	-3.01	1.20	4
Shandong	-0.65	-0.69	-3.22	-0.57	4
Henan	-0.45	-0.39	-2.90	0.43	4
Hubei	0.17	0.17	-1.63	0.60	4
Hunan	0.32	0.30	-1.83	0.52	4
Guangdong	-0.19	-0.26	-3.30	0.54	4
Guangxi	-1.05	-0.88	-2.18	-0.21	4
Hainan	-3.59	-1.93	-2.26	-1.17	3
Sichuan (Chq)	-0.47	-0.41	-3.19	0.37	3
Guizhou	-0.54	-0.36	-2.41	1.52	4
Yunan	-0.52	-0.49	-3.94 **	0.18	4
Tibet	-6.37	-1.95	-4.22 **	0.24	4
Shaanxi	-0.64	-0.43	-3.31	1.55	4
Gansu	-0.38	-0.32	-2.64	0.86	4
Qinghai	-0.80	-0.54	-2.67	2.45	4
Ningxia	-0.61	-0.55	-3.55	1.04	4
Xinjiang	-1.57	-1.21	-3.43	-0.49	4
	IPS t-bar panel unit root test with constant				
All provinces	-0.44				0

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Phillips-Perron unit root test critical value:
   - t(phro-1) test with intercept 5%=-12.5
   - t-test with intercept 5%= -3.082
   - t-test with intercept and trend 5%= -3.761
3. We put 0 lags in all three Phillips-Perron unit root tests.
4. ADF t-test critical value: 5%=-3.00
5. IPS panel unit root test critical value: 5%=-1.74

Table 8.14 **Estimates of the Cointegrating Slope Coefficient of** $\ln XR = \alpha + \beta \ln \frac{p^T}{P^T}$

Region	$\hat{\beta}_{OLS}$	$t(\beta_{OLS}=1)$	$\hat{\beta}_{FMOLS}$	$t(\beta_{FMOLS}=1)$	No. of lags
Beijing	0.54	-11.27 **	0.54	-14.90 **	3
Tianjin	0.51	-14.68 **	0.53	-11.84 **	3
Hebei	0.41	-18.72 **	0.42	-13.28 **	3
Shanxi	0.49	-16.40 **	0.50	-13.07 **	3
Inner Mongolia	0.49	-12.62 **	0.49	-9.10 **	3
Liaoning	0.50	-14.77 **	0.51	-11.01 **	3
Jilin	0.55	-10.88 **	0.56	-7.99 **	3
Heilongjiang	0.58	-11.14 **	0.62	-7.46 **	3
Shanghai	0.57	-12.19 **	0.58	-9.51 **	3
Jiangsu	0.44	-20.91 **	0.45	-17.30 **	3
Zhejiang	0.36	-22.43 **	0.36	-16.16 **	3
Anhui	0.43	-16.22 **	0.43	-11.38 **	3
Fujian	0.35	-25.30 **	0.35	-18.50 **	3
Jiangxi	0.53	-16.34 **	0.54	-12.58 **	3
Shandong	0.42	-24.73 **	0.43	-24.08 **	3
Henan	0.43	-18.31 **	0.44	-14.00 **	3
Hubei	0.43	-14.76 **	0.42	-10.06 **	3
Hunan	0.45	-14.15 **	0.44	-10.00 **	3
Guangdong	0.36	-25.71 **	0.38	-19.72 **	3
Guangxi	0.45	-19.82 **	0.45	-17.57 **	3
Hainan	0.22	-26.35 **	0.18	-19.33 **	3
Sichuan (Chq)	0.52	-16.75 **	0.53	-13.94 **	3
Guizhou	0.55	-10.55 **	0.58	-7.11 **	3
Yunan	0.48	-17.83 **	0.50	-14.52 **	3
Tibet	0.62	-3.84 **	0.53	-5.49 **	3
Shaanxi	0.58	-11.73 **	0.60	-8.90 **	3
Gansu	0.53	-13.28 **	0.55	-9.07 **	3
Qinghai	0.57	-11.11 **	0.59	-7.72 **	3
Ningxia	0.51	-15.37 **	0.55	-10.71 **	3
Xinjiang	0.51	-18.84 **	0.52	-19.58 **	3

Panel Tests of $\beta = 1$

	$\hat{\beta}_{PANEL}$	$\sqrt{N}\,\bar{t}_{\hat{\beta}}$
All provinces	0.49	-70.46 **

Panel Tests of $\beta = 1$ with Common Time Dummies

	$\hat{\beta}_{PANEL}$	$\sqrt{N}\,\bar{t}_{\hat{\beta}}$
All provinces	0.001	-7.98E+15 **

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Critical values of the t-values with n-k=16-2=14 degrees of freedom
   5% = 2.145 10%=1.761
3. $\sqrt{N}\,\bar{t}_{\hat{\beta}}$ is the group mean t-ratio which is distributed as standard normal under the null.
   Panel test critical value: 5% = 1.96

Table 8.15 Unit Root Tests for the China Real Parallel Exchange Rate q_b

Region	PP t(phro-1) test w/intercept	PP t-test w/ intercept	PP t-test w/ intercept & trend	ADF t-test w/intercept	No. of lags
Beijing	-0.18	-0.11	-2.66	-0.99	1
Tianjin	-1.45	-0.70	-2.37	-0.65	0
Hebei	0.09	0.07	-2.56	-1.81	4
Shanxi	-0.58	-0.36	-2.48	-1.59	4
Inner Mongolia	-0.24	-0.16	-2.44	-1.45	4
Liaoning	-0.56	-0.33	-2.39	-1.72	4
Jilin	-0.60	-0.35	-2.51	-1.83	4
Heilongjiang	-0.34	-0.22	-2.33	-2.18	4
Shanghai	-0.90	-0.48	-2.26	-1.79	4
Jiangsu	-0.52	-0.30	-2.38	-1.91	4
Zhejiang	-0.03	-0.02	-2.32	-1.85	4
Anhui	-0.19	-0.13	-2.18	-2.11	4
Fujian	0.27	0.23	-2.59	-1.36	4
Jiangxi	-0.13	-0.09	-2.36	-2.32	4
Shandong	-0.03	-0.02	-2.57	-1.76	4
Henan	-0.02	-0.01	-2.59	-2.31	4
Hubei	-0.14	-0.09	-2.42	-2.33	4
Hunan	-0.18	-0.12	-2.29	-1.56	4
Guangdong	0.23	0.19	-2.82	-2.22	4
Guangxi	-0.39	-0.27	-2.22	-1.27	4
Hainan	-0.67	-0.53	-1.80	-30.15 **	4
Sichuan (Chq)	-0.24	-0.16	-2.41	-2.22	4
Guizhou	-0.63	-0.36	-2.32	-1.18	4
Yunan	-0.29	-0.19	-2.61	-1.31	4
Tibet	-0.54	-0.28	-2.99	-1.40	4
Shaanxi	-2.49	-1.25	-2.98	-1.87	4
Gansu	-0.51	-0.30	-2.30	-2.00	4
Qinghai	-0.64	-0.36	-2.38	-1.04	4
Ningxia	-0.26	-0.17	-2.26	-1.29	4
Xinjiang	-0.06	-0.04	-2.36	-1.33	4
	IPS t-bar panel unit root test with constant				
All provinces	-0.21				0

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Phillips-Perron unit root test critical value:
   - t(phro-1) test with intercept 5%=-12.5
   - t-test with intercept 5%= -3.066
   - t-test with intercept and trend 5%= -3.735
3. We put 0 lags in all three Phillips-Perron unit root tests.
4. ADF t-test critical value: 5%=-3.00
5. IPS panel unit root test critical value: 5%=-1.74

Table 8.16 Unit Root Tests for China Real Official Exchange Rate q

Region	PP t(phro-1) test w/intercept	PP t-test w/ intercept	PP t-test w/ intercept & trend	ADF t-test w/intercept	No. of lags
Beijing	0.14	0.07	-2.71	0.06	0
Tianjin	-2.52	-0.81	-2.68	1.00	1
Hebei	0.37	0.27	-2.97	0.23	1
Shanxi	-0.82	-0.42	-3.36	-0.19	1
Inner Mongolia	-0.59	-0.33	-3.23	1.44	4
Liaoning	-0.13	-0.07	-3.18	1.87	4
Jilin	-0.53	-0.24	-2.74	0.22	4
Heilongjiang	0.18	0.11	-2.64	-0.15	4
Shanghai	-0.10	-0.04	-2.14	-0.28	4
Jiangsu	-0.51	-0.25	-3.53	-0.16	4
Zhejiang	0.15	0.11	-2.81	0.06	4
Anhui	-0.37	-0.24	-2.04	0.25	4
Fujian	0.21	0.22	-3.30	0.22	4
Jiangxi	-0.32	-0.21	-2.43	0.38	4
Shandong	0.28	0.22	-3.73	-0.01	4
Henan	0.25	0.17	-2.65	0.18	4
Hubei	0.53	0.34	-2.12	-0.26	4
Hunan	-0.19	-0.12	-2.43	0.66	4
Guangdong	0.06	0.05	-4.14 **	0.39	4
Guangxi	-0.88	-0.61	-3.10	0.05	4
Hainan	-3.18	-1.89	-3.15	-2.50	4
Sichuan (Chq)	-0.16	-0.11	-2.81	0.38	4
Guizhou	-2.31	-0.96	-3.04	1.21	4
Yunan	-0.89	-0.55	-4.42 **	1.28	4
Tibet	-1.76	-0.60	-2.75	0.67	4
Shaanxi	-6.38	-2.02	-3.14	-0.35	4
Gansu	-0.33	-0.17	-2.02	0.19	4
Qinghai	-2.53	-0.97	-3.15	1.37	4
Ningxia	-0.77	-0.47	-3.01	1.46	4
Xinjiang	-0.59	-0.43	-3.93 **	1.08	4
	IPS t-bar panel unit root test with constant				
All provinces	-0.35				0

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Phillips-Perron unit root test critical value:
   - t(phro-1) test with intercept 5%=-12.5
   - t-test with intercept 5%= -3.066
   - t-test with intercept and trend 5%= -3.735
3. We put 0 lags in all three Phillips-Perron unit root tests.
4. ADF t-test critical value: 5%=-3.00
5. IPS panel unit root test critical value: 5%=-1.74

Table 8.17 Unit Root Tests for Relative TFP Difference between US and China
$(\ln \theta_T - \ln \theta_N) - (\ln_{\theta_T} - \ln_{\theta_N})$

Region	PP t(phro-1) test w/intercept	PP t-test w/ intercept	PP t-test w/ intercept & trend	ADF t-test w/intercept	No. of lags
Beijing	-2.98	-1.62	-2.07	-1.50	0
Tianjin	-4.14	-1.94	-2.10	-1.80	0
Hebei	-5.51	-1.75	-1.41	-1.63	0
Shanxi	-5.07	-1.58	-1.86	-1.47	0
Inner Mongolia	-2.31	-0.78	-0.74	-0.72	0
Liaoning	-3.45	-1.85	-0.63	-1.72	0
Jilin	-3.19	-1.18	0.03	-1.09	0
Heilongjiang	-4.87	-1.88	-1.32	-2.01	3
Shanghai	-5.07	-2.18	-2.26	-1.82	3
Jiangsu	-8.61	-2.65	-3.00	-1.52	3
Zhejiang	-8.54	-2.61	-2.63	-1.68	3
Anhui	-6.19	-1.86	-1.61	-1.38	3
Fujian	-11.11	-2.84	-3.19	-1.29	3
Jiangxi	0.23	0.09	-1.57	-0.07	3
Shandong	-6.39	-2.35	-2.01	-1.70	3
Henan	-11.13	-2.78	-2.54	-1.45	3
Hubei	-5.27	-1.69	-1.39	-1.34	3
Hunan	-1.77	-0.66	-0.58	-1.29	3
Guangdong	-8.27	-2.53	-2.61	-1.78	2
Guangxi	-6.25	-1.97	-1.51	-1.13	2
Hainan	-5.48	-1.74	-2.70	-1.20	2
Sichuan (Chq)	-5.36	-2.01	-1.14	-1.75	3
Guizhou	-3.15	-1.36	-0.12	-2.16	4
Yunan	-4.16	-1.53	-0.53	-1.30	4
Tibet	-23.28 **	-7.08 **	-7.13 **	-6.59 **	0
Shaanxi	-3.61	-1.53	-0.62	-1.42	0
Gansu	-1.20	-0.44	0.14	-1.88	4
Qinghai	-4.49	-1.45	-0.57	-1.35	0
Ningxia	-1.13	-0.38	-0.55	-0.85	4
Xinjiang	-4.47	-1.70	-1.46	-1.83	4
	IPS t-bar panel unit root test with constant				
All provinces	-1.73				0

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Phillips-Perron unit root test critical value:
   - t(phro-1) test with intercept 5%=-12.5
   - t-test with intercept 5%= -3.066
   - t-test with intercept and trend 5%= -3.735
3. We put 0 lags in all three Phillips-Perron unit root tests.
4. ADF t-test critical value: 5%=-3.00
5. IPS panel unit root test critical value: 5%=-1.74

Table 8.18 Test for Cointegration of China Real Parallel Exchange Rate and Relative TFP Difference between US and China $q_b = \alpha + \beta[(\ln \theta_T - \ln \theta_N) - (\ln_{\theta_T} - \ln_{\theta_N})]$

Region	$T(\hat{\rho}-1)$	$t_{\hat{\rho}}(PP)$	$t_{\hat{\rho}}(ADF)$	No. of lags
Beijing	-4.46	-1.70	-1.62	0
Tianjin	-2.99	-1.31	-3.22 **	4
Hebei	-0.21	-0.15	-1.99 **	4
Shanxi	-3.02	-1.28	-1.24	0
Inner Mongolia	-1.60	-0.89	-1.82	4
Liaoning	-1.01	-0.52	-2.17 **	4
Jilin	-0.62	-0.36	-2.41 **	4
Heilongjiang	-0.42	-0.27	-2.28 **	4
Shanghai	-2.12	-0.98	-4.02 **	4
Jiangsu	-2.00	-0.83	-2.57 **	4
Zhejiang	-0.85	-0.40	-1.83	4
Anhui	-0.88	-0.57	-1.95 **	4
Fujian	-2.78	-1.18	-1.10	4
Jiangxi	-5.26	-1.72	-1.41	4
Shandong	-1.45	-0.59	-1.41	4
Henan	-0.56	-0.36	-2.00 **	4
Hubei	-0.57	-0.37	-2.18 **	4
Hunan	-1.38	-0.85	-2.07 **	4
Guangdong	-0.63	-0.33	-2.37 **	4
Guangxi	-0.29	-0.18	-1.94	4
Hainan	-14.62	-4.43 **	-0.46	4
Sichuan (Chq)	-0.21	-0.13	-3.01 **	4
Guizhou	-0.57	-0.32	-1.85	4
Yunan	-0.10	-0.07	-1.94	4
Tibet	-1.60	-0.69	-1.62	4
Shaanxi	-2.53	-1.22	-1.84	4
Gansu	-1.47	-0.82	-2.25 **	4
Qinghai	-1.43	-0.77	-1.79	4
Ningxia	-2.32	-1.17	-2.21 **	4
Xinjiang	-0.40	-0.28	-1.82	4

	With constant	With constant and trend	With constant, trend and time dummy	
panel v-stat	-1.42	-1.50	-1.00	0
panel rho-stat	3.05 **	2.80 **	-0.99	0
panel pp-stat	3.53 **	0.39	-6.46 **	0
panel adf-stat	5.47 **	2.11 **	-5.93 **	0
group rho-stat	5.40 **	4.81 **	1.06	0
group pp-stat	5.92 **	2.16 **	-6.42 **	0
group adf-stat	8.51 **	3.95 **	-5.10 **	0

1. Statistical significance at the 95% level or greater are signified by **.

2. The $T(\hat{\rho}-1)$ and $t_{\hat{\rho}}(PP)$ statistics are Phillips-Perron tests applied to the residuals from the first regression and are computed with 0 lags.

   The Phillips and Ouliaris (1990) critical values for residual based tests for cointegration with constant and one explanatory variable are:
   $\hat{Z}_\alpha$ 5%=-20.4935 $\hat{Z}_t$ 5%=-3.3654

3. The $t_{\hat{\rho}}(ADF)$ is the augmented Dickey-Fuller statistic with no constant or trend.

   The MacKinnon critical values for rejecting of the hypothesis of a unit root is: 5%=-1.95.

4. The panel cointegration tests are those proposed by Pedroni (1995), which is the source of the critical value: 5%=1.65.

Table 8.19 **Test for Cointegration of China Real Official Exchange Rate and Relative TFP Difference between US and China** $q = \alpha + \beta[(\ln \theta_T - \ln \theta_N) - (\ln_{\theta_T} - \ln_{\theta_N})]$

Region	$T(\hat{\rho}-1)$	$t_{\hat{\rho}}(PP)$	$t_{\hat{\rho}}(ADF)$	No. of lags
Beijing	-4.29	-1.20	-1.22	0
Tianjin	-5.20	-1.41	-1.41	0
Hebei	0.06	0.06	-0.19	0
Shanxi	-2.39	-1.34	-1.31	0
Inner Mongolia	-1.84	-1.31	-0.64	4
Liaoning	-0.54	-0.18	-0.68	4
Jilin	-0.83	-0.40	-0.44	4
Heilongjiang	0.14	0.09	-0.78	4
Shanghai	-2.06	-0.67	-1.44	4
Jiangsu	-2.52	-0.79	-0.69	4
Zhejiang	-0.86	-0.34	-0.49	4
Anhui	-1.35	-0.92	-0.26	4
Fujian	-2.04	-1.14	-0.35	4
Jiangxi	-5.88	-2.44	-0.88	4
Shandong	-1.83	-0.54	-0.18	4
Henan	-0.27	-0.19	-0.58	4
Hubei	-0.73	-0.41	-0.63	4
Hunan	-1.82	-1.38	-0.61	4
Guangdong	-0.82	-0.37	-0.08	4
Guangxi	-0.76	-0.43	0.03	4
Hainan	-13.71	-4.33 **	0.86	4
Sichuan (Chq)	-0.03	-0.01	-0.27	4
Guizhou	-2.31	-0.94	0.41	4
Yunan	-0.62	-0.31	0.10	4
Tibet	-4.01	-1.26	0.09	4
Shaanxi	-6.47	-2.02	-1.88	4
Gansu	-2.04	-1.34	-0.48	4
Qinghai	-2.87	-1.21	0.45	4
Ningxia	-2.77	-2.14	-0.42	4
Xinjiang	-0.61	-0.45	0.40	4

	With constant	With constant and trend	With constant, trend and time dummy	
panel v-stat	-3.00 **	7.28 **	-0.94	0
panel rho-stat	3.80 **	-1.03	-1.14	0
panel pp-stat	4.59 **	-8.00 **	-6.64 **	0
panel adf-stat	4.78 **	-7.35 **	-6.08 **	0
group rho-stat	6.00 **	1.54	1.04	0
group pp-stat	6.85 **	-7.83 **	-6.32 **	0
group adf-stat	6.99 **	-6.68 **	-5.09 **	0

1. Statistical significance at the 95% level or greater are signified by **.

2. The $T(\hat{\rho}-1)$ and $t_{\hat{\rho}}(PP)$ statistics are Phillips-Perron tests applied to the residuals from the first regression and are computed with 0 lags.

   The Phillips and Ouliaris (1990) critical values for residual based tests for cointegration with constant and one explanatory variable are:
   $\hat{Z}_\alpha$ 5%=-20.4935 $\hat{Z}_t$ 5%=-3.3654

3. The $t_{\hat{\rho}}(ADF)$ is the augmented Dickey-Fuller statistic with no constant or trend.

   The MacKinnon critical values for rejecting of the hypothesis of a unit root is: 5%=-1.95.

4. The panel cointegration tests are those proposed by Pedroni (1995), which is the source of the critical value: 5%=1.65.

Table 8.20 **Estimates of the Cointegrating Slope Coefficient of** $q = \alpha + \beta[(\ln \theta_T - \ln \theta_N) - (\ln_{\theta_T} - \ln_{\theta_N})]$

Region	$\hat{\beta}_{OLS}$	$t(\beta_{OLS} = 0)$	$\hat{\beta}_{FMOLS}$	$t(\beta_{FMOLS} = 0)$	No. of lags
Beijing	-0.29	-3.55 **	-0.23	-1.89 *	3
Tianjin	-0.23	-1.89 *	-0.2	-1.1	3
Hebei	0.11	0.53	0.01	0.03	3
Shanxi	0.40	2.03 *	0.29	0.99	3
Inner Mongolia	0.34	1.58	0.1	0.29	3
Liaoning	-0.17	-1.52	-0.08	-0.44	3
Jilin	0.06	0.40	-0.1	-0.4	3
Heilongjiang	0.03	0.12	0.09	0.21	3
Shanghai	-0.24	-1.62	-0.16	-0.65	3
Jiangsu	-0.36	-1.90 *	-0.32	-1.05	3
Zhejiang	-0.32	-1.43	-0.28	-0.77	3
Anhui	0.22	1.02	0.17	0.48	3
Fujian	0.53	1.59	0.44	0.9	3
Jiangxi	0.68	5.69 **	0.56	4.03 **	3
Shandong	-0.57	-2.43 **	-0.53	-1.4	3
Henan	0.11	0.50	-0.04	-0.12	3
Hubei	0.14	0.81	0.08	0.3	3
Hunan	0.30	1.67	0.12	0.42	3
Guangdong	-0.24	-1.48	-0.13	-0.5	3
Guangxi	-0.16	-0.63	-0.27	-0.66	3
Hainan	0.11	0.52	0.08	0.4	3
Sichuan (Chq)	-0.15	-0.65	-0.11	-0.26	3
Guizhou	-0.01	-0.10	-0.03	-0.13	3
Yunan	-0.20	-0.65	-0.38	-0.72	3
Tibet	0.39	1.11	0.52	1.03	3
Shaanxi	0.29	1.59	0.16	0.61	3
Gansu	0.25	1.84 *	0.07	0.34	3
Qinghai	0.09	0.52	-0.05	-0.18	3
Ningxia	0.34	1.82 *	0.13	0.51	3
Xinjiang	0.01	0.04	0.04	0.08	3

Panel Tests of $\beta = 0$

	$\hat{\beta}_{PANEL}$	$\sqrt{N}\,\bar{t}_{\hat{\beta}}$
All provinces	-0.001	0.06

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Critical values of the t-values with n-k=16-2=14 degrees of freedom
   5% = 2.145 10%=1.761
3. $\sqrt{N}\,\bar{t}_{\hat{\beta}}$ is the group mean t-ratio which is distributed as standard normal under the null.
   Panel test critical value: 5% = 1.96

Table 8.21 **Estimates of the Cointegrating Slope Coefficient of**

$q_b = \alpha + \beta[(\ln \theta_T - \ln \theta_N) - (\ln_{\theta_T} - \ln_{\theta_N})]$

Region	$\hat{\beta}_{OLS}$	$t(\beta_{OLS} = 0)$	$\hat{\beta}_{FMOLS}$	$t(\beta_{FMOLS} = 0)$	No. of lags
Beijing	-0.50	-3.15 **	-0.55	-2.42 **	3
Tianjin	-0.43	-1.74	-0.54	-1.41	3
Hebei	0.14	0.44	-0.25	-0.42	3
Shanxi	0.77	2.04 *	0.26	0.41	3
Inner Mongolia	0.55	1.50	-0.21	-0.33	3
Liaoning	-0.29	-1.25	-0.34	-0.82	3
Jilin	0.01	0.03	-0.57	-1.04	3
Heilongjiang	0.08	0.18	-0.18	-0.22	3
Shanghai	-0.40	-1.33	-0.43	-0.85	3
Jiangsu	-0.50	-1.48	-0.66	-1.18	3
Zhejiang	-0.41	-1.15	-0.58	-0.93	3
Anhui	0.38	1.03	-0.08	-0.12	3
Fujian	0.80	1.79 *	0.55	0.77	3
Jiangxi	1.12	5.47 **	0.74	2.58 **	3
Shandong	-0.76	-1.97 *	-0.98	-1.49	3
Henan	0.21	0.58	-0.24	-0.37	3
Hubei	0.23	0.78	-0.16	-0.3	3
Hunan	0.51	1.69	-0.07	-0.13	3
Guangdong	-0.25	-1.04	-0.26	-0.61	3
Guangxi	-0.17	-0.43	-0.62	-0.88	3
Hainan	0.50	2.94 **	0.56	2.9 **	3
Sichuan (Chq)	-0.12	-0.31	-0.38	-0.5	3
Guizhou	-0.06	-0.22	-0.39	-0.79	3
Yunan	-0.19	-0.40	-0.83	-0.94	3
Tibet	0.30	0.50	0.28	0.27	3
Shaanxi	0.31	0.80	-0.16	-0.25	3
Gansu	0.34	1.23	-0.28	-0.56	3
Qinghai	0.28	0.88	-0.21	-0.35	3
Ningxia	0.64	1.98 *	-0.06	-0.11	3
Xinjiang	0.20	0.46	-0.06	-0.08	3

Panel Tests of $\beta = 0$

	$\hat{\beta}_{PANEL}$	$\sqrt{N}\,\bar{t}_{\hat{\beta}}$
All provinces	-0.22	-1.86 *

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Critical values of the t-values with n-k=16-2=14 degrees of freedom

   5% = 2.145 10%=1.761

3. $\sqrt{N}\,\bar{t}_{\hat{\beta}}$ is the group mean t-ratio which is distributed as standard normal under the null.

   Panel test critical value: 5% = 1.96 10%=1.64

Table 8.22 Unit Root Tests for Relative Price Difference between US and China
$(\ln P_N - \ln P_T) - (\ln p_N - \ln p_T)$

Region	PP t(phro-1) test w/intercept	PP t-test w/ intercept	PP t-test w/ intercept & trend	ADF t-test w/intercept	No. of lags
Beijing	-7.55	-2.24	-2.18	-4.80	3
Tianjin	-2.49	-1.49	-1.49	-1.38	0
Hebei	-1.53	-1.56	-1.62	-1.44	0
Shanxi	-1.49	-1.14	-1.62	-1.05	0
Inner Mongolia	-0.51	-0.45	-2.33	-0.41	0
Liaoning	-1.36	-1.03	-2.59	-0.95	0
Jilin	-3.27	-1.48	-3.19	-1.37	0
Heilongjiang	-4.47	-1.94	-2.60	-1.80	0
Shanghai	-4.19	-1.70	-1.86	-1.58	0
Jiangsu	-4.23	-1.98	-1.41	-1.83	0
Zhejiang	-3.53	-1.75	-1.69	-1.62	0
Anhui	-2.23	-1.65	-1.19	-1.53	0
Fujian	-2.12	-1.31	-2.30	-1.21	0
Jiangxi	-2.47	-1.50	-0.94	-1.39	0
Shandong	-2.79	-1.69	-1.00	-1.56	0
Henan	-1.53	-1.25	-1.02	-1.16	0
Hubei	-1.28	-1.30	-1.49	-1.21	0
Hunan	-1.82	-1.22	-2.01	-1.13	0
Guangdong	-1.34	-1.38	-1.06	-1.28	0
Guangxi	-2.69	-1.77	-0.99	-1.64	0
Hainan	-3.39	-1.28	-2.18	-1.19	0
Sichuan (Chq)	-3.36	-1.55	-1.12	-1.43	0
Guizhou	-1.62	-1.70	-0.22	-1.58	0
Yunan	-3.48	-1.91	-0.44	-1.77	0
Tibet	-5.98	-1.99	-4.29 **	-1.84	0
Shaanxi	-2.80	-1.60	-1.17	-1.48	0
Gansu	-1.54	-1.00	-1.50	-0.93	0
Qinghai	-1.93	-1.70	-0.85	-1.58	0
Ningxia	-2.20	-1.91	-0.53	-1.77	0
Xinjiang	-3.48	-1.87	-0.97	-1.73	0
	IPS t-bar panel unit root test with constant				
All provinces	-1.52				0

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Phillips-Perron unit root test critical value:
   - t(phro-1) test with intercept 5%=-12.5
   - t-test with intercept 5%= -3.082
   - t-test with intercept and trend 5%= -3.761
3. We put 0 lags in all three Phillips-Perron unit root tests.
4. ADF t-test critical value: 5%=-3.00
5. IPS panel unit root test critical value: 5%=-1.74

Table 8.23 Test for Cointegration of China Real Parallel Exchange Rate and Relative Price Difference between US and China $q_b = \alpha + \beta[(\ln P_N - \ln P_T) - (\ln p_N - \ln p_T)]$

Region	$T(\hat{\rho}-1)$	$t_{\hat{\rho}}(PP)$	$t_{\hat{\rho}}(ADF)$	No. of lags
Beijing	-0.16	-0.10	-0.93	1
Tianjin	-3.79	-1.56	-1.49	0
Hebei	-3.48	-1.68	-4.00 **	4
Shanxi	-3.87	-1.74	-2.74 **	4
Inner Mongolia	-3.83	-2.00	-2.59 **	4
Liaoning	-5.73	-2.54	-2.36 **	4
Jilin	-3.64	-1.63	-4.02 **	4
Heilongjiang	-5.62	-2.40	-2.37 **	4
Shanghai	-2.04	-0.93	-2.40 **	4
Jiangsu	-0.88	-0.47	-2.67 **	4
Zhejiang	-1.99	-0.94	-2.05 **	4
Anhui	-2.51	-1.23	-3.41 **	4
Fujian	-2.93	-1.42	-2.62 **	4
Jiangxi	-0.83	-0.46	-2.61 **	4
Shandong	-1.24	-0.64	-3.08 **	4
Henan	-2.46	-1.21	-2.45 **	4
Hubei	-3.29	-1.56	-3.19 **	4
Hunan	-3.14	-1.49	-3.65 **	4
Guangdong	-3.01	-1.60	-2.71 **	4
Guangxi	-2.45	-1.14	-1.63	4
Hainan	-9.51	-3.83 **	-0.93	4
Sichuan (Chq)	-0.31	-0.19	-6.41 **	4
Guizhou	-2.94	-1.44	-2.34 **	4
Yunan	-0.30	-0.18	-2.36 **	4
Tibet	-2.90	-1.01	-2.17 **	4
Shaanxi	-3.25	-1.67	-2.09 **	4
Gansu	-3.97	-1.69	-1.55	4
Qinghai	-2.63	-1.25	-3.46 **	4
Ningxia	-2.38	-1.15	-2.74 **	4
Xinjiang	-0.31	-0.15	-1.70	4

	With constant	With constant and trend	With constant, trend and time dummy	
panel v-stat	-0.03	-2.63 **	-0.32	0
panel rho-stat	1.58	2.94 **	-0.86	0
panel pp-stat	1.38	0.04	-6.02 **	0
panel adf-stat	3.58 **	1.57	-5.46 **	0
group rho-stat	3.98 **	4.88 **	1.17	0
group pp-stat	3.20 **	1.63 *	-5.54 **	0
group adf-stat	5.89 **	3.23 **	-4.49 **	0

1. Statistical significance at the 95% level or greater are signified by **.

2. The $T(\hat{\rho}-1)$ and $t_{\hat{\rho}}(PP)$ statistics are Phillips-Perron tests applied to the residuals from the first regression and are computed with 0 lags.

   The Phillips and Ouliaris (1990) critical values for residual based tests for cointegration with constant and one explanatory variable are:
   $\hat{Z}_\alpha$ 5%=-20.4935 $\hat{Z}_t$ 5%=-3.3654

3. The $t_{\hat{\rho}}(ADF)$ is the augmented Dickey-Fuller statistic with no constant or trend.

   The MacKinnon critical values for rejecting of the hypothesis of a unit root is: 5% = -1.95.

4. The panel cointegration tests are those proposed by Pedroni (1995), which is the source of the critical value: 5%=1.65.

Table 8.24 **Test for Cointegration of China Real Official Exchange Rate and Relative Price Difference between US and China** $q = \alpha + \beta[(\ln P_N - \ln P_T) - (\ln p_N - \ln p_T)]$

Region	$T(\hat{\rho}-1)$	$t_{\hat{\rho}}(PP)$	$t_{\hat{\rho}}(ADF)$	No. of lags
Beijing	0.10	0.05	-0.16	0
Tianjin	-4.63	-1.36	-1.35	0
Hebei	-3.67	-1.28	-1.25	0
Shanxi	-3.13	-1.12	-1.11	0
Inner Mongolia	-6.09	-1.64	-1.63	0
Liaoning	-8.23	-2.28	-2.20 **	0
Jilin	-4.39	-1.36	-1.34	0
Heilongjiang	-6.30	-1.81	-1.77	0
Shanghai	-0.42	-0.18	-1.32	4
Jiangsu	-0.84	-0.36	-0.70	4
Zhejiang	-1.84	-0.73	-0.99	4
Anhui	-1.50	-0.60	-1.14	4
Fujian	-5.51	-1.72	-1.61	4
Jiangxi	-1.23	-0.50	-1.03	4
Shandong	-0.42	-0.20	-0.91	4
Henan	-1.57	-0.60	-1.48	4
Hubei	-2.24	-0.79	-1.99 **	4
Hunan	-2.76	-1.02	-1.41	4
Guangdong	-5.21	-1.63	-1.75	4
Guangxi	-4.15	-1.31	-0.85	4
Hainan	-10.39	-3.91 **	-1.04	4
Sichuan (Chq)	-0.01	0.00	-0.62	4
Guizhou	-5.49	-1.51	-1.91	4
Yunan	0.19	0.10	-1.37	4
Tibet	-3.68	-1.10	-1.67	4
Shaanxi	-6.53	-2.08	-1.98 **	4
Gansu	-3.07	-1.08	-2.22 **	4
Qinghai	-5.28	-1.54	-1.64	4
Ningxia	-1.72	-0.62	-2.01 **	4
Xinjiang	0.52	0.22	-0.65	4

	With constant	With constant and trend	With constant, trend and time dummy	
panel v-stat	-0.83	3.51 **	-0.30	0
panel rho-stat	2.32 **	-1.51	-0.88	0
panel pp-stat	3.43 **	-8.17 **	-6.08 **	0
panel adf-stat	4.73 **	-7.41 **	-5.49 **	0
group rho-stat	4.37 **	0.80	1.10	0
group pp-stat	5.37 **	-8.29 **	-5.69 **	0
group adf-stat	7.05 **	-7.11 **	-4.69 **	0

1. Statistical significance at the 95% level or greater are signified by **.

2. The $T(\hat{\rho}-1)$ and $t_{\hat{\rho}}(PP)$ statistics are Phillips-Perron tests applied to the residuals from the first regression and are computed with 0 lags.

   The Phillips and Ouliaris (1990) critical values for residual based tests for cointegration with constant and one explanatory variable are:
   $\hat{Z}_\alpha$ 5%=-20.4935 $\hat{Z}_t$ 5%=-3.3654

3. The $t_{\hat{\rho}}(ADF)$ is the augmented Dickey-Fuller statistic with no constant or trend.

   The MacKinnon critical values for rejecting of the hypothesis of a unit root is: 5%=-1.95.

4. The panel cointegration tests are those proposed by Pedroni (1995), which is the source of the critical value: 5%=1.65.

Table 8.25 **Estimates of the Cointegrating Slope Coefficient of**
$q = \alpha + \beta[(\ln P_N - \ln P_T) - (\ln p_N - \ln p_T)]$

Region	$\hat{\beta}_{OLS}$	$t(\beta_{OLS} = 0)$	$\hat{\beta}_{FMOLS}$	$t(\beta_{FMOLS} = 0)$	No. of lags
Beijing	0.20	0.67	0.33	0.71	3
Tianjin	-0.26	-1.55	-0.12	-0.47	3
Hebei	-1.07	-6.41 **	-0.93	-3.53 **	3
Shanxi	-0.62	-5.23 **	-0.53	-2.84 **	3
Inner Mongolia	-0.83	-8.02 **	-0.84	-6.09 **	3
Liaoning	-1.04	-6.91 **	-1.01	-4.92 **	3
Jilin	-0.62	-3.70 **	-0.63	-2.41 **	3
Heilongjiang	-0.90	-3.49 **	-0.78	-2.1 *	3
Shanghai	-0.43	-1.15	-0.18	-0.29	3
Jiangsu	-0.32	-0.96	0	0.01	3
Zhejiang	-0.91	-2.61 **	-0.58	-0.98	3
Anhui	-0.64	-3.61 **	-0.44	-1.48	3
Fujian	-1.47	-6.25 **	-1.38	-3.71 **	3
Jiangxi	-0.50	-2.10 *	-0.31	-0.79	3
Shandong	-0.54	-2.55 **	-0.28	-0.75	3
Henan	-0.58	-4.08 **	-0.47	-2.03 *	3
Hubei	-0.79	-4.73 **	-0.64	-2.41 **	3
Hunan	-0.89	-5.00 **	-0.78	-2.69 **	3
Guangdong	-0.90	-6.39 **	-0.8	-3.65 **	3
Guangxi	-1.21	-4.84 **	-1	-2.47 **	3
Hainan	-1.37	-2.10 *	-1.09	-1.96 *	3
Sichuan (Chq)	-0.34	-1.10	-0.18	-0.36	3
Guizhou	-0.58	-4.13 **	-0.47	-2.35 **	3
Yunan	-0.73	-1.65	-0.68	-0.87	3
Tibet	-0.19	-1.21	-0.3	-1.4	3
Shaanxi	-0.07	-0.24	-0.09	-0.24	3
Gansu	-0.38	-2.73 **	-0.28	-1.34	3
Qinghai	-0.46	-3.57 **	-0.32	-1.66	3
Ningxia	-0.60	-4.05 **	-0.37	-1.49	3
Xinjiang	-1.20	-3.00 **	-0.83	-1.25	3

Panel Tests of $\beta = 0$

	$\hat{\beta}_{PANEL}$	$\sqrt{N}\,\bar{t}_{\hat{\beta}}$
All provinces	-0.53	-10.19 **

Notes:

1. Statistical significance at the 95% level or greater are signified by **.

2. Critical values of the t-values with n-k=16-2=14 degrees of freedom
   5% = 2.145 10%=1.761

3. $\sqrt{N}\,\bar{t}_{\hat{\beta}}$ is the group mean t-ratio which is distributed as standard normal under the null.
   Panel test critical value: 5% = 1.96

Table 8.26 **Estimates of the Cointegrating Slope Coefficient of**

$q_b = \alpha + \beta[(\ln P_N - \ln P_T) - (\ln p_N - \ln p_T)]$

Region	$\hat{\beta}_{OLS}$	$t(\beta_{OLS}=0)$	$\hat{\beta}_{FMOLS}$	$t(\beta_{FMOLS}=0)$	No. of lags
Beijing	0.36	0.67	-0.07	-0.08	3
Tianjin	-0.61	-1.83 *	-0.59	-1.23	3
Hebei	-1.40	-3.79 **	-1.32	-2.48 **	3
Shanxi	-0.99	-3.47 **	-1.07	-2.64 **	3
Inner Mongolia	-1.36	-6.41 **	-1.54	-5.72 **	3
Liaoning	-1.84	-4.32 **	-2.25	-4.76 **	3
Jilin	-1.11	-2.91 **	-1.38	-2.45 **	3
Heilongjiang	-1.79	-4.01 **	-2.25	-3.85 **	3
Shanghai	-0.83	-1.13	-0.96	-0.8	3
Jiangsu	-0.33	-0.57	-0.05	-0.05	3
Zhejiang	-1.27	-2.22 **	-1.15	-1.15	3
Anhui	-1.00	-3.18 **	-0.95	-1.88 *	3
Fujian	-1.84	-4.67 **	-1.86	-2.93 **	3
Jiangxi	-0.84	-2.16 **	-0.78	-1.16	3
Shandong	-0.65	-1.79 *	-0.43	-0.67	3
Henan	-0.90	-3.59 **	-0.9	-2.31 **	3
Hubei	-1.17	-3.31 **	-1.13	-2.25 **	3
Hunan	-1.31	-3.73 **	-1.38	-2.54 **	3
Guangdong	-1.18	-4.60 **	-1.15	-2.89 **	3
Guangxi	-1.46	-2.93 **	-1.23	-1.48	3
Hainan	-2.60	-7.09 **	-2.54	-6.68 **	3
Sichuan (Chq)	-0.60	-1.15	-0.67	-0.73	3
Guizhou	-0.95	-3.34 **	-0.93	-2.15 **	3
Yunan	-0.54	-0.74	-0.61	-0.45	3
Tibet	-0.51	-2.20 **	-0.69	-1.91 *	3
Shaanxi	-0.53	-0.96	-0.75	-0.95	3
Gansu	-0.88	-3.66 **	-0.96	-2.76 **	3
Qinghai	-0.66	-2.45 **	-0.5	-1.11	3
Ningxia	-0.88	-2.84 **	-0.7	-1.38	3
Xinjiang	-1.62	-2.53 **	-1.41	-1.24	3

Panel Tests of $\beta = 0$

	$\hat{\beta}_{PANEL}$	$\sqrt{N}\,\bar{t}_{\hat{\beta}}$
All provinces	-1.07	-11.44 **

Notes:

1. Statistical significance at the 95% level or greater are signified by **.
2. Critical values of the t-values with n-k=16-2=14 degrees of freedom

   5% = 2.145 10%=1.761

3. $\sqrt{N}\,\bar{t}_{\hat{\beta}}$ is the group mean t-ratio which is distributed as standard normal under the null.

   Panel test critical value: 5% = 1.96

Table 8.27 Pool (Total) regression of nontradable price on investment-output and capital-output ratios

Coefficient	Equation (I)	Coefficient	Equation (II)	Coefficient	Equation (III)
δ_1	0.75** (0.01)	γ_1	0.15 (0.63)	- -	- -
δ_2	-0.78** (0.00)	- -	- -	- -	- -
- -	- -	- -	- -	η_1	-0.15** (0.00)
δ_3	0.60* (0.08)	γ_2	-0.04 (0.91)	η_2	-0.31** (0.00)
δ_4	-0.92** (0.00)	γ_3	-0.07 (0.16)	η_3	-0.10** (0.03)
Constant	0.79** (0.00)	Constant	0.37** (0.045)	Constant	0.13 (0.41)
Trend	no	Trend	no	Trend	no
AR(1) test	4.04** (0.00)	AR(1) test	4.44** (0.00)	AR(1) test	4.29** (0.00)
AR(2) test	3.97** (0.00)	AR(2) test	4.14** (0.00)	AR(2) test	4.03** (0.00)

Statistical significance at 95% and 90% level are denoted by ** and * respectively.

Table 8.28 OLS on differences regression of nontradable price on investment-output and capital-output ratios

Coefficient	Equation (I)	Coefficient	Equation (II)	Coefficient	Equation (III)
δ_1	0.44 (0.32)	γ_1	0.70** (0.045)	- -	- -
δ_2	-0.88** (0.00)	- -	- -	- -	- -
- -	- -	- -	- -	η_1	0.19** (0.01)
δ_3	0.42 (0.36)	γ_2	0.66* (0.08)	η_2	-0.04** (0.00)
δ_4	-1.06** (0.00)	γ_3	-0.31** (0.00)	η_3	-0.28** (0.00)
Constant	-0.02** (0.01)	Constant	-0.003 (0.69)	Constant	-0.01** (0.01)
Trend	no	Trend	no	Trend	no
AR(1) test	-1.89* (0.06)	AR(1) test	-1.61 (0.11)	AR(1) test	-1.23 (0.22)
AR(2) test	1.96 (0.05)	AR(2) test	0.67 (0.51)	AR(2) test	0.61 (0.54)

Statistical significance at 95% and 90% level are denoted by ** and * respectively.

Table 8.29 LSDV regression of nontradable price on investment-output and capital-output ratios

Coefficient	Equation (I)	Coefficient	Equation (II)	Coefficient	Equation (III)
δ_1	1.19** (0.00)	γ_1	0.95** (0.00)	- -	- -
δ_2	-0.68** (0.00)	- -	- -	- -	- -
- -	- -	- -	- -	η_1	0.09 (0.16)
δ_3	1.05** (0.02)	γ_2	0.75** (0.01)	η_2	-0.36** (0.00)
δ_4	-0.87** (0.00)	γ_3	-0.20** (0.00)	η_3	-0.13** (0.01)
Constant	0.54** (0.00)	Constant	0.07 (0.67)	Constant	0.86** (0.00)
Trend	no	Trend	no	Trend	no
AR(1) test	3.70** (0.00)	AR(1) test	4.19** (0.00)	AR(1) test	4.27** (0.00)
AR(2) test	3.21** (0.00)	AR(2) test	3.76** (0.00)	AR(2) test	3.15** (0.00)

Statistical significance at 95% and 90% level are denoted by ** and * respectively.

Table 8.30 Within-Groups regression of nontradable price on investment-output and capital-output ratios

Coefficient	Equation (I)	Coefficient	Equation (II)	Coefficient	Equation (III)
δ_1	1.19** (0.00)	γ_1	0.95** (0.00)	- -	- -
δ_2	-0.68** (0.00)	- -	- -	- -	- -
- -	- -	- -	- -	η_1	0.09 (0.16)
δ_3	1.05** (0.02)	γ_2	0.75** (0.01)	η_2	-0.36** (0.00)
δ_4	-0.87** (0.00)	γ_3	-0.20** (0.00)	η_3	-0.13** (0.01)
Constant	- -	Constant	- -	Constant	- -
Trend	no	Trend	no	Trend	no
AR(1) test	3.70** (0.00)	AR(1) test	4.19** (0.00)	AR(1) test	4.27** (0.00)
AR(2) test	3.21** (0.00)	AR(2) test	3.76** (0.00)	AR(2) test	3.15** (0.00)

Statistical significance at 95% and 90% level are denoted by ** and * respectively.

Table 8.31 Between-Groups regression of nontradable price on investment-output and capital-output ratios

Coefficient	Equation (I)	Coefficient	Equation (II)	Coefficient	Equation (III)
δ_1	0.25 (0.68)	γ_1	-0.003 (1.00)	- -	- -
δ_2	-0.40 (0.22)	- -	- -	- -	- -
- -	- -	- -	- -	η_1	0.09 (0.66)
δ_3	0.19 (0.80)	γ_2	-0.02 (0.98)	η_2	0.12 (0.71)
δ_4	-0.48 (0.21)	γ_3	-0.03 (0.78)	η_3	-0.04 (0.72)
Constant	0.47 (0.323)	Constant	0.11 (0.77)	Constant	0.23 (0.45)
Trend	no	Trend	no	Trend	no
AR(1) test	- -	AR(1) test	- -	AR(1) test	- -
AR(2) test	- -	AR(2) test	- -	AR(2) test	- -

Statistical significance at 95% and 90% level are denoted by ** and * respectively.

Table 8.32 GLS using Within/Between-Group regression of nontradable price on investment-output and capital-output ratios

Coefficient	Equation (I)	Coefficient	Equation (II)	Coefficient	Equation (III)
δ_1	1.14** (0.00)	γ_1	0.80** (0.00)	- -	- -
δ_2	-0.70** (0.00)	- -	- -	- -	- -
- -	- -	- -	- -	η_1	-0.01 (0.83)
δ_3	1.00** (0.00)	γ_2	0.59** (0.00)	η_2	-0.34** (0.00)
δ_4	-0.88** (0.00)	γ_3	-0.18** (0.00)	η_3	-0.13** (0.00)
Constant	0.65** (0.00)	Constant	0.31** (0.00)	Constant	0.69** (0.00)
Trend	no	Trend	no	Trend	no
AR(1) test	13.96** (0.00)	AR(1) test	17.94** (0.00)	AR(1) test	15.64** (0.00)
AR(2) test	9.22** (0.00)	AR(2) test	10.64** (0.00)	AR(2) test	7.33** (0.00)

Statistical significance at 95% and 90% level are denoted by ** and * respectively.

Table 8.33 **GLS using OLS residuals regression of nontradable price on investment-output and capital-output ratios**

Coefficient	Equation (I)	Coefficient	Equation (II)	Coefficient	Equation (III)
δ_1	1.13** (0.00)	γ_1	0.79** (0.00)	- -	- -
δ_2	-0.70** (0.00)	- -	- -	- -	- -
- -	- -	- -	- -	η_1	-0.01 (0.65)
δ_3	0.99** (0.00)	γ_2	0.59** (0.00)	η_2	-0.34** (0.00)
δ_4	-0.88** (0.00)	γ_3	-0.18** (0.00)	η_3	-0.13** (0.00)
Constant	0.65** (0.00)	Constant	0.31** (0.00)	Constant	0.66** (0.00)
Trend	no	Trend	no	Trend	no
AR(1) test	14.22** (0.00)	AR(1) test	18.00** (0.00)	AR(1) test	15.84** (0.00)
AR(2) test	9.49** (0.00)	AR(2) test	10.70** (0.00)	AR(2) test	7.58** (0.00)

Statistical significance at 95% and 90% level are denoted by ** and * respectively.

Table 8.34 MLE regression of nontradable price on investment-output and capital-output ratios

Coefficient	Equation (I)	Coefficient	Equation (II)	Coefficient	Equation (III)
δ_1	1.15** (0.00)	γ_1	0.88** (0.00)	- -	- -
δ_2	-0.69** (0.00)	- -	- -	- -	- -
- -	- -	- -	- -	η_1	0.04 (0.26)
δ_3	1.01** (0.00)	γ_2	0.68** (0.00)	η_2	-0.35** (0.00)
δ_4	-0.88** (0.00)	γ_3	-0.19** (0.00)	η_3	-0.13** (0.00)
Constant	0.64** (0.00)	Constant	0.30** (0.00)	Constant	0.84** (0.00)
Trend	no	Trend	no	Trend	no
AR(1) test	13.44** (0.00)	AR(1) test	16.15** (0.00)	AR(1) test	14.51** (0.00)
AR(2) test	8.68** (0.00)	AR(2) test	8.66** (0.00)	AR(2) test	5.99** (0.00)

Statistical significance at 95% and 90% level are denoted by ** and * respectively.

Table 8.35 One-step or two-step GMM regression of nontradable price on investment-output and capital-output ratios

Coefficient	Equation (I)	Lags	Coefficient	Equation (II)	Lags	Coefficient	Equation (III)	Lags
δ_1	0.56 (0.40)	1	γ_1	0.60 (0.18)	1	- -	- -	- -
δ_2	-0.95** (0.00)	2	- -	- -	- -	- -	- -	- -
- -	- -	- -	- -	- -	- -	η_1	0.21** (0.00)	1
δ_3	0.56 (0.42)	2	γ_2	0.57 (0.23)	2	η_2	-0.04** (0.01)	1
δ_4	-0.98** (0.00)	1	γ_3	-0.31** (0.00)	1	η_3	-0.19** (0.068)	2
Constant	0.03 (0.75)	- -	Constant	-0.002 (0.99)	- -	Constant	0.01 (0.74)	- -
Trend	no	-	Trend	no	-	Trend	yes	-
1 or 2-step	2-step		1 or 2-step	2-step		1 or 2-step	1-step	
Sargan test	25.19 (1.00)		Sargan test	28.55 (1.00)		Sargan test	104.00 (0.481)	
AR(1) test	-1.62* (0.10)		AR(1) test	-1.234 (0.22)		AR(1) test	-2.254** (0.024)	
AR(2) test	1.41 (0.16)		AR(2) test	-0.02 (0.98)		AR(2) test	-1.426 (0.154)	

Statistical significance at 95% and 90% level are denoted by ** and * respectively.

Table 8.36 One-step or two -step combined GMM regression of nontradable price on investment-output and capital-output ratios

Coefficient	Equation (I)	Lags	Coefficient	Equation (II)	Lags	Coefficient	Equation (III)	Lags
δ_1	0.150 (0.56)	1	γ_1	0.49 (0.13)	1	- -	- -	- -
δ_2	-0.64** (0.00)	1	- -	- -	- -	- -	- -	- -
- -	- -	- -	- -	- -	- -	η_1	0.20** (0.00)	1
δ_3	0.08 (0.74)	1	γ_2	0.47 (0.19)	1	η_2	-0.04** (0.04)	1
δ_4	-0.71** (0.00)	1	γ_3	-0.27** (0.00)	1	η_3	-0.12* (0.069)	1
Constant	0.22** (0.02)	- -	Constant	0.013 (0.86)	- -	Constant	0.15** (0.001)	- -
Trend	yes	-	Trend	no	-	Trend	yes	-
1 or 2-step	1-step		1 or 2-step	1-step		1 or 2-step	1-step	
Sargan test	337 (1.00)		Sargan test	495.3 (0.194)		Sargan test	272.6 (1.000)	
AR(1) test	-1.631* (0.10)		AR(1) test	-1.233 (0.21)		AR(1) test	-1.788* (0.07)	
AR(2) test	0.823 (0.41)		AR(2) test	1.034 (0.301)		AR(2) test	0.5849 (0.559)	

Statistical significance at 95% and 90% level are denoted by ** and * respectively.

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