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THE RENMINBI EQUILIBRIUM EXCHANGE RATE: AN AGNOSTIC VIEW

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Abstract

The supposed undervaluation of the renminbi has been the subject of intensive academic research over the past few years. Using equilibrium exchange rate models (Purchasing Power Parity, BEER and FEER), many authors have concluded that the renminbi is undervalued by 15 to 30% against the dollar.

This article shows that the common view is not that obvious. The models used in the estimation (BEER or FEER) assume that the economy is at full-employment, a strong hypothesis for developing economies such as China, whose unemployed amount to 150 million people. On the contrary, we show that China is facing massive unemployment and if investment depends on expected potential demand (from domestic consumption and foreign demand), then an undervalued exchange rate (by traditional standards) is suited for its policy objectives. Therefore the exchange rate can be analyzed as a policy tool used by the Chinese authorities to pursue their objectives. The exchange rate can be undervalued by traditional standards and in equilibrium compared to the government's policy objectives. This article shows that equilibrium exchange rate theories are not suited for developing countries and therefore the concept of equilibrium exchange rate is highly questionable. The final section analyzes the adoption of a managed float regime by the Popular Bank of China and discusses the delicate issue of the best exchange rate regime for China.

Keywords: equilibrium exchange rate, exchange rate management, China economic strategy.

JEL codes: F31, F42, O24

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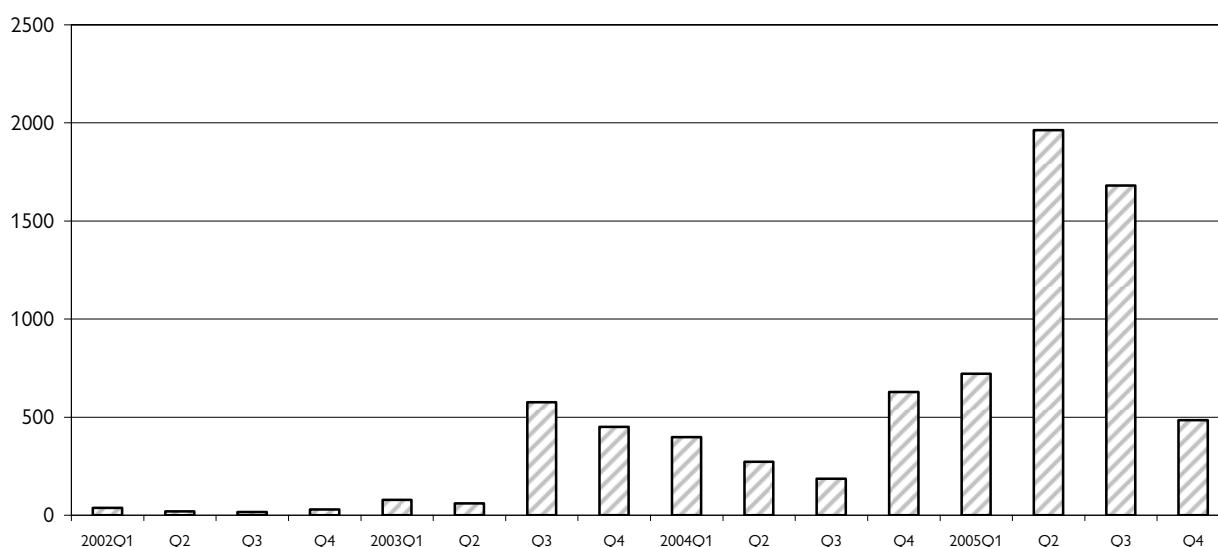
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Introduction

The undervaluation of the renminbi-dollar exchange rate has been a major issue in policy and academic circles. Graph 1 shows the number of references to China's exchange rate in economic journals. Many studies have estimated the equilibrium exchange rate of the renminbi using different theoretical frameworks⁴. Most of them conclude that the scope of the undervaluation of the renminbi is between 15 and 30%. Yet China has been experiencing strong economic growth for a decade and does not seem to suffer from the supposed misalignment of its exchange rate, having a relative low inflation rate and current account surpluses.

Graph 1: Number of articles in "Banking and Finance" and "Business and Management" sections containing the words "China" and "undervaluation" or "revalue"



Source: Lexis-Nexis.

It appears therefore important to deepen the concept of undervaluation and to define accurately the equilibrium exchange rate standard. Some authors refer to the purchasing power parity but this theory does not apply to economies with different development levels like the United States and China. Other authors claim that the growing American current account deficits or the persistence of massive unemployment in Western Europe are proofs of

⁴ See for instance: Jeong and Mazier (2003), Bénassy-Quéré and *al.* (2004), Wang (2004), Frunke and Rahn (2004), Coudert and Couharde (2005), Dunaway and Li (2005) and Frankel (2005).

the Renminbi undervaluation. The global imbalances would be the consequence of the policy implemented by the Popular Bank of China (PBC), which aims at stabilizing its exchange rate at a very low level. But in an International Monetary System without a code of good conduct, the exchange rate strategy of a country can only be judged with reference to its own interests. Who can say that the FED is taking Europe interests into account while defining its exchange rate policy? The Chinese exchange rate strategy can only be evaluated with reference to its growth strategy, and the Chinese growth strategy appears very successful, leading the unbiased observer to blame the European or the United States' economic policies for global imbalances.

Some economists (in particular American economists from the Institute for International Economics: Goldstein (2004, 2005), Goldstein and Lardy (2003, 2005), Williamson (2004), Bergsten (2006), but also Frankel (2004)) ask China to revalue its exchange rate from 15 to 40%, which would make it possible to revalue all Asian currencies and thus to decrease world imbalances. They agree with the American Congress which threatens China of commercial sanctions if it does not revalue significantly. On the contrary, some other economists (McKinnon, 2004, 2005; Bosworth, 2004; Dooley *and alii*, 2004; Aglietta, 2005) claim that China should not yield to the American pressures. Revaluing the Renminbi would slow down its growth and involve a crisis similar to Japan's after its *Endaka*.

This article aims at showing that the equilibrium exchange rate models commonly used are not relevant for a developing country such as China, which is not aiming at achieving its equilibrium. Indeed China has been experiencing massive unemployment for years; an undervalued exchange rate according to traditional standards allows it to impulse strong economic growth required to reduce unemployment. As a policy tool, the exchange rate is at an appropriate level with regard to Chinese economic growth. Broadly speaking, the optimal exchange rate for a developing country can only be defined with regard to a growth strategy: the more the country needs economic growth, the more it has to increase savings, the lower the exchange rate has to be.

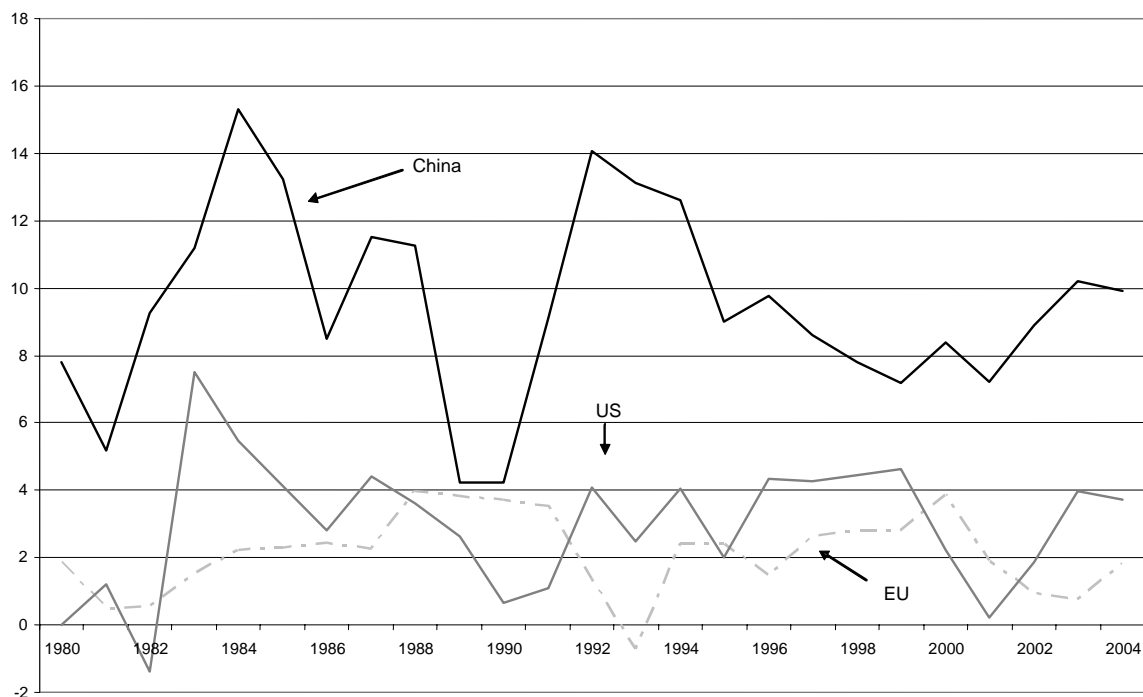
The remainder of the article is as follows :Part I describes the main facts of the Chinese economy from 1994, when the country decided to move to a *de jure* floating exchange rate regime, while moving to a *de facto* peg to dollar. Part II analyzes equilibrium exchange rate estimations; Part III proposes a model in which the exchange rate is willingly

fixed at a low level to achieve strong economic growth. Part IV analyzes the reform of the Chinese exchange rate regime since July 2005.

1. A strong economic growth

China has been experiencing dramatic economic growth for a decade (graph 2): from 1995 to 2004, its GDP growth has been 8.5% per year while 3.3% in the US and 2.2% in the Eurozone. Only a few Asian countries have experienced such growth: Vietnam and Myanmar (7.2%) and India (6.1%).

Graph 2: Real GDP growth for the US, European Union and China.

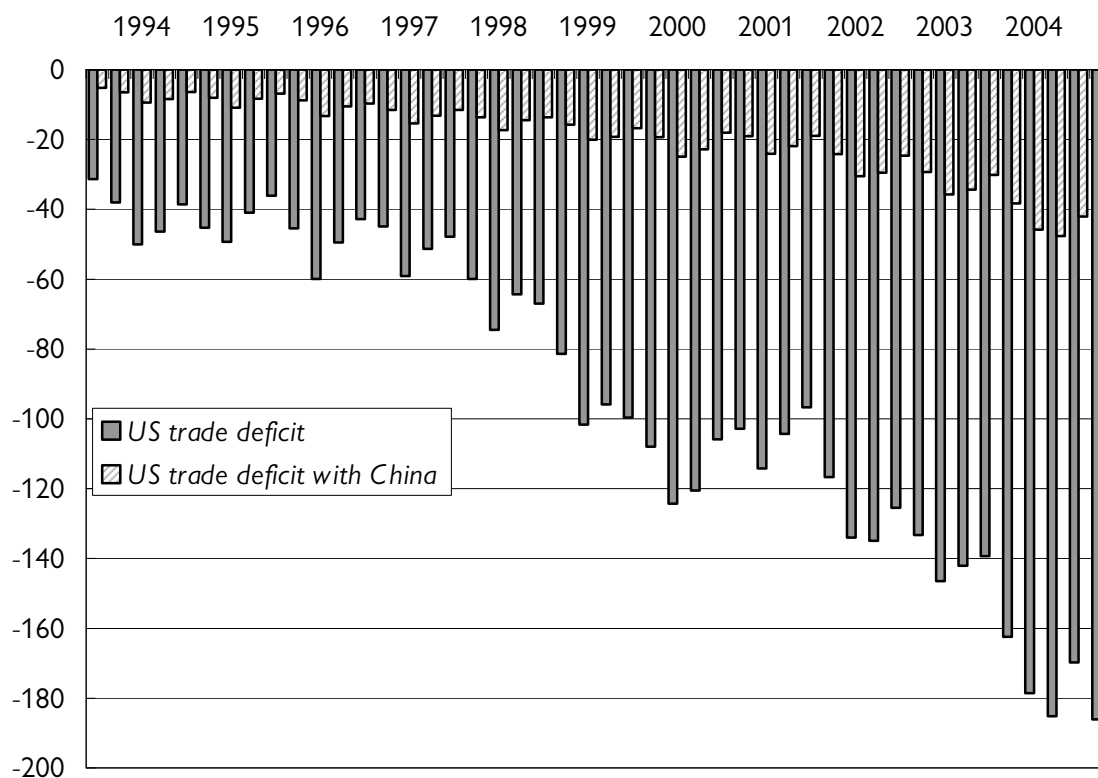


Source: NBS, BEA, Eurostat.

Since 2003, the worsening of the US current account (6.5% of GDP in 2005, 5 points more than in 1993-1997) has led to violent disputes against China, arguing that the Chinese exchange rate regime could be held responsible for the deindustrialization of the American economy. The American current account deficit would be a consequence of the trade deficit with China (graph 3), blamed for fixing its exchange rate at an “undervalued” level against the dollar. Yet the American deficit with China stands for a small part of American global deficit (approximately 20%) and therefore cannot be on its own a proof of the Renminbi

undervaluation. The Renminbi exchange rate ought to be assessed according to a Chinese point of view: does it promote growth or does it lead to unsustainable imbalances?

Graph 3: American Trade deficit (quarterly data – billions of US \$)



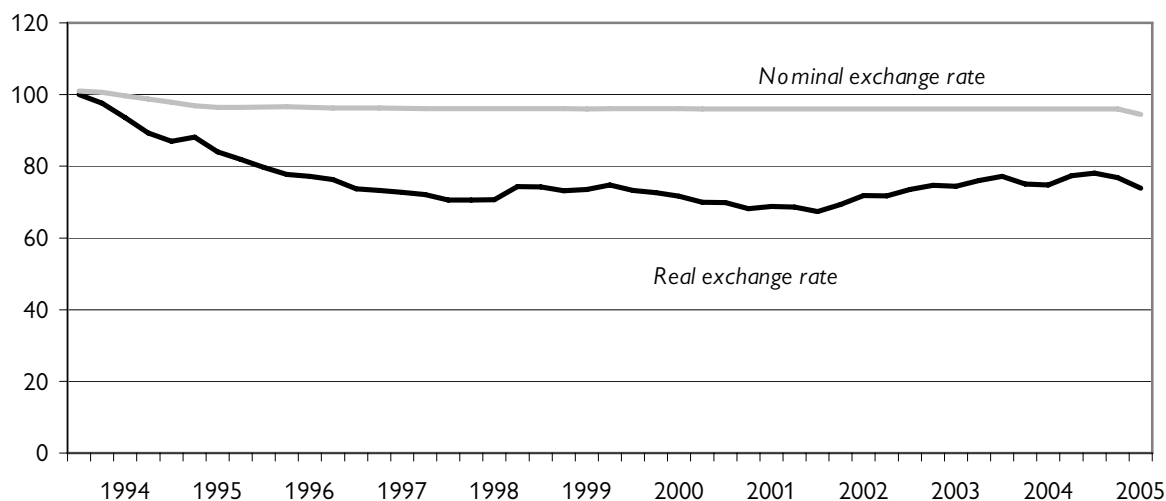
Source: BEA, Survey of Current Business.

1.1. The renminbi exchange rate: a tool to promote development

The Renminbi is the Chinese currency, its base unit is the Yuan. From 1994 to July 2005, the renminbi-dollar nominal exchange rate was fixed at 8.277 RMB for a dollar. Despite official speeches claiming that China moved to a floating exchange rate regime, Chinese authorities stabilized the exchange rate at this level from the 1st of January 1994 to the 21st of July 2005 with a very narrow margin (+/-0.18%). On the 21st July 2005, the PBC reevaluated the Yuan by 2.1% to 8.11 RMB for a dollar (with a band of +/-0.3%). The PBC also announced that the Chinese currency would be anchored to a currency basket (dollar, euro, won and yen), without defining the weights attached to each currency. Since then, the RMB has been slowly appreciating to 8.005RMB in May 2006. Its total rise is 3.3%, while the US were demanding a significant appreciation (around 20%) and were threatening China of protectionist measures. Yet the PBC announcement allowed it to lower the pressure and to

show its commitment in modifying its strategy, while underlining it would keep its freedom of choice.

**Graph 4: Chinese Effective exchange rate⁵ (Base 100 in 1994)
and nominal exchange rate against the dollar***



*An increase is a depreciation of the renminbi.

Source: Global Insight.

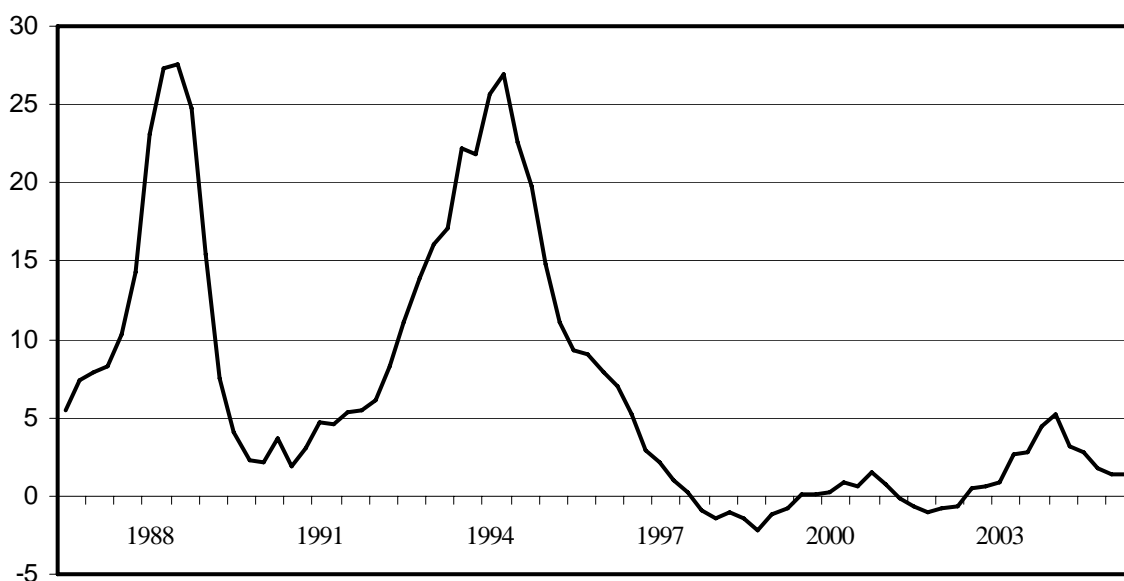
The Chinese effective exchange had been appreciating from 1994 to 1997 because of inflation, which peaked to 24% in 1994. After 1994, the peg to the dollar has been a nominal anchor, leading to a fall of inflation under 3% as soon as 1997 (graph 5) which stabilized in return the effective exchange rate. The latter has been reproducing the fluctuations of the dollar: appreciation until 2001, depreciation from 2001 to 2004. A developing country with an undervalued currency would have experienced a substantial inflation, increasing its effective exchange rate, which is not the case for China. The exchange rate fixity, the price control and the absence of tensions on goods and labour markets enable China to stabilize its inflation on a low level.

Since 1994, the PBC has chosen to maintain a peg to the dollar so as to promote substantial growth in China. China aims at incorporating workers in the modern economic system because it is facing massive under-unemployment and unemployment, especially in rural areas (Table 1 and box 1). China has chosen an export led growth strategy. A low exchange rate helps to preserve its competitiveness. Its central role explains that the PBC may

⁵Based on nominal exchange rates and consumer prices, trade weights are taken from the period 1988-1990, see Zanella and Desruelle (1997).

not want to allow speculation on its currency. In order to improve its economic and technological catching-up process, China needs Foreign Direct Investment and joint-ventures agreements; this pleads for a low exchange rate so as to maintain a high return on foreign investment. The undervaluation of the renminbi must be assessed with reference to this strategy.

Graph 5: Inflation rate (consumer prices) in China 1987-2005 (quarterly data in %)



Source: NBS

Table 1: Total Population, Labor force and employment in China (in millions)

	1980	1990	1995	2000	2002	2004
Total population	987.1	1.143.3	1.211.2	1.267.4	1.284.5	1.299.9
Rural (en %)	80.6	73.6	71.0	63.8	60.9	58.2
Labor force	429	653.2	687.4	739.9	753.6	768.2
Employment	423	647.5	680.7	720.9	737.4	752.0
– urban employment	105.3	170.4	190.4	231.5	247.8	264
– rural employment	318.4	477.1	490.3	489.3	489.6	488
Unemployed	5.4	5.7	6.7	19.0	16.2	16.2
– in urban area	5.4	3.8	5.2	6.0	7.7	8.3
– in rural area	0	1.9	1.5	13.1	8.5	7.9
Official unemployment rate (in %)	1.2	0.8	0.9	2.5	2.1	2.1

Source: NBS

Box 1: Unemployment in China

In spite of the dynamism of the growth, the question of unemployment is crucial in China. From 1995 to 2002, the public firms were restructured and saw their employment passing from 113 to 72 millions. At the same time, in spite of the system of licence of residence (*hokou*), the differences in incomes attract the rural people towards the cities. Chinese figures of unemployment are questionable. According to the official sources, the urban unemployment rate is 3.1% in 2002 (7.7 millions of unemployed). According to Brooks *and alii* (2004) it amounts to 5.3% (13.9 millions). A study pursued by the Chinese Academy of Social Science in five cities assesses the urban unemployment at 12.7% (Gile *and al.* 2005). The Chinese Prime Minister has acknowledged that urban unemployment was above 7% in a speech in 2002. (OECD, 2005). The *CIA World Factbook* assesses it at 9.8%. According to Gile and alii (2005), the unemployment rate is undervalued. Official unemployment doesn't take disguised unemployment, embodied by *xiagang* (people officially employed but who doesn't work for their firms and earn unemployment benefit), and rural unemployment into account. The number of unemployed would be close to 100-150 millions against 16 millions officially. Wang Jian, a research fellow of the State Development and Reform Commission, claims that there are more than 100 millions of unemployed in China in 2003. According to Brook (2004), China must currently create each year approximately 16 millions urban employment (+ 4% per annum): 9 millions because of the growth of the working-age population, 2 millions because of the job losses in the public firms and 5 millions because of the rural migrations.

Table 2: The extent of Chinese urban unemployment (in %)

	2001
Official sources (ADB)	3.6
The Economist	9.3
CIA World Factbook	9.8
Wang Jian (2003)	12-15
Gile <i>and al</i> (2005)	12.7
NBS survey (2001)	13.2

The main criteria of undervaluation would be that a low level of the exchange rate leads to a too strong competitiveness, which would induce huge foreign demand, larger than the capacity of production, raising the inflation rate. Yet the flaw of the argument is that growth requires always some disequilibrium so that supply would be driven by demand. Moreover, the inflation rate has not risen over the past few years (graph 5). As a consequence,

most articles refer to the excessive accumulation of foreign exchange reserves, linked with current account surplus and FDI (table 3), as evidences of undervaluation.

Table 3: The renminbi undervaluation

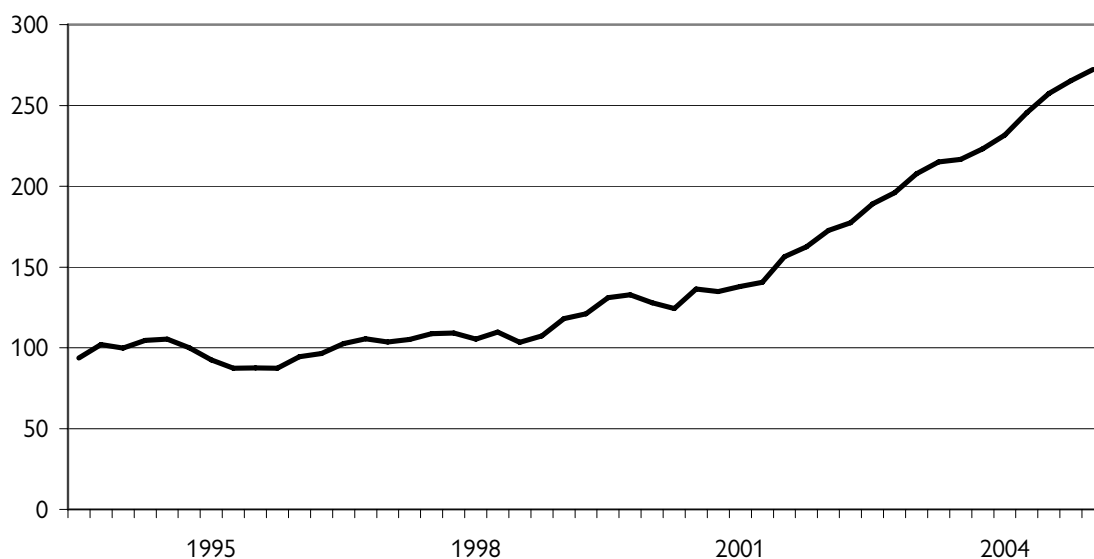
	Goldstein and Lardy (2003, 2004, 2005)	Williamson (2003, 2004)	Frankel (2004)	Mc Kinnon (2003, 2005)
PROOFS	<ul style="list-style-type: none"> – Regulation of capital flows – Current account surplus – Foreign exchange reserve accumulation 	<ul style="list-style-type: none"> – Overheating of the economy – Growing banking loans – The Investment level is close to the one observed during the Asian crisis – Current account surplus – Foreign exchange reserve accumulation 	<ul style="list-style-type: none"> – Overheating of the economy; – Foreign exchange reserve accumulation – Growing costs of sterilization 	<ul style="list-style-type: none"> No signals of undervaluation but – Fast growth of China – Growth of exports – High Saving rate – Same strategy as Japan in the 80's and 90's
RESOLUTION	<p>Three-steps reform :</p> <ol style="list-style-type: none"> 1) revaluation 2) anchor on a basket of currencies (dollar yen and euro) <ul style="list-style-type: none"> – Improvement of the banking system <ol style="list-style-type: none"> 3) Liberalization of the banking system <ul style="list-style-type: none"> – Liberalization of capital flows – Floating exchange rate regime 	<p>As G/L risk of competitiveness degradation and exchange rate volatility.</p> <ul style="list-style-type: none"> – Negotiation with Asian countries for a general realignment of the currencies. – Wide fluctuation band – Managed floating of the currency. 	<p>Anchor to an Asian currency such as the Singapore, itself anchored to a basket of currencies (dollar, euro, yen and yuan).</p>	<ul style="list-style-type: none"> – The Chinese government must keep the 8.277 Yuan-dollar exchange rate stable – No more reference to exchange rate flexibility or revaluation – Introduction of a wide fluctuation band.

1.2. The Chinese competitiveness and the level of the renminbi

Chinese exports are very dynamic: they have been increasing by 15.5% per year from 1990 to 2004 and more than 30% in 2003 and 2004. Chinese market share has steadily increased from index 100 in 1994, to 130 in 2000, and will be over 250 in 2005 (graph 6). Yet import growth has also been dynamic, closed to exports: 15.9% from 1990 to 2004 (graph7).

Chinese trade surplus is hence huge (60 billion dollars in 2004) but steady since 2000, around 2.5% of GDP. It exploded in 2005 to 128 billions dollars. The Chinese external balance is in 2005 of 148 billions dollars (7.7% of the Chinese GDP), the second of the world, behind Japan (158 billions dollars), before Germany (114 billions dollars): one cannot blame it for world imbalances.

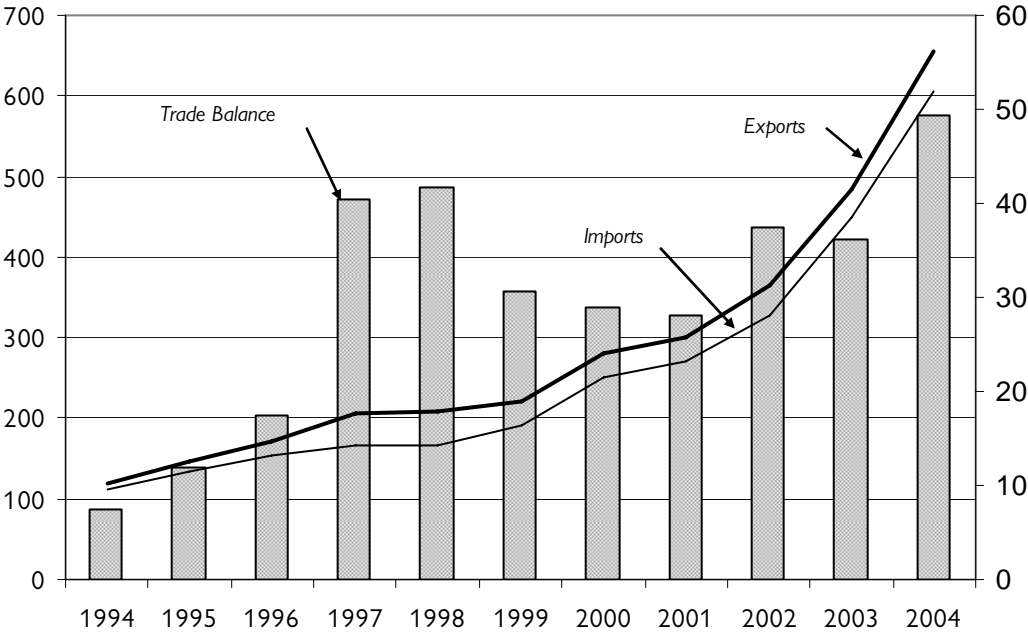
Graph 6: Chinese market share (index 100 in 1994)



Source: OFCE.

The US and Europe have been recording large trade deficits with China, but those deficits have to be corrected for two factors. The huge Chinese surplus with the US and Europe is counterbalanced by the rising deficit of China with Asian countries. During 2002-2004, more than 20% of imports or exports by mainland China have been freighting through Hong Kong. When Hong Kong is added to mainland China (table 4), the overall trade surplus slightly decreases.

Graph 7: Chinese Exports, imports (billion dollars, left axis) and trade balance (right axis)



Source: NBS.

Table 4: Chinese trade balance in 2003 (billions US \$)

	Mainland China	Mainland China and Hong Kong
US	58	88
UE	18	29
Japan	-14	-31
South Korea	-21	-27
Hong Kong	65	
ASEAN	-15	-30
Other	-65	-12
Total	26	17

Source: NBS, BEA, Eurostat and Asian Development Bank

China is a huge assembly plant where lots of products are transiting to be transformed by a cheap, low-skilled labour force. Lastly, exports of China have a relatively weak composition in Chinese value added since they incorporate, in addition to the weak wages of

the labour, imported intermediate consumptions, but also the profits carried out by mainly foreign companies, re-exported or reinvested in China⁶.

Chinese competitiveness does not depend exclusively on the exchange rate but also on structural factors: wages are low and stable because of the existence of a massive labour force. Half of Chinese exports are done by foreign firms located in China. They produce and export goods with high import content and are therefore hardly affected by the exchange rate. Many Chinese export prices are determined in dollar by foreign importers/producers and are barely affected by the yuan exchange rate. The dramatic increase in Chinese exports is deeply due to foreign firms' behaviour, searching for cheap labour force. The fast growth of exports can also be linked with China's accession to the WTO and the removal of customs tariffs (textile especially), which had been anticipated by the Western distributors, which had strongly increased their orders. In addition, the progression of the Chinese imports could start to be reduced insofar as certain multinational firms start to produce in China of the goods that they exported there before (Zhou, 2006).

If some firms complain about competition from Chinese products, other firms or distributors benefit from the low production costs in China. The low prices of Chinese exports mean that, for a given value, they represent a large volume and thus have a strong negative impact on employment in the countries of North; at the same time, they reduce the price level to the West and increase there the standard of living of the households.

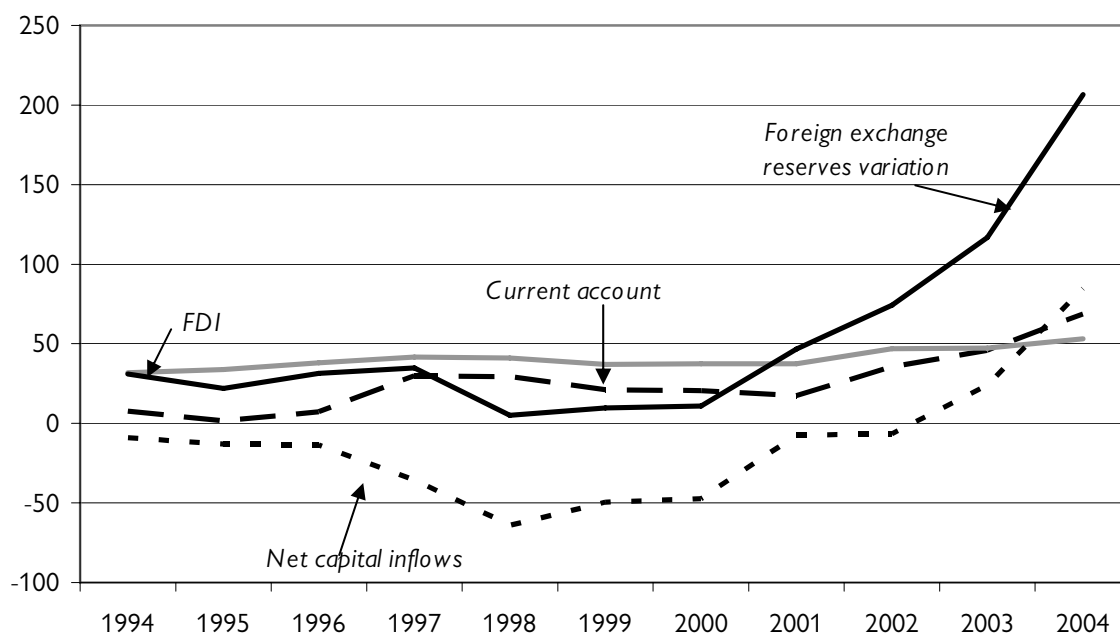
1.3. Is Chinese foreign exchange reserves accumulation sustainable?

The second evidence proving the undervaluation of the renminbi is the growth of PBC's foreign exchange reserves (graph 8). They peaked at 846 billion \$ in January 2006 (609 billion at the end of 2004), amounting to 6.8 % of US GDP, 45% of Chinese GDP and 13 months of Chinese imports. China has the world's largest foreign exchange reserves, before Japan (Table 5). Foreign exchange reserves are useful as a tool to deter speculation. This accounts for the building of foreign exchange reserves in Asian countries after the crisis of 1997-1998. Yet an excess of reserves can lead to a crisis, if the speculators consider that the exchange rate is undervalued and put pressure on an appreciation of the currency. The accumulation of foreign exchange reserves stems from three channels: current account surplus, FDI and net capital inflows (excluding FDI) as can be seen from graph 8 and table 6.

⁶ The prices of Chinese exports can be overestimated if they are inter-firm transactions since firms can prefer, for taxation, reasons, to declare their profits in China rather than in their origin country.

Chinese current account surplus reached 69 billion \$ in 2004 (graph 8). It comes mainly from trade balance but also from the « other Transfers » account. Between 1994 and 2004, the current account surplus has been steadily growing.

Graph 8: The factors of Chinese foreign exchange reserve accumulation (billion \$)



Source: NBS.

**Table 5: Foreign exchange reserves in January 2006
(in billions of US \$)**

China	845
Japan	832
Taiwan	258
South Korea	217
Eurozone	207
Russia	182
India	134
Hong-Kong	128
Singapore	118

Source: IMF

Table 6: China's balance of payments

	2000	2002	2004
Trade balance	29	37	49
Income	-15	-15	-5
Other Transfers	6	13	23
Current account	21	35	69
FDI	38	47	53
Portfolio Investment Assets	-11	-10	20
Other Investments	-24	-5	37
Net errors and omissions	-12	8	27
Reserves	-11	-75	-206

Source: NBS

Foreign Direct Investment (FDI)

Massive FDI has been flowing to China over the last decade. One of China's policy objective has been to attract foreign firms to impulse its technical modernization. FDI allows China to acquire new technical knowledge and production techniques. FDI has been flowing to China since 80's, because of its economic growth, its liberalization process and the opening of its markets. Foreign firms produce goods to export, thanks to low wages, but also for the domestic market, expecting a high level of development. There are tax incentives (no taxes for foreign firms during the first two years then the tax is 15% against 33% for others businesses). In 2004, FDI amounted to 53 billions \$. From 1990 to 2002, the cumulated amount of FDI reached 424 billions \$, making China the third most attractive country behind the US and UK. China has received 5% of FDI in the world and near 25% of FDI flowing to developing countries.

Net capital inflows

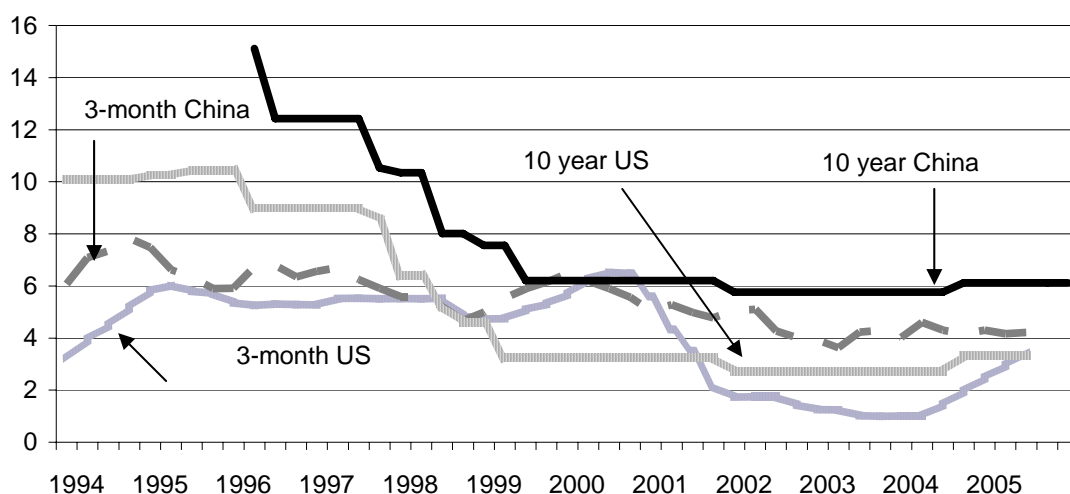
China's financial account has not been fully liberalized yet, despite partial measures for capital flows liberalization in 2003. Capital operations are submitted to regulation and agreement from the authorities. Those regulations prevented China from being widely affected by the Asian crisis of 1997-1998. China has moved from a balanced capital inflow position in 2002 to a positive capital inflow position, around 110 billion \$, in 2004⁷.

⁷ Including the lign "errors and omissions" in the capital flows.

Until 2000, current account surpluses and FDI's were counterbalanced by net capital outflows. Therefore the foreign exchange reserves remained stable. But the net capital inflows have become large in 2003-2004, leading to a rise in foreign exchange reserves accumulation. This evolution stems from two main factors. First, the rise of financial returns and their safety have inverted the flows from the Chinese Diaspora. Then Chinese residents save and get loans in dollars through Chinese financial institutions. Since 2003, Chinese firms and household, expecting an appreciation of the currency, have increased their holdings in Yuan against dollars. Firms' debts have been financed through loans in dollars. So as to meet the demand for dollars, despite a decrease in dollar deposits, Chinese banks have decreased their foreign assets and increased their debts in foreign currencies. The exporting companies hastened to convert their dollars into yuans while the importers delayed their payments. The main part of foreign exchange reserves accumulation since 2003 is therefore attributable to speculation and cannot lead to consider that foreign exchange reserve accumulation is a proof of the renminbi undervaluation.

For a country it is easier to withstand net capital inflows than outflows because it has not to face any liquidity constraint and doesn't have to borrow abroad. On the contrary it is harder to decrease interest rate than to increase it. China has not been willing to struggle against an appreciation of its currency through a fall in the interest rate (graph 9): China short term rate is slightly higher than the US and China long term interest rate (10 years) is significantly higher. Considering Mundell's incompatibility triangle, the PBC has maintained an autonomous monetary policy and a fixed exchange rate, giving up liberalisation of capital flows. Chinese interest rates are nonetheless very low (2% for short term, 4% for long term) compared to real GDP growth. Credit regulation is mainly achieved through quantitative control and rationing. The viability of such a system is increasingly problematic (Prasad *and alii*, 2005): the exchange control is difficult to maintain in a foreign trade open country as firms since the companies can use payment delays and transfer prices to speculate.

Graph 9: Short and Long term interest rates in China an in the US



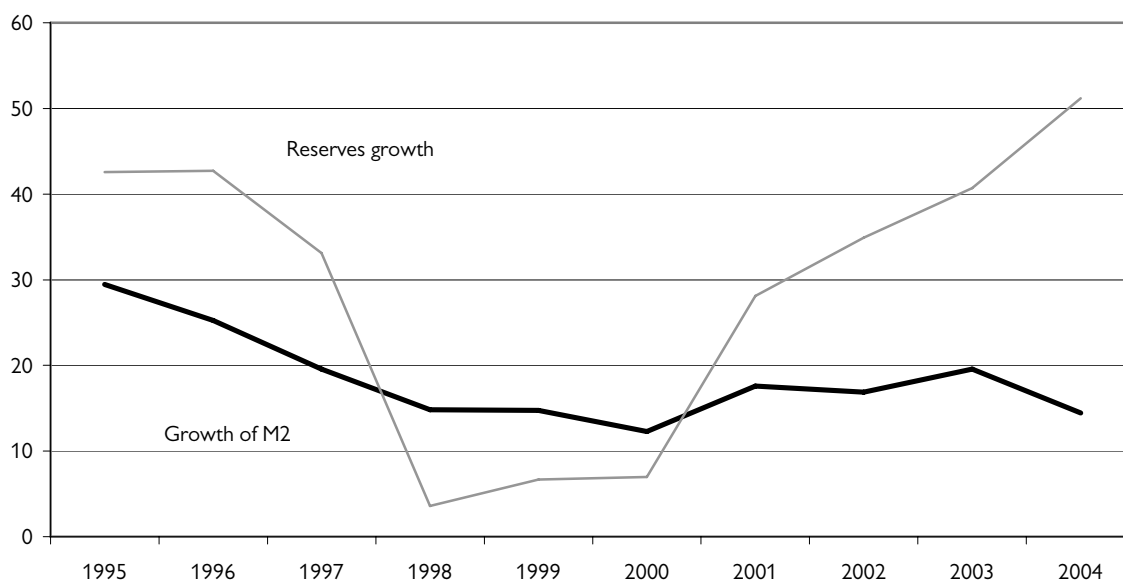
Source: NBS, US Treasury

The inflows of liquidity into the banking system may increase credits and loans, inducing a rise of inflation and therefore an appreciation of the real exchange rate, despite the peg to the dollar (Box 2). This can be avoided if the central Bank sterilizes the surplus of liquidities by imposing obligatory reserves on the banks or by obliging them to buy Treasury bills. When the Central Bank accumulates reserves in American bonds, it benefits from interest flows lower than that which it would have obtained while choosing national bonds and runs an important exchange rate risk. To maintain the fixity of the exchange rate obliges the Central Bank to play against the speculators.

Box 2: Sterilization and the exchange rate in China

When a country has current account surplus or receives capital flows and wants to stabilize its exchange rate, its Central Bank is obliged to provide central money and to let inflate its exchange reserves. It results a strong liquidity of the banking system. To prevent that banks develop their credits in an excessive way, the Central Bank must sterilize these flows of capital. Sterilization can be made by an increase of the banks reserve ratio or by obliging them to buy domestic Treasury bills. In the case of China, the two types of operations have been jointly carried out and supplemented by the control of the credits. The sterilization have a cost which depends on the differential of interest rate between the assets in dollars which constitute the reserves (to which the rate of appreciation of the RMB must eventually be added) and Chinese Treasury bills. The cost of the operation was important between 2001 to 2004 insofar as the American bonds offered a very low interest rate. A strong revaluation of the yuan would induce in an important loss in capital for the BPC: 5% of the Chinese GDP for a revaluation of 10% However, the operations of sterilization made possible to maintain the fixity of the rate of exchange renminbi/dollar, until the revaluation of 2.1% of July 2005. In 2005, the Chinese authorities bought from 15 to 20 billions dollars per month.

Graph 10: Monetary base and foreign exchange reserves growth (in %)



Source : NBS.

The growth of monetary aggregates in China does not come from reserves accumulation (graph 10): their evolution is quite different, especially after 2000, when reserves have been growing around 40% per year against 20% for monetary aggregates. The increase in money stems from a strengthening of Chinese households' savings and deposits from the firms, reflecting the strengthening of speculative capital inflows. The inflation rate has remained fairly stable, taking in consideration the strength of the GDP growth (graph 5).

Another look on the current account

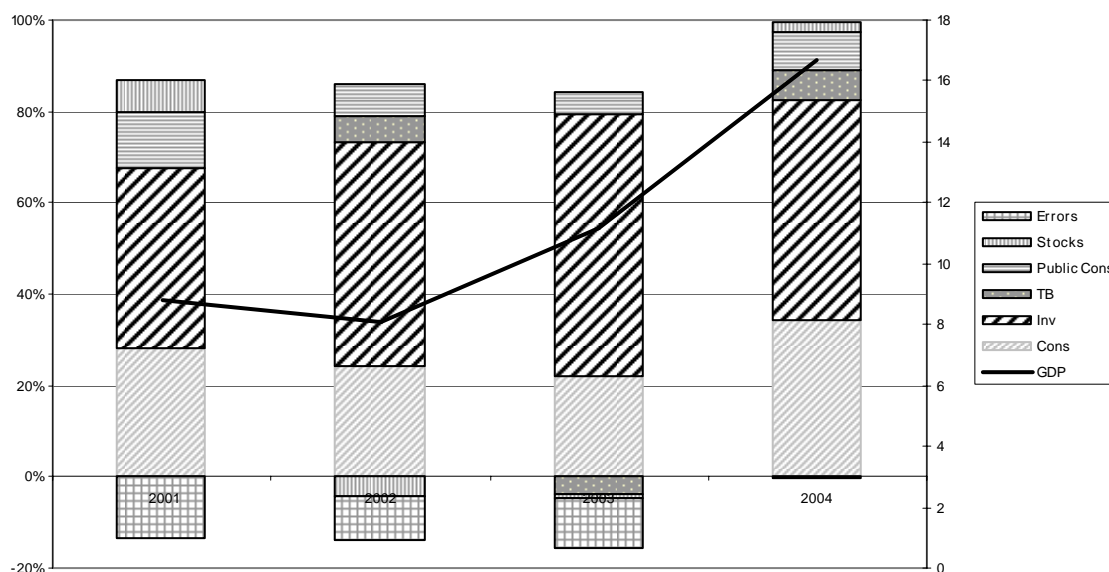
The current account is the difference between domestic saving and domestic investment. It is linked with the strong Chinese exports but it could also be linked with to the weakness of imports in a country where public and private consumption are relatively low, savings high and where growth comes from the investment boom (table 7).

Table 6: GDP components (en % of GDP)

	1987	1995	2000	2004
Private consumption	49.8	46.1	47.2	43.3
Public consumption	12.5	11.4	13.1	12.0
Investment	36.1	40.8	36.3	45.3
Trade balance	0.1	1.7	2.5	2.6

Source: NBS.

Graph 12: GDP growth (right axis) and the sources of growth (left axis)



Source: NBS.

China savings rate is very high : 42.5 % GDP in 2003 (table 8), 20 points higher than the average of the five large countries chosen by Kujs (2005). This comes from two factors : the part of the national income which is keep by firms household savings are particularly highs (20% of GDP). The saving of the administrations is higher of 5 points of GDP; this excess of saving is transferred to the firms : the administrations finance large public firms for 6 points of GDP. The saving of the companies is higher of 7 points of the GDP. Lastly, the saving of the households is higher of 9 points of GDP: the share of the income of households in the GDP is lower of 4 points; but the strong rate of saving of the Chinese households (25% of their income) induced a supplement of saving of 13 points of GDP.

Table 7: Saving and investment in % of GDP in China en Chine

	China (2003)	United States (2002)	France (2002)	Japan (2002)	Korea (2002)	Mexico (2001)
National Saving	42.5	14.3	20.7	25.5	31.0	20.8
Gap China/others countries:		28.2	21.8	17.0	11.5	21.7
<i>Households saving</i>		11.8	5.8	8.4	12.1	8.6
<i>Firms saving</i>		8.6	9.4	-0.5	4.1	8.3
<i>Administrations saving</i>		7.9	6.7	9.2	-4.7	4.8

Source: Kuijs (2005).

Modigliani and Cao (2004) explain the high level of households saving rate by the life cycle hypothesis and reject explanations based on cultural or ethnical grounds. Strong economic growth and limiting demographic measures would have caused the rise of savings. The part of people under the age of 15 have fell dramatically, which, with the single child policy, has limited the role of the family and children in taking care of the older, being an incentive to save more. On the other hand, the enrichment has also improved the savings rate compared to the previous levels (5% in 70's). This fact is reinforced by an imperfect pension system, introduced in 1997 (see OECD (2005, p187)).

In addition, the saving of the households is undoubtedly reinforced by the constraints weighing on consumption: the foreign products are very expensive because of the low rate of exchange; the access to the products is not always possible, in particular in rural areas; regulations limit the purchase of some goods (car for example); although its accession to the WTO will oblige China to change its regulations.

Investment is the main determinant of Chinese dramatic growth: the Investment/GDP ratio in 2004 was around 45%. This level is explained as well by the force of the growth as by its industrial orientation. Investment is mainly self-financed (table 9), the other part stemming from household saving, and to a lesser extent from FDI and the public sector.. Most of saving is channelled through the banking sector because agents cannot freely access to financial markets.

Table 9: Sources of investment in 2004
(in % of total investment):

State	4.2
Domestic loans	20.4
Bonds	0.3
FDIs	4.3
Self-finance	51.3
Other ⁸ .	19.5

Source: NBS

A deceleration of growth would have ambiguous effects on balance of the saving and the investment since investment would drop as saving. A rise of the consumption would require a rise on the part of the households in the GDP (by the rise of wages and a more

⁸ grey banks loans (informal banking loans)

generous social policy) and a fall of the rate of saving (which would pass also improvement of the Social Security system).

The weakness of the banking sector: the role of non performing loans (NPL)

NPLs are high in China (table 10) in banks' balance sheets despite the strengthening of the banking regulation committee, and the participation of foreign banks into several large Chinese banks. In June 2005, NPL accounted for 155 billions \$ (9.5% of GDP) against 191 billions in late 2004. The banks do not have yet the capacity of evaluating the quality of the projects; many financings are still granted to the large public firms for political reasons . The majority of the economists consider that the recapitalisation, the reorganization and the liberalization of the banking structure are preconditions to the opening of China to capital flows and to the floating of the RMB. In their absence, the Chinese banks could hardly intervene on the international financial markets and could not develop hedge instruments which would make it possible the Chinese companies to support the floating of the currency. Remain to know if this float must be an objective of the BPC.

Table 10: Non Performing Loans (in % of total loans):

	2000	2001	2002	2003	2004
Argentina	16	19.1	38.6	33.6	18.6
Hungary	3	2.7	2.9	2.6	2.7
France	5	5	5	4.8	n.d.
Chine	22.4	29.8	26	20.4	15.6
Hong Kong	7.3	6.5	5	3.9	2.2
Japan	5.5	8.4	7.2	5.2	2.9
US	1.1	1.3	1.4	1.1	0.8

Source: FMI, Global Financial stability report. September 2005

2. China equilibrium exchange rate

Defining China's undervaluation requires a model of equilibrium exchange rate determination. Three main models have been used to estimate China equilibrium exchange rate: the purchasing power parity (corrected by Balassa-Samuelson effect), the Fundamental Equilibrium Exchange Rate (FEER) and the Behavioural Equilibrium Exchange Rate (BEER). Those theories will be further investigated in this section.

2.1. From PPP to the Balassa-Samuelson effect (B-S)

According to the absolute version of PPP, the prices of two similar products, measured in a common currency, must be equal, warranting that no arbitrage can be made. Therefore the prices of the same product in Beijing or in NYC must, after conversion, be equal. Then the real exchange rate is stationary, constant and equals 1 according to absolute PPP. According to the softer version, the relative PPP, price and exchange rate variations must be equal in order to allow the real exchange rate to be stationary. Yet neither absolute PPP nor relative PPP have sound theoretical grounds. For absolute PPP, does it concern every product or just tradable? For nontradable goods, like the services, no mechanism allows a direct arbitrage between a haircut in New York and in Beijing. If PPP is designed for tradable products (such as copper), PPP can at best determine the International Division of Labour: the exchange rate between Poland and France doesn't move so as to adjust copper production costs to be equal in Poland and France.

In order to compare national standard of living, it is useful to estimate PPP (table 11), but those estimation cannot be turned into exchange rate rule. They are fragile because they don't take the same goods basket into account to define the price level, those differences being huge for countries with different development levels like the US and China. For China, heterogeneity between areas is a major issue, weakening the use of a global index.

**Table 11: Country rating according to GDP per capita and relative price index
(2004)**

	GDP per capita	Relative price level
US	34,1	1
Canada	28,5	0,86
Japan	26,5	1,79
United Kingdom	24,5	0,98
France	24,2	1,29
Germany	24,1	1,38
Italy	23,3	0,93
Spain	19,9	0,97
South Korea	19,5	0,84
Argentina	10,8	0,68
Russia	10,0	0,37
Poland	9,7	0,52
South Africa	9,5	0,45
Mexico	8,6	0,44
Turkey	7,2	0,48
Thailand	7,0	0,46
Iran	6,8	0,31
Colombia	6,3	0,40
Myanmar	5,7	0,04
Ukraine	5,2	0,25
China	5,1	0,22
Philippines	4,1	0,30
Morocco	3,6	0,40
Egypt	3,3	0,35
Indonesia	2,8	0,36
India	2,7	0,21
Viet-Nam	2,4	0,19
Pakistan	1,9	0,28
Bangladesh	1,7	0,25
Nigeria	1,0	0,31

Source: Chelem.

The Balassa-Samuelson effect (1964) reconsiders the PPP and the stationarity of the real exchange rate, dividing the economy between a tradable sector, opened to world competition and a non tradable sector. The real exchange rate is the weighted average of the two sectors prices and will not be stationary. Real exchange rate can be decomposed into:

$$e = (s + p_T^* - p_T) - ((1 - \alpha)(p_{NT} - p_T) - (1 - \alpha^*)(p_{NT}^* - p_T^*))$$

The first term stands for the real exchange rate in the tradable sector (from the PPP), the second and third terms stands for the internal exchange rate (the ratio of tradable goods prices, p_T , to non tradable, p_{NT}). If the last two terms are considered, they represent the relative price ratio of domestic and foreign non tradable goods. Even if PPP were to hold for tradable goods, which is debatable, it wouldn't hold globally if the relative price ratio is not similar in the two countries. Yet Southern countries are less productive in industrial tradable goods while the productivity gap is lower for services which accounts for a major part of non tradable goods. Hair-dressers or waiters have approximately the same productivity around the world, no matter what the level of development is. Then if productivity in developing countries is lower in tradable goods and wages in the non tradable sector equals the tradable sector wages, wages will be lower in developing countries and prices of non tradable goods will also be lower. During the catching-up process, productivity gains in the tradable sector will lead to a rise of wages in all sectors, leading to an appreciation of the real exchange rate. The B-S effect can explain that the lower the price level in a country, the less productive is the country (table 11).

As a result, China's low price level cannot account for the renminbi's undervaluation. China's price level can just be compared with other developing countries. Compared with Ukraine, Vietnam or other Asian countries, the Chinese case is not that odd. The Asian currencies are, *ceteris paribus*, lower than most African currencies, but those countries cannot be a reference in terms of growth strategy.

Frankel (2004) estimates a regression linking the relative price level to GDP per capita. For the year 2000, its results are: $\log(\text{PR}) = -4,15 + 0,38 \log(\text{Y/N})$.
(12,3)

According to that regression, the "good" relative price level between China and the US would be 36.2% (instead of 23.1%), indicating a need of a 57% Yuan appreciation⁹. Yet the regression is not very accurate, with a standard error of 39%. The results could be improved when other determinants are taking into account such as the need for growth. Those estimates show that the renminbi is undervalued compared with other developing countries, but they do not show that this undervaluation could be detrimental to development.

Coudert and Couharde (2005) show that there is no Balassa-Samuelson effect in China between 1998 and 2002: the real exchange rate has not been appreciating in connection with the relative gap between consumer and producer prices. This result can be explained by a

⁹Using a similar method, Coudert et Couharde (2005) find a 43 to 50% undervaluation for the renminbi-dollar exchange rate in 2003.

statistical bias (the gap used is partially reflecting the price gap between the tradable and non tradable sectors; during the catching-up process, Chinese products evolve; Chinese industrial products don't have the same price as American's), or by the theoretical reasons put forward by the authors : there is no wage equalization between the tradable and non tradable sectors in China and many prices are still managed. Finally, Chinese growth per capita can be a consequence of a massive transfer of workers from agriculture to industry, more than the effect of a stronger productivity.

2.2. The Fundamental Equilibrium Exchange Rate (FEER)

Williamson (1983, 1984) defines the FEER as the exchange rate that allows internal (output at its potential) and external equilibrium (sustainable current account position). More precisely, the FEER is « [the real exchange rate] which is expected to generate a current account surplus or deficit equal to the underlying capital flow over the cycle, given that the country is pursuing « internal balance » as best as it can and not restricting trade for balance of payments reasons ». The FEER is therefore a medium run concept. If the FEER approach can be criticized because of its theoretical inconsistencies (see Bouveret and Sterdyniak, 2005), it raises the issue of defining the exchange rate in a multinational framework, taking the full employment and the current account targets into account. Here we focus on its application to emerging economies such as China.

Three problems are to be solved. On the one hand, the target current account needs to be defined. The common use is to choose a level at which the basis balance (including FDI) is equilibrated. In the Chinese case, Williamson and Mahar (1998) estimate it at -2.8% of GDP while Williamson estimates it at -1% and Coudert and Couharde at -1.5%. Yet the choice is relatively arbitrary. A country may want to have a significant margin to avoid exchange rate fluctuations or because it expects future consumption growth.

On the other hand, the FEER implies external equilibrium at full employment, which is debatable for developed countries, even if full employment is measured by the natural rate of unemployment. This point is even more debatable for developing economies. Emerging economies are catching-up. They face massive unemployment and in China's case, a massive underemployed labour force. They face a supply constraint: they need to accumulate capital so as to increase employment. This implies a high return for national and foreign capital and a strong demand to pull growth. By definition growth is not an equilibrium process. For China, the authorities have chosen an export led growth strategy. Then the dollar-renminbi exchange

rate is crucial for this policy as a factor of competitiveness. It can be considered as a policy tool, aiming at improving growth. Yet equilibrium exchange rate theories do not shed light on economic policies.

Lastly, it should be supposed that the authorities have sufficient instruments economic policy to maintain the full employment with fundamental balance balanced, which poses problem for China. The authorities chose a development impelled by the foreign trade, which also tends to develop the investment. A development impelled by consumption would run up quickly against external pressure and the insufficiency of capital.

Using an econometric framework, Jeong and Mazier (2003) estimate current account targets, distinguishing industrialized and emerging countries. The current account target is supposed to be an increasing function of fiscal surplus, GDP per capita, net foreign assets (in contradiction with the theory); a decreasing function of net FDI inflows. For China their equation amounts to a -1.5% norm (mainly because of FDI inflows). The gap between realized and potential output is measured by HP filter on industrial output: the need for growth is not taking into account. The Yuan appears to be undervalued by 60% against the dollar in 2000. Coudert and Couharde (2005) apply the same method and use a target of -2.8% (from Williamson) or -1.5% (from Jeong and Mazier), they obtain an undervaluation of the RMB between 44 and 54% in 2003.

2.3. The Behavioural Equilibrium Exchange Rate, an empirical method

Several articles estimate China's equilibrium exchange rate using the BEER method, put forward by Clark and MacDonald (1997). They assess a long run relationship between the real exchange rate and its fundamentals (mainly net foreign assets and productivity), then estimate econometrically the exchange rate adjustment using error-correction model (see Bouveret and Sterdyniak, 2005). The fundamentals commonly used are: (Table 11):

— The change in relative productivity which implies a real exchange rate appreciation according to the B-S effect. Empirically, relative productivity is often proxied by the consumer to producer prices ratio, the former standing for all goods and the latter standing for tradable goods only

— Net Foreign Assets (NFA). A country with a positive net foreign assets position gets income flows, it can therefore have a trade deficit, hence a higher real exchange rate.

— Openness of the economy. It may require an exchange rate depreciation.

Unfortunately, the econometric method applied assumes the equilibrium real exchange rate to be equal to the real exchange rate, on average over the period. This is a very strong assumption: there is no evidence that the means over the sample period stands for equilibrium, even less an optimum. Thereby Wang (2004) reaches the conclusion that there is no renminbi undervaluation. This result doesn't stem from the fundamentals but from the fact that the author has used annual data on the 1980-2003 period. The author estimates an equation with 8 independent variables (productivity, NFA, openness, a constant and 4 dummies) and 24 observations. Because of the small size of the sample compared with the number of regressors, the point estimates are close to the observations, while the residuals centred around zero are supposed to represent the degree of misalignment. The more precise the equation, the bigger the denial of misalignment. Frunke and Rahn (2004) use a similar method over the period 1994-2002, and reach the conclusion of a null undervaluation on average over the sample, and 11% in 2002.

Table 12: Some RMB equilibrium exchange rate estimations

Article	Model	Fundamentals	Period	Undervaluation against dollar	Method
Frankel (2005)	PPP with B-S effect	Relative GDP	1990 et 2000	-35% (2000)	Panel
Coudert and Couharde (2005)	PPP with B-S effect	Relative GDP	2003	-50% /-41 % (2003)	Panel
Jeong and Mazier (2003)	FEER	Current account target of -1.5% of GDP	2000	60%	By country
Goldstein (2004)	FEER	Current account target of -1% of GDP	2003	-15-30% (2003)	By country
Coudert and Couharde (2005)	FEER	Current account target of -1.5% of GDP and -2.8% of GDP	2002-2003	-54%/-44 % (2003)	By country
Frunke and Rahn (2004)	BEER	NFA, productivity	1985-2002	-11% (2002)	By country
Wang (2004)	BEER	NFA, productivity	1980-2003	0% (2003)	By country
Bénassy-Quéré <i>and alii</i> (2004)	BEER	NFA, productivity	1980-2001	-47% (2003)	Panel

Panel estimations are no more legitimate. Bénassy-Quéré *and al* (2004) carry out regression on a panel with fixed effects for each country. This amounts to assume that the equilibrium exchange rate has been equal to the observation on average over the sample for each country, and that the countries share the same structure of their economy because each fundamental is supposed to have the same impact on each country. A unique equation for the whole countries, implies that the same behaviour applies to every country, i.e to China as to the US. In 2003, the RMB would be undervalued by 47% against the dollar, this result counterbalancing a very strong overvaluation from 1980 to 1987.

Equilibrium exchange rate estimations widely vary, depending on the sample, the model and the norm used. According to the articles, the undervaluation falls between 0 and 45%. The uncertainty on empirical results underlines the care with which those results must be interpreted. The main flaws are nevertheless theoretical: the concept of equilibrium is barely defined. The studies concluding of a renminbi undervaluation against the dollar claim that the fixed exchange regime chosen by China is detrimental to the global economy, arguing that it would increase global imbalances. Finally, the undervaluation with regard of traditional standards would be the cause of a global economic imbalance. On the contrary, we argue that this undervaluation is a consequence of existing economic disequilibrium in China that it helps to correct.

2.4 The US threats and their credibility

“Because of this action [the 21st July revaluation] and China’s stated – and repeatedly reaffirmed – commitment to enhanced, market-determined currency flexibility, Treasury has refrained from designating China [as manipulating its currency]at this time.” Report to Congress on International Economic and Exchange Rate Policies, November 2005

The United States have been putting pressure on Chinese authorities for several months, so that they revalue the renminbi. Indeed, Senators Charles Schumer and Lindsay Graham have suggested a tax of 27.5% on Chinese products, until a large renminbi revaluation occurs. However, the vote of this bill has been delayed to autumn 2006.

The *Omnibus Trade and Competitiveness Act* (1988) explains that (Title 3, sub-title A) the State secretary of the Treasury has to analyze foreign countries’ exchange policies each year, in order to assess whether some of these countries manipulate their exchange rates in comparison to the dollar, to avoid any adjustment of their payments balance or to promote an unfair competitive advantage in international trade. If a manipulation of the exchange rate occurs, the State Secretary of the Treasury must implement multilateral negotiations (through

the IMF) or bilateral negotiations so as to allow a quick exchange rate adjustment. The concept of manipulation of the rate of exchange does not have a scientific definition; however, Goldstein (2004) or Bergsten (2006) define it as a fix exchange rate system where the accused country accumulates exchange reserves and require of the IMF to intervene, if not the United States will do it.

The report to the Congress of May 2005 claims that the Chinese authorities must move to a more flexible exchange rate regime. The report of November 2005 underlines that the system implemented on July 2005 (nominal anchor to a currency basket with a fluctuation band of +/-0.3%) allows greater flexibility and improves the influence of market power. The report concludes that China is not manipulating its exchange rate but it warns that the next reports will carefully study if the Chinese authorities' commitment in favour of greater flexibility is followed by appropriate measures, otherwise the US may implement sanctions against China.

China and the US belong to the WTO, which weakens the credibility of those sanctions. A country cannot unilaterally choose to restore tariffs on imports, arguing that the other country manipulates its exchange rate. This amounts to open the Pandora's Box. Thus the PBC 's governor, Zhou Xiaochuan claimed in a speech on 20th March 2006, that according to the articles of the IMF, a country is free to choose its exchange rate regime (managed, floating or fixed) and cannot be blamed for manipulating its exchange rate. The WTO aims at making countries take advantage of trade gains. Protectionist measures would be harmful to both countries.

Chinese and American authorities' behaviour can be analyzed through a simple model of game theory. China and the US have each a tool: the US can implement protectionist measures and China can fix its exchange rate.

Case one: Tariffs are not damaging to the US

Such a situation can be summed up by the matrix A. In a one period game, the *statu quo* is a dominant strategy for China. The US will therefore choose the tariffs.

		Matrix A	
		The US	
		Tariffs	No Tariffs
China	Revaluation	(- 15, 5)	(0,0)
	<i>Statu quo</i>	(- 5, - 5)	(10, - 10)

Note: the pair couple (- 15, - 5) stands for China's gains (- 15) and the US' (5) when China revalues and the US choose to implement a tariff.

The repeated version of the game is quite different. The US decides to implement tariffs in the first period and commits itself to remove it as soon as the RMB is revalued. In the next period, China may either revalue its exchange rate as an incentive for the US to remove the tariffs, or maintain its exchange rate at a low level. If there is a revaluation, the US removes their tariffs and China's gains are: $G_{China}(\text{reval}) = -5$ and for the US: $G_{US}(\text{reval}) = -5$. If China keeps its exchange rate low and the US maintains their tariffs, the Chinese gains are:

$$G_{China}(\text{statu quo}) = \sum_{t=0}^{+\infty} \delta^t (-5) = -\frac{5}{1-\delta} \text{ with } \delta \text{ being a discount factor } (0 < \delta < 1)$$

$$\text{and for the US: } G_{US}(\text{statu quo}) = \sum_{t=0}^{+\infty} \delta^t (-5) = -\frac{5}{1-\delta}$$

China will have to revalue its exchange rate and the American threat is credible.

Case Two: the tariffs are harmful to the US economy

Implementing a tariff on trade may be harmful to the US, because tax gains for the State are lower than the loss of welfare for the consumers. The results are different (matrix B). In the one-period game, the Chinese dominant strategy is the *statu quo* while the US do not have incentives to implement their tariffs. The equilibrium is therefore *statu quo* without tariffs.

		Matrix B	
		The US	
		Tariffs	No tariffs
China	Revaluation	(-15,-12)	(0,0)
	<i>Statu quo</i>	(-5,-15)	(10,-10)

In the repeated version of the game the results will change compared to case one. In the first period the US implement a tariff, in the next period China can either revalue or fix its exchange rate. With a revaluation, used as an incentive, Chinese gains are: $G_{China}(\text{reval}) = -5$ and for the US: $G_{US}(\text{reval}) = -15$. If China keeps its exchange rate at a low level and the US

their tariffs, gains are: $G_{China}(\text{statu quo}) = \sum_{t=0}^{+\infty} \delta^t (-5) = -\frac{5}{1-\delta}$

and for the US: $G_{US}(\text{statu quo}) = \sum_{t=0}^{+\infty} \delta^t (-15) = -\frac{15}{1-\delta}$

Both countries are worst off when non cooperative behaviour is chosen. Yet in this case, the American tariffs are not credible. If the US choose *the statu quo* without tariffs, they get

$$G_{US}(\text{statu quo without tariffs}) = -\frac{10}{1-\delta} > G_{US}(\text{statu quo}) = -\frac{15}{1-\delta}$$

Their gains are higher than in the non cooperative solution, and China gets:

$$G_{China}(\text{statu quo without tariffs}) = \frac{10}{1-\delta}$$

The American sanctions are therefore not credible because if China chooses the non cooperative behaviour, American losses are higher than those from the *statu quo*.

Conclusion:

The results of the game depend on each player credibility. On the one hand, the US have shown their tenacity against China in several reports, reinforcing the credibility of their threats. Yet international trade theory shows that case two is more realistic, reducing America's credibility, in conjunction with America's belonging to the WTO. Theoretically, WTO members are not allowed to implement unilateral tariffs. The 2.1% revaluation of the 21st July 2005 can be analyzed as a political choice, showing the commitment of China. On the other hand, the smallness of the revaluation can be analysed as a proof that China doesn't want a significant, large revaluation.

3. A Chinese growth model

The renminbi undervaluation is questionable on theoretical and empirical grounds. In this section we will analyze a model showing the possibility of an undervaluation of the exchange rate according to the traditional standards (PPP, FEER, BEER), but compatible with a development strategy. In this framework, the exchange rate is a tool to reach an objective of

full-employment of an underemployed labour force. The model can be linked with Dooley and alii. (2004) works (Box 3).

Box 3: the model of Dooley and alii (2004)

Dooley and alii (2004) analyze the level of the renminbi as a choice of Chinese authorities and the advent of a Bretton Woods II (BW2). Facing massive unemployment (around 200 millions according to Garber (2004)), the Chinese government has chosen an exchange rate-led strategy to incorporate the labour force into the modern economic system. China has huge savings (household and firms savings) but, as the NPL shows, its banking system is plagued and is not able to play its role of financial intermediation. A low exchange rate can raise the foreign demand for Chinese goods and FDI so as to improve China's technological and managerial catching-up process. Low real wages and exchange rate allows high and stable returns on foreign capital in dollars.

The authors claim that a BW2 has emerged. China has chosen an export-led growth model, inducing tensions with its trade partners, such as the US; this cost is counterbalanced by high returns for American investors in China. Those profits may make the American investors act as a lobby, against the industrial lobby. Chinese government accumulate foreign exchange reserves to stabilize the exchange rate; its reserves are collateral for foreign investors. The advantages of such system are the following: China attracts FDI and reduce underemployment through its exports; the US have a trade deficit with China but China finances their deficit and American investors earn higher returns. The gap between the profit rate in China and interest rate in the US is earnings for the US Multinational Firms, because of their ability to raise Chinese GDP, and their role as lobbyists. The renminbi-dollar exchange rate does not appear to be a indicator of economic disequilibrium but an equilibrium vector for China, and to a lesser extent for the US.

This thesis is disputed by Goldstein and Lardy (2005) which claim that the FDI play only a minor role in the Chinese growth, and the system BW2 is very expensive for the PBC (which runs the risk to see its foreign exchange reserves experiencing a strong depreciation). They claim that the American firms producing in China do not make there exceptional profits, that they do not play the role of lobbyists in the United States, and do not view the Chinese foreign exchange reserves as a collateral. In short, they think that China could give up the current specificities of its strategy without losing much in growth. They estimate that the system is not durably bearable because the PBC will not agree to constantly accumulate risky stocks of foreign assets.

3.1. The model

Contrary to Dooley *and alii* (2004), our model is explicitly defined. FDI play no role because China isn't facing a financing problem: self-financing and households savings are high (despite NPL), and FDI, despite important in value, account for 5% of total investment.

The main idea is the following: China has a huge unemployed labour force and seeks to integrate it into the economic system. Without trade, Investment would be low because domestic demand is low. China is facing a demand problem and not a financing problem. Lowering its exchange rate enables to raise the Chinese competitiveness through the real exchange rate. The increase in demand leads to a rise in Investment, and a fall in unemployment. Then Chinese wages and prices increase as a consequence of the rise of their costs. In the long run, the real exchange rate has appreciated, allowing trade balance equilibrium, and there is no investment (there is no obsolescence in the model) when the optimal capital level is reached.

3.2. Defining the equilibrium exchange rate

From a Chinese point of view, the equilibrium exchange rate is the exchange rate that impulses the demand enough to raise investment and decrease unemployment. Investment increases the physical capital in the economy, which, through a complementary factors production function, raises employment. Formally, the sums of investments must increase output, physical capital and employment so that the whole active population could be employed. The investment must therefore allow the economy to reach its potential. As a consequence, the authorities must fix the nominal exchange rate at a level which allows a significant increase in potential demand and in investment. The model is solved in a rational expectations framework: the path chosen is the only one that converges to the equilibrium. If the authorities could modify their policy during the trajectory, several exchange rate values would be possible. This point is not studied in this article.

It is therefore possible to implicitly¹⁰ define a minimal value of the exchange rate, S_{\min} , that allows the economy to reach full-employment. In the long run, the trade balance

¹⁰ Formally, S_{\min} is the solution of the following equation

$$S_{\min} = s \mid \sum_{k=1}^T I_k \Rightarrow K_T = \bar{K} \Leftrightarrow \sum_{k=1}^T \lambda a (C_{k+1}^a + D^* (\frac{SP_{k+1}^{a*}}{P_{k+1}^a}) - Y_{k+1}^a) = \bar{K}$$

$$S_{\min} = \frac{\bar{K} - \sum_{k=1}^T \lambda a (C_{k+1}^a + D^* (\frac{P_{k+1}^{a*}}{P_{k+1}^a}) - Y_{k+1}^a)}{a \lambda D^* (T - 1)}$$

gets back to equilibrium because of real exchange rate variations (employment increases, as the wages and *in fine* the prices), potential demand is equal to observed demand and investment is null. S_{\min} can thus be analyzed as an equilibrium exchange rate, as in the FEER framework, despite that here it does have an impact on internal equilibrium and this equilibrium cannot be reached immediately. For an exchange rate value lower than S_{\min} , (i.e. when the exchange rate is revalued), the rise of investment is not enough for absorbing the unemployed; in the long run the trade balance is in equilibrium an investment is null but there is still unemployment. Such an exchange rate can be undervalued with reference to traditional standards (PPP for instance), but because of unemployment it appears to be overvalued in our framework.

In the model, the exchange rate, through its effect on potential demand, is used as an impulse tool of the economy. Its effect is strong in the short run and diminishes through time, when domestic consumption relayed trade balance as the source of economic growth.

3.3. Dynamic analysis

Graph 13 shows the model dynamics when the government fixes the exchange rate at its equilibrium level. The low exchange rate raises competitiveness and potential demand. China has trade surpluses, and an investment boom which raises physical capital and employment. Then unemployment falls and wages rise, leading to a cost rise and finally inflation. The real exchange rate appreciates because of price dynamics and stabilizes demand. Household consumption increases and becomes the main source of growth. In the long run, the optimal level of capital is reached, wages are stable and the trade balance is at equilibrium because of the real exchange rate.

Graph 14 shows a variant where the exchange rate is overvalued. This can be the case if the Chinese government decides to appreciate its currency because of American pressure. Then the initial exchange rate depreciation is not strong enough for unemployment to disappear. Employment increases but the rise of demand is not strong enough to dramatically raise investment and employment.

The simulations of the model show that the exchange rate can be undervalued with reference to the PPP or FEER criterion, and be in equilibrium in more realistic framework.

3.4. On the usefulness of equilibrium definition

There are as many equilibrium exchange rates as economic policy strategies. In the model the equilibrium exchange rate must allow enough growth to absorb unemployment in

China. The equilibrium exchange rate cannot be obtained immediately, because it would diminish incentives to invest in China. From this point of view, this model defines explicitly the link between the exchange rate and economic policy strategy. The model is relatively *ad hoc*. Of course it is just suited for China, but its goal is to show that there is an equilibrium concept for each country objective. The multiplicity of equilibrium exchange rates weakens the relevance of equilibrium exchange rates estimations, underlining Joan Robinson's point (1947) when she asserts that "The notion of the equilibrium exchange rate is a chimera".

The equations

$$Y_t = K_t / a \quad (1) \quad a = 0.5$$

$$L_t = bY_t \quad (2) \quad b = 1$$

$$U_t = Pop - L_t \quad (3)$$

$$I_t = \lambda a (Dpot_{t+1}^a - Y_t) \quad (4) \quad \lambda = 0.25$$

$$K_t = K_{t-1} + I_{t-1} \quad (5)$$

$$C_t = cY_t + \tau(W_t - W_t^d) - cn(s_t p_t^* / p_t) \quad (6) \quad c = 0.5, \tau = 0.15, n = 0.2$$

$$W_t = (1+r)W_{t-1} + Y_t - C_t \quad (7)$$

$$W_t^d = \phi Y_t \quad (8) \quad \phi = 2$$

$$Dpot_t = C_t + D^*(s_t p_t^* / p_t) \quad (9) \quad D^* = 15$$

$$TB_t = C_t + I_t - Y_t \quad (10)$$

$$cu_t = \chi w_t + (1-\chi)pk_t \quad (11) \quad \chi = 0.7$$

$$pk_t = tpro((s_t p_t^*)^m p_t^{1-m}) \quad (12) \quad m = 0.5 ; tpro = 0.15$$

$$w_t = p_t^\alpha + \nu L_t \quad (13) \quad \alpha = 1, \nu = 0.05$$

$$p_t = (1+\beta)cu_t \quad (14) \quad \beta = 0.34$$

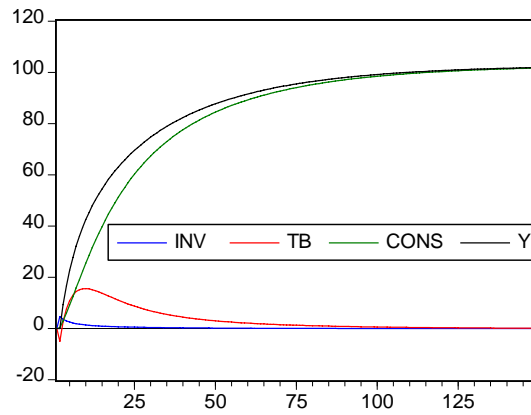
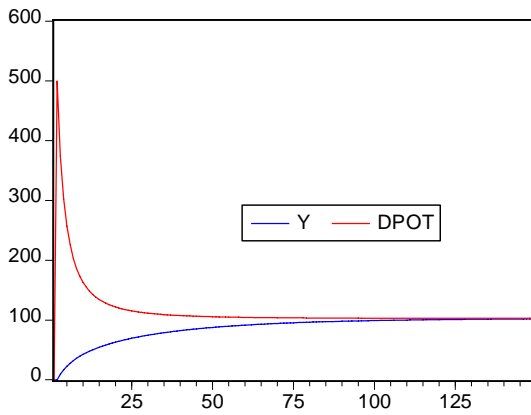
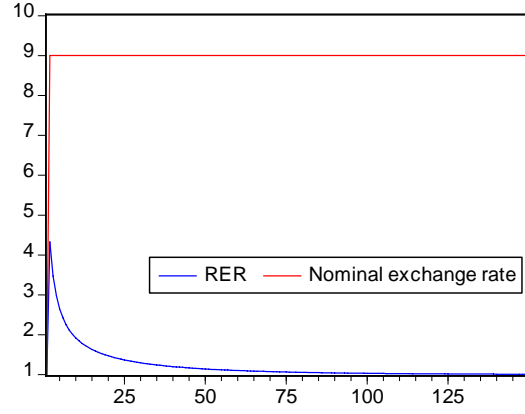
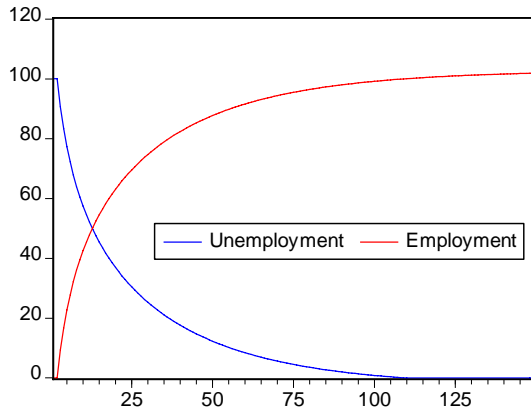
with: Y, output ; K, physical capital stock ; L, Employment ; Pop, potential population ; U Unemployed; I, Investment ; Dpot, Potential Demand ; s, nominal exchange rate (a rise is a renminbi depreciation) ; cu, unit cost ; w, nominal wages ; pk, capital price ; p, Chinese producer prices ; C, Consumption ; W, household wealth.

Comments

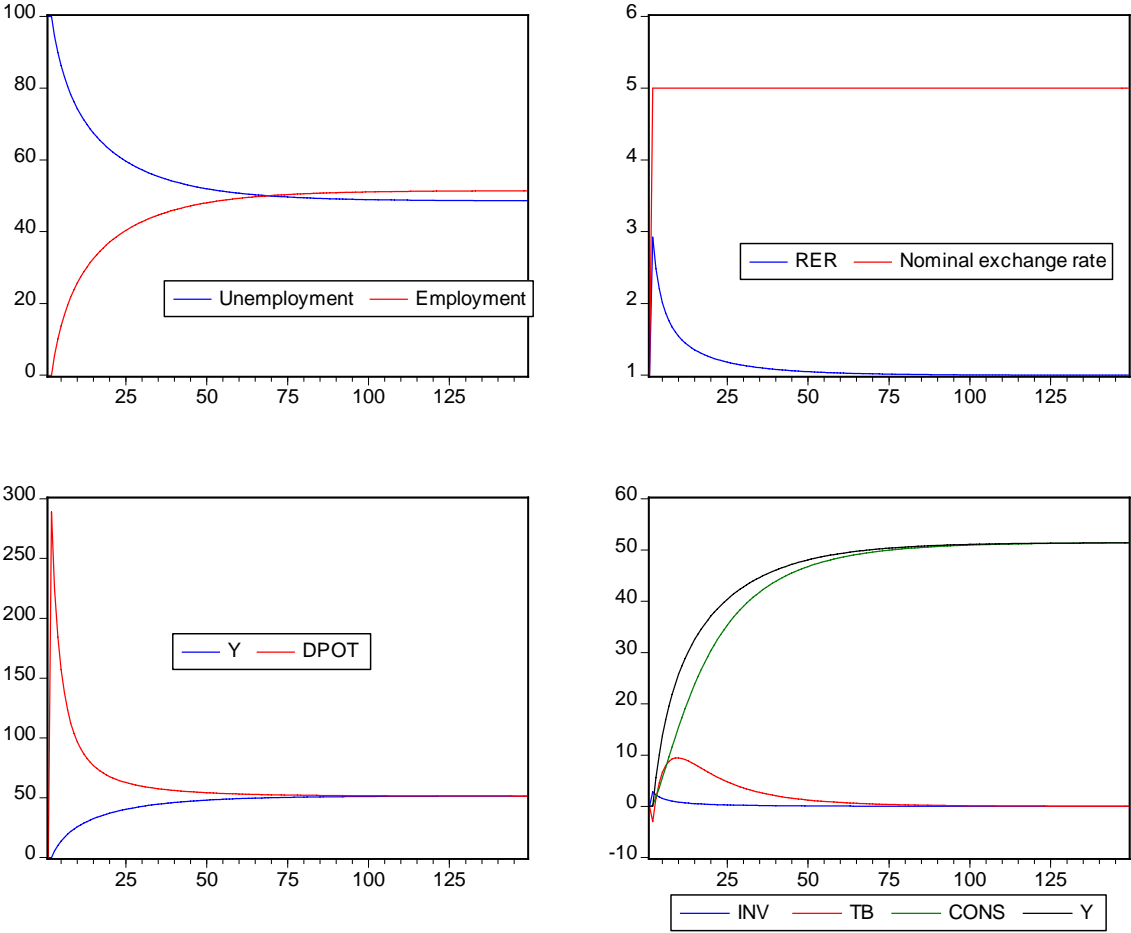
The production function is a Leontief (fixed proportions technology) function; output is limited by capital stock (1 and 2). Investment adjusts to the gap between potential demand

and expected output for the next period (4). Consumption depends on income and the gap between current and desired wealth, which depends on the income (6 and 8). Consumption is linked with the exchange rate because a real depreciation raises the domestic price of foreign products (hypothesis of a weak substitutability between foreign and products). Potential demand is linked with domestic consumption, foreign demand and Chinese competitiveness (9). Domestic production that is not consumed in the country is exported (10). Unit costs depend on wages and capital price (11). The price of capital depends on the profit rate, the equipment goods prices, of which $m\%$ are imported (12). Wages are linked with prices and output (13). Firms apply a mark-up on their costs (14).

Graph 13 : The exchange rate is at its equilibrium level



Graph 14: The exchange rate is overvalued



4. What kind of exchange rate regime for China?

In addition to the question of the revaluation of the RMB, it would be necessary to examine the problem of the optimal exchange rate regime for China. On July 21st, 2005, the PBC decided to move from a peg to the dollar to a managed floating exchange rate regime: *“With a view to establish and improve the socialist market economic system in China, enable the market to fully play its role in resource allocation as well as to put in place and further strengthen the managed floating exchange rate regime based on market supply and demand, the People’s Bank of China, is hereby making the following announcements regarding reforming the RMB exchange rate regime:*

Starting from July 21, 2005, China will reform the exchange rate regime by moving into a managed floating exchange rate regime based on market supply and demand with reference to a basket of currencies. RMB will no longer be pegged to the US dollar and the RMB exchange rate regime will be improved with greater flexibility. The People’s Bank of China will make adjustment of the RMB exchange rate band when necessary according to market development as well as the economic and financial situation. The RMB exchange rate will be more flexible based on market condition with reference to a basket of currencies. The People’s Bank of China is responsible for maintaining the RMB exchange rate basically stable at an adaptive and equilibrium level, so as to promote the basic equilibrium of the balance of payments and safeguard macroeconomic and financial stability.”

This text is conflicting because it announces in the same time a managed floating to maintain the macroeconomic stability and a “floating exchange rate” based on market supply and demand. China must choose its exchange rate regime between a managed float and an exchange rate based on the rules of the market such as all emergent countries (see Gharbi 2005). The first option insures the stability of the exchange rate but it can induce conflict of interest between countries and it could lead to errors in the economic policy and crisis. The second option induces systematically a strong instability of the exchange rate because the market ignores the target of the monetary authorities. This strategy is not practicable by China as it has an important current account surplus. If the authorities don’t intervene, the exchange rate would appreciate strongly.

The Chinese must also choose between maintaining the control of the exchange rate and liberalisation of capital flows. The exchange control makes possible to maintain the autonomy of the monetary policy; the internal interest rate can be disconnected from exchange rate expectations. But, it becomes increasingly difficult to maintain insofar as China

has important trade in goods and liberalizes part of the movements of capital (FDI, income transfers etc). Liberalization would make it possible to let play “supply and demand”. But, this play would induce a strong instability of the exchanges and would oblige the Chinese authorities to deviate from their desired level of exchange rate. If the market anticipates a value of balance of 6 RMB for a dollar and that the interest rate is 4% in the United States, as the Chinese interest rate cannot go below 0, the rate of exchange of the RMB can hardly deviate from 6,24 RMB for a dollar, that is to say a big rise compared to the current 8 RMB..

The contradictory character of the Chinese declarations is emphasized by the reference to a managed float of the RMB around a basket of currencies. The system as exposed by the authorities is asymmetrical and contradictory. The exchange rate of the RMB would be defined according to a basket of currencies. According to certain declarations, this basket would be composed of the dollar, the euro, the yen and the South Korean won. According to other declarations, it includes also, in a long-run perspective, the pound sterling, the Australian dollar, the Canadian dollar, the Russian rouble, as well as the currencies of three neighbours of Southeast Asia: the Thai baht, the Singaporean dollar and the Malaysian ringgit. In fact, the PBC defines daily a central value of parity RMB-dollar around which the exchange rate can fluctuate of +/- 0.3%. For the three other currencies, the central parity would be defined according to the parity of the RMB /dollar, and of the exchange rate between the dollar and the currency considered, with a margin of fluctuation of +/-3%. For the daily management, the RMB is thus not pegged to a basket of currencies but to only one currency: the dollar, from which one deduces the exchange rate of the RMB against non US-dollar currencies (and one does not see the signification of the band of 3%). For the long run, one does not see how the announced peg would be implemented: weights were not specified: the PBC did not indicate if it maintains fixed the nominal effective exchange rate, the real exchange rate or if it intended to let the real exchange rate one appreciate slowly. So, the reform of the exchange rate regime induces many interrogations.

4.1 In terms of what currency the central value of the Yuan will be expressed?

Two practices are possible: to use an international currency (the dollar, the yen or the euro) or to define a basket of currencies with weights reflecting the importance of each currency, as currency of the importers and of the export competitors. The first strategy has the advantage of simplicity and transparency, therefore credibility. But, it is destabilizing when the exchange rate of the central country undergo strong variations against the currencies

of the supplying countries, customers or competitors, which is often the case of the dollar. Stability against a basket of currencies allow the central bank to reduce the impact of the fluctuations of the exchange rate, but it can be opaque and easy to handle and thus not very credible.

The peg to the dollar in East Asia and in particular in China is not only used because of the trade with the United States, but also because the dollar is used for the trade with Japan and in the Asian area. The rigidity of all the Asian currencies against the dollar avoid a strong instability of the bilateral exchange rates in Asia and compensates, to some extent, the non-existence of a regional monetary agreement.

Frankel, (2004) considers that Asia needs today a central currency which could be a suitable peg for each country of the area. The yuan cannot be a stable peg because China does not have a sufficiently open money market; the yen fluctuates too much against the dollar. To facilitate the monetary integration in Asia, he proposes that Singapore unilaterally adopts a firm and transparent basket peg (dollar, euro, yen, and yuan) and that other countries in the region uses the Singapore dollar as their anchor to target their own exchange rate. But, the proposal is complicated. An agreement to use the Singapore dollar as the central currency seems not very realizable. The project does not settle the question of the suitable level of the Asian currencies.

McKinnon (2005 a) criticises the claim of the BPC to practise simultaneously a peg against the dollar and against a basket of currencies. It is obviously impossible since the exchange rate of the RMB against dollar and the exchange rate of the dollar against the euro determines the exchange rate of the RMB against the euro. ICI

4.2 Can China maintain its exchange rate fixed?

China used a fixed exchange rate against the United States for eleven years since 1994 to 2005. From Chinese point of view, this strategy was a success. Inflation was suppressed and the economic growth was vigorous. However, the viability of the systems of fixed exchange rate is reconsidered. The most resounding exchange rate crises of the last decade intervened in systems of fixed changes: mechanism of European exchange rate in 1992/1993, Mexico 1994/1995, country of East Asia 1997, Russia 1998, Brazil 1999, Turkey 2001. According to its despisers, the fixity of the exchange rate is not sustainable on the long run. It requires that the country laid strong constraints on its macroeconomic policy. Its rate of inflation must be equal to that of the country of pegging (corrected by the Balassa effect) and

any rate going beyond must be corrected. Its interest rate must be the interest rate of the country of pegging increased by the risk of devaluation perceived by the markets; and that prevents any monetary policy of stabilization. These constraints can become so heavy that their containment appears not very credible for the markets, which precipitates the exchange rate crisis. So, The IMF advocates to give up the traditional fixed exchanges rate and to adopt the corners hypothesis, floating exchange rates or “hard” pegs like the currency boards. But at the beginning of the year 2002, the collapse of the Argentina’s currency board made this regime not credible. Williamson (2004) indicates several conditions so that the fixed exchange rate regime does not lead to a misalignment of the real effective exchange rate: the economy must be open and small to be able to be absorbed by a significant monetary area; the major part of its trade must concern the trade partners to which the currency will be pegged and finally the country must be ready to adopt institutional agreements enabling him to ensure a credibility to the fixed exchange rate regime. China is not a small economy and the major part of its trade does not relate to the United States but to the Asian region. It is not ready to give up its sovereignty to adopt an institutional agreement like the currency board to reinforce the credibility of the fixed exchange rate regime. However, China could maintain without difficulty its fixed exchange rate regime because of several assets. It has, until now, preserved a certain exchange rate control, which enables him to resist to the pressure of the appreciation of the exchange rate; it maintained a certain credit control; being more threatened by an appreciation than by a depreciation of its exchange rate, it is easier to it to accumulate reserves of exchanges than to be involved in debt to defend its parity. Does it have to put in danger the dynamism of its growth? The first strategy would consist of a simple adjustment of its parity, followed by the return to the fixity of the exchange rate. It would have the merit to show the goodwill of China and to reduce the American pressures. But, this strategy is dangerous. A weak readjustment could cause anticipations of later readjustments, therefore inflows of hot money and slightest inflows of foreign direct investments, the reverse of the required goal. A strong readjustment, that is difficult to gauge precisely, would represent a danger for the Chinese growth. So, McKinnon (2004) considered that China must firmly maintain the parity of 8,28 yuans/dollar. For him, to give in to the American pressures was the same as to involve China in a situation of deflation like Japan between 1992 and 2003. Mc Kinnon and Schnabl (2004) evoke the conflicted virtue: in China today like once in Japan, the strong propensity to save of the population creates a structural current account surplus. If the central Bank gives up the accumulation of exchange rate reserves, it must continuously lead an expansionist monetary policy in order to prevent the appreciation of the currency. But

this policy runs up against a near-zero interest rate liquidity trap: impossibility of fixing the nominal interest rates at negative values whereas the appreciation of the exchange rate causes a downward trend of the prices. The risk is that the dynamism of the growth is broken since competitiveness is degraded, the wages drop (because of the growth of unemployment) and the monetary policy is impotent.

4.3. Fixed or flexible exchange rates?

As we saw previously, the choice of the RMB parity is delicate. It cannot rest on a concept of "equilibrium exchange rate". China must choose an exchange rate which ensures a strong growth, while avoiding inflationary pressures and unbearable social strains. Who must decide on this parity? The international government or financial markets? The logic of the managed floats is that it is the government (or the Central Bank) which decides changes of parity by a trade-off between inflation and competitiveness. The logic of the floating but controlled exchange rate is that it is the market which decides, and the government settles for smoothing the fluctuations. Today China uses a managed exchange rate regime, because the RMB would experience a strong appreciation if the BPC did not intervene every day. A system where the BPC would give up intervening would be characterized by a strong appreciation of the exchange rate, then by disordered fluctuations (like those which the yen or the euro knew) since that the market cannot determine an equilibrium exchange rate. The strong appreciation would involve a fall of the activity, a deceleration of FDI's inflows, a fall in the interest rates, then anticipations of fall of the exchange rate, etc. No one wish that the exchange rate of China experience strong fluctuations, which would destabilize its foreign trade, its accumulation of capital and its growth. The only alternative to the fixed exchange rate is a managed exchange rate with a slow and regular appreciation of the RMB. With such a regime, the speculators cannot anticipate to make profits when an exchange rate crisis rises. However, this option supposes that the government recognizes the need for an appreciation of the real exchange rate of China, which is not easy in a phase of extensive growth (increase in the production by rise of employment rather than by rise of the productivity). A system of crawling peg where, for example, the RMB would be revalued from 3 to 5% per year, would suppose, in situation of free capital movement and taking into account the level of the American interest rate, a near zero interest rate in China, therefore, a big rise of the credit if the banking structure were liberalized. Consequently, this system supposes more or less the containment of the credit and exchange rate control.

4.4. Off-board projects

Several American economists imagined rules of management for the Chinese exchange rate, where China would agree to let the latter fluctuate according to the goodwill of the financial market. These projects generally rely on the implicit thesis according to which there is a fundamental exchange rate the market could help to establish. Williamson (2004) proposes for China to apply a mechanism of exchange rate which would combine its theory of the FEER (fundamental equilibrium exchange rate) with the BBC rule of Dornbusch: a Basket parity, a wide **B**and and a **C**rawl of the exchange rate. He proposes to define for each currency its FEER then to determine a limit of fluctuation or target zone around the central parity. The monetary authority would have the responsibility of maintaining the real exchange rate inside the zone. But, this does not answer the question of the definition of the domestic equilibrium: full employment of the current potential output or growth leading on the long run to full employment. Williamson proposes to define a wide band of fluctuation (10 to 15%) because it considers that it is difficult to estimate the FEER precisely and to prevent the government to defend a misaligned exchange rate. But this supposes that there exist a FEER that one can determine with precision. The width of the band of fluctuation is supposed to let the exchange rate fluctuate with the fundamentals, without causing destabilizing anticipations. It should help a country with strong but temporary capital inflows, to stabilize its exchange rate. Insofar as the operators of the market think that the band is credible, they will anticipate a return of the rate towards the central parity. If the foreign investors estimate that the band is credible, they will rather hold account the value of the parity than the rate on the market for an investment decision. Thus, any deviation from the equilibrium will not destabilize the decisions of investments. But does such a mechanism make sense when the value of the currency depends on the interventions of the central bank on the exchange rate? A gap between the rate and the central parity can be interpreted like a temporary variation which is going to disappear or on the contrary as an indicator that the central Bank prepares a change of parity: the band is stabilizing in the first case, destabilizing in the second. Goldstein and Lardy (2003, 2004, and 2005) plead for a reform in three periods. First a “one shot revaluation” of approximately 25 % in order to restore the equilibrium of the fundamental balance; then a “re-peg” of the RMB to a basket of currencies (dollar, euro and yen) with a band of fluctuations of +/- 10 %; then, the floating of the RMB and its convertibility. The initial revaluation would be significant; it would allow speculators to make important profits; the latter will anticipate that this type of profits will be repeated in the future. One can then enter in a dangerous circle which will push the RMB up to a level where the operators on the

market will not anticipate any more possibilities of revaluation of the currency's value, therefore where the exchange rate of China will not be competitive any more. It is not in the interest of China to take this way. The authors propose that China negotiate with its Asian partners to insure that they will simultaneously accept a general realignment of their currency. Thus, China will be able to avoid the sudden decrease of competitiveness which would be likely to result from the revaluation. So, China should inquire its neighbours of sacrifice their growth to the American interests. Is this in its own interests? Then, Goldstein and Lardy (2003, 2004 and 2005) propose to surround the new parity by a wide band of fluctuations within which the authorities would take actions in order to influence the exchange rate. But the exchange rate of the RMB is likely to become the "toy" of the speculators. The second stage of the reform suggested (the aim of it is to end up with a floating of the RMB) is a series of steps: to recapitalize and to restructure the Chinese banking system; then, to liberalize it; then, to liberalize the capital flows and finally, to make the exchange rate of the RMB floating. But, the authors do not prove that this programme inspired from the Western model corresponds to the stage of development of China and its needs for growth. The opposite strategy - to maintain the exchange rate low and stable, to protect this level by interventions on the foreign exchange market, to avoid the inflows of hot money and to promote the FDI (source of technological transfer), to exhort the banks to control the development of the national companies- has, until now, succeeded in China. Should it be sacrificed to the myth of equilibrium? The Chinese growth is not balanced, but can a vigorous growth be balanced? China requires a rise of wages, a more generous and more extended social protection, which will induce a fall of the rate of saving and a growth resting more on consumption than on export. But, the crisis of growth, which a strong appreciation of the RMB would be likely to cause, would not make it possible for China to go in this direction.

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