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## ABSTRACT

### Rebalancing Growth in China: A Three-Handed Approach\*

Our paper is an attempt to define the contours of the right macroeconomic strategy for China. In a nutshell, we believe that the package includes a decrease in saving, with a focus on private saving, an increase in the supply of services, in particular health services, and an appreciation of the RMB. This is why we refer to this strategy as a 'three-handed approach': action on the fiscal and budgetary front, accompanied by currency revaluation. We start by asking how the Chinese economy got to where it is – what the strategy has been since the beginning of the reforms, and what the main characteristics of the economy are today. We then ask what is the desirable path for the future, and which are the main policy tradeoffs implied by such a path. Finally, we put the various pieces together to describe what we believe is a consistent policy package.

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## 1 Introduction

On July 21, 2005 China began the process of rebalancing its economy. The new exchange rate rule will, over time, reduce the incentive to invest in the export sector. This is the right move for China since there are increasing signs that the economy has proceeded too far into manufacturing for export markets, to the point that the country's capital stock is misallocated: too much in manufacturing, too little in the domestic service industry—in particular in the provision of health services.

At the same time the government has announced that the national poll tax will be eliminated in all rural provinces and is considering reducing, in those provinces, some local taxes as well. It has also introduced free elementary education and some free basic health services for all rural households. These policies are also right, for two reasons. First, the prices of agricultural products in China follow international prices very closely: The revaluation will therefore be accompanied by a corresponding fall in the local currency price of foodstuffs and, as a consequence, a fall in rural incomes. Second, a substantial revaluation risks pushing the economy into a recession—or at least a significant slowdown in growth. Using fiscal policy to support domestic demand is clearly appropriate. Doing so by focusing primarily on rural provinces, appears therefore to be the right approach both from a distribution and from a macroeconomic viewpoint.

Our paper is an attempt to define the contours of the right macroeconomic strategy for China. In a nutshell, we believe that the package includes a decrease in saving, with a focus on private saving, an increase in the supply of services, in particular health services, and an appreciation of the RMB. This is why we refer to this strategy as a "three-handed approach": action on the fiscal and budgetary front, accompanied by currency revaluation.

Before describing the optimal policy mix, we start by asking in Section 2 how the Chinese economy got to where it is—what the strategy has been since the beginning of the reforms, and what the main characteristics of the economy are today. In Section 3 we use this assessment to ask what is the desirable path for the future, and which are the main policy tradeoffs implied by such a path. Finally, in Section 4 we put the various pieces together to describe what we believe is a consistent policy package.

## 2 The strategy so far

### 2.1 Saving and exports

Partly as a result of deliberate policy choices, partly by historical accident, China's economic strategy since the early 1990's has been characterized by two features: high saving and high capital accumulation, and export-led growth.<sup>1</sup>

- *High saving.*

China's national saving rate, 43 percent of GDP in 2003, is unusually high, no matter which group of countries China is compared to (see Table 1).

The high national saving rate reflects both high private and high public saving. The fraction of saving invested abroad has been relatively small: In the past 15 years China has always run a current account surplus, but never a very large one: 2 percent of GDP on average since 1990. As a result of high household saving, private consumption has been relatively low: As shown in Table 2, it is now 56 percent of GDP, having lost six percentage points since the early 1990's. This reduction in private consumption has gone entirely into financing domestic investment, which over the same period has gained the same share of GDP, 6 percent.

**Table 1: National saving rate (percent of GDP, 2003)**

China	43.2
Low-income countries	20.3
Lower-middle income countries	30.4
Middle income countries	28.3
Upper-middle income countries	23.9

*Source. World Development Indicators (2004)*

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1. A more detailed characterization of China's growth, with a comparison to other rapid growth experiences such as those in Korea and Japan earlier in time, is given in Hausmann (2005).

**Table 2: The composition of demand (percent of GDP)**

	1991	2003
Consumption	62	56
private	49	43
public	13	13
Investment	36	42
Exports	16	31
Imports	14	29

Source. *IWEP, Chinese Academy of Social Sciences*

- *High exports and high imports.*  
Openness, measured by the share of trade (exports plus imports) in GDP is 60 percent today (2003): China is about as open as France and Italy, two economies deeply integrated in the European Single Market (for comparison, average trade openness is below 40 percent in Latin America.) In less than ten years, China has nearly doubled its degree of openness by raising both exports and imports by an order of magnitude more than the increase in world trade (see Table 3). Much of this trade is related to Chinese processing of imported intermediate goods (processing trade accounts for about one half of total Chinese trade). One the major benefits of openness, learning-by-doing, occurs precisely in the area of processing trade.

**Table 3: The growth rate of exports and imports (percent per year)**

Exports	1980's	1990's	2000-03
China	5.7	12.4	23.1
World	5.0	6.2	5.8 (*)
Imports	1980's	1990's	2000-03
China	10.2	15.5	23.5
World	4.7	5.8	5.3

Source: *World Development Indicators (2004) (\*)*: 2000-02

Overall, this has clearly been a very successful strategy:

- *Per capita income.*  
In just 15 years Chinese GDP per capita (PPP corrected) has increased from being equal to that of India to being now twice as large. Or to take another example, it has gone from 18% of Korean GDP to 29%. These are impressive achievements.
- *Total factor productivity and learning-by-doing.*  
Between 1990 and 2002 labor productivity growth in industry has averaged 12.5 percent per year. These productivity gains are obviously related to the high investment rate, but (as shown in Hu, Jefferson, Xiaojing and Jinchang, 2003) learning-by-doing has contributed to increase total factor productivity. The estimates of TFP growth computed by various authors and discussed in Wang (2005) range around 3 percent per year since the beginning of the reforms (Table 4). More recently however, as discussed in Hu and Zheng (2004), TFP growth appears to have slowed significantly; we shall return to this below.

**Table 4: Total factor productivity growth, various estimates**

Author	Period	Annual TFP growth
Wang Mengkui	1978-1985	0.5
	1978-2003	2.4
Li Shantong	1982-1997	1.4
Maddison	1952-1978	-0.8
	1978-1995	2.2
World Bank	1978-1995	3.1
Zheng Jinghai	1979-1984	7.7
	1985-1990	2.2
	1991-1995	3.7
	1995-2001	0.6
Zhu Baoliang	1978-2002	3.0

Source: As reported by IWEPP, quoting from Wang, unpublished.



- *No evidence of overheating.*

With respect to labor, there appears to be no general pressure on wages. With respect to capital, the evidence from prices of machinery and building materials in particular, suggest, if anything, excess supply (Table 5).

**Table 5: Price indices (rate of change, 2003)**

Ex-factory prices	2.3%
Price deflator, investment in fixed assets	2.2%
Price deflator, machine building industry	- 3.0%
Price deflator, building materials industry	- 0.4%

*Source: IWEP, Chinese Academy of Social Sciences*

## 2.2 Imbalances

Along with growth, a number of social and economic imbalances have emerged however.

- *Uneven growth across provinces.*

In the 1970s, per capita income in urban areas was 3 times its level in rural areas: Controls on the price of foodstuffs and limitations to labor mobility were aimed at favoring the cities. The reforms of the 1980s brought that ratio down to 2.2. Since 1990, however, it has risen again and was back to 3.2 in 2003. The same has happened to per capita consumption in urban and rural areas (Table 6). This divergence between urban and rural households is also reflected, not surprisingly, in an increasing divergence in income per capita between provinces (last column of Table 6). The standard deviation of income per capita across provinces has increased by 72 percent between 1998 and 2003.

Growth differences across provinces have been larger than what can be explained by different characteristics, such as geography, or the endowment of human capital. In particular, the policy of awarding fiscal privileges to exporters and investors in selected areas has contributed directly to the widening of income differences. Cities that have been granted the status of special “economic zones” have grown by as much as 5 percent per year faster than the rest (Jones et al., 2003). Spillovers across provinces have

also contributed to the widening of income disparities because (as shown in Brun et al. 2002) such spillovers have been positive among coastal provinces, but non-existent between coastal and inland or western regions.

**Table 6: Ratio of per capita income and consumption. Urban to rural households, and top 8 to bottom 22 provinces**

	Income ratio Urban to rural	Consumption ratio Urban to rural	Income ratio Provinces
1979	2.6	2.9	
1990	2.2	3.0	
1998	2.9	3.4	2.8
2003	3.2	3.6	3.1

Source. IWEPP, Chinese Academy of Social Sciences

- *Uneven growth across skill levels.*

We estimate that the skilled-unskilled wage differential has risen from 1.3 to 2.1 in a decade (the details of estimation are given in the box below.) The large migration flows from rural to urban areas and from inland and western provinces to coastal provinces suggest that the countryside has been used mainly as a reservoir of labor. The high supply elasticity of unskilled labor has certainly been a factor in the rise of the skilled-unskilled differential.

How large is this elasticity? Using a survey of residents in the Hubei province, Zhu (2000) finds that the wages of workers who have migrated to the city are twice as high as those of workers who have remained in the countryside. Part of this difference reflects differences in skills. However, even after correcting for differences in skills, the wage of a migrant worker remains higher than that of a farmer (correcting for differences in skills, the ratio falls from 2 to 1.8), suggesting that returns to skills are larger in the city, but also that migrating is costly (one of the main factors here are the legal restrictions on mobility, under the policy known as the Hukou policy). We are thus far from perfect arbitrage between rural and urban jobs. The interesting question, however, is by how much a widening of the wage differential induces higher migration. The same survey indicates that a 10% fall in rural wages—holding wages in the city constant—raises migration flows by approximately 0.5%. Fluctuations in rural incomes are

thus an important determinant of the decision to migrate, although the cost of moving prevents perfect arbitrage. As we shall discuss, this is an important fact when asking what are the effects of a revaluation, since a currency revaluation lowers incomes in the countryside.

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**Box. Estimating skilled-unskilled wage differentials**

Denote the average wage in sector  $i$  in year  $t$  by  $w_{it}$ . Decompose workers in two groups, skilled (high school and more) and unskilled (less than high school), and denote their respective wages by  $w_{it}^s$  and  $w_{it}^u$ . Let the proportions of skilled and unskilled workers be denoted by  $\alpha_{it}^s$  and  $\alpha_{it}^u$  respectively. Then, by definition:

$$w_{it} = \alpha_{it}^s w_{it}^s + \alpha_{it}^u w_{it}^u$$

If we assume that the wages of skilled and unskilled workers are the same across sectors, this implies:

$$w_{it} = \alpha_{it}^s w_t^s + \alpha_{it}^u w_t^u$$

We can then recover  $w_t^s$  and  $w_t^u$  from cross-sector regressions for each year of the average wage on the proportions of skilled and unskilled workers in that sector for that year. The data are from IWEP, and the regressions are based on 14 sectors. The numbers in the text correspond to the ratio of the first estimated coefficient to the second estimated coefficient, for the years 1994 and 2003 respectively.

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- *Uneven growth across sectors.*

Not surprisingly, given the strategy and the composition of exports (in 2003, 91% of Chinese exports were manufactured goods), the share of manufacturing in GDP is large, quite independently of the group of countries to which China is compared (Table 7). The share of services is correspondingly low. This reflects in particular a low provision of health services with the situation getting worse in the countryside (We shall return to this below). The reported share of retail and wholesale trade is low as well; we are skeptical that this is indeed the case, but we have no data to confirm or challenge it.<sup>2</sup>

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2. The low share of retail and wholesale trade in GDP, compared with countries at a similar

**Table 7: The composition of output (value added, percent of GDP, 2000)**

	Agriculture	Industry	Services
China 1990	27	42	31
China 2003	14	52	33
Other countries (2003):			
Low income countries	25	27	48
Upper-middle income countries	12	41	59
World	4	28	68

Source. *World Development Indicators (2004) and IWEP*

- *Safety nets have substantially weakened.*  
The high saving rate reflects (as we show below) a high level of individual risk, related to health costs, retirement, the financing of education. The decrease in social insurance has left individuals with the need to self-insure—an expensive and very imperfect solution. The decrease in safety nets has become particularly relevant in the area of health, and the transition to a fee-based health care and education system (more on this below) has compounded the effects of widening income inequality.
- *A misallocation of investment.*  
The saving glut, combined with a bank-centered financial system and privileged access to funds by state firms, has resulted in misallocation of investment. The fall in measured TFP growth (Angang and Zheng, (2004) estimate that TFP growth has fallen from 3.7% in 1991-95 to 0.6% during 1996-2001) should probably not be interpreted as a decrease in true technological progress, but rather as a reflection of capital misallocation, leading to a marginal productivity of capital close to zero or even negative in parts of manufacturing. Capital productivity is probably still high however for investment in social capital (health, education, ...) especially in rural areas. It is therefore hard to say whether China is investing too much, but it is certainly misallocating at least some of its investment.

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stage of development may reflect to some extent from the undervalued exchange rate (more on this below). An undervalued exchange rate is likely to translate in a low price of non-traded goods, such as services, relative to traded goods (manufacturing). Thus, the low share of retail and wholesale trade in GDP may reflect a low price rather than a low quantity of trade services. For the same reason, manufacturing may be overstated, and so may investment volume.

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**Box. Can measured TFP growth really be close to zero if growth is so high?**

The answer is yes:

Assume that production is given by  $Y = F(hL, K, A)$  where  $h$  is human capital per worker,  $L$  is the number of workers,  $K$  is the physical capital stock,  $A$  measures technological progress, and the function  $F$  has constant returns to scale. Then, under the assumption that factors are paid their marginal product, it follows that the Solow residual, TFP growth, is given by:

$$S \equiv \frac{\Delta Y}{Y} - \alpha_N \left( \frac{\Delta h}{h} + \frac{\Delta L}{L} \right) - \alpha_K \left( \frac{\Delta K}{K} \right)$$

For the period 1995-2001, using the information in Angang and Zheng (2004) the numbers are as follows:

$$\frac{\Delta Y}{Y} = 8.2\%; \quad \frac{\Delta h}{h} = 2.8\%; \quad \frac{\Delta L}{L} = 1.2\%; \quad \frac{\Delta K}{K} = 12\%$$

so, if we use a share for capital of 0.4 (and by implication a share of labor of 0.6), this implies:

$$S = 8.2\% - 0.6(2.8\% + 1.2\%) + 0.4(12\%) = 1.0\%$$

Minor changes in assumptions can easily make it smaller. Consider for example the construction of the rate of growth of the capital stock:

$$\frac{\Delta K}{K} = \frac{I}{Y} \frac{Y}{K} - \delta$$

The growth rate of capital used above is based on  $I/Y = 45\%$ ,  $K/Y = 2.5$ , and  $\delta = .06$ , so  $\Delta K/K = 12\%$ . There is considerable uncertainty about  $K$  however, which is constructed using a perpetual inventory method. Assuming a value of  $K/Y = 2$  gives instead  $\Delta K/K = 16.5\%$  and, by implication, a small negative Solow residual. (Using a labor share of 0.47 and capital share of 0.53 the OECD estimates a growth rate of TFP equal to 4% over the period 1979-85 and 1991-95. It estimates that the growth rate of TFP has decreased further since, reaching -3% in 2003. [OECD Economic Survey of China, August 2005.]

*The implication of this computation should not be however that there is no technological progress in China. The assumption underlying the computation is that factors are paid their marginal products. If, in fact, capital has been misallocated, then, contrary to this assumption, the marginal productivity of capital in those sectors where there has been excessive investment could be negative. Therefore, the right way to interpret the computation is that, while technological progress is surely present, it is partly offset by capital misallocation.*

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- *Growing macroeconomic imbalances.*  
High saving and export-led growth do not imply trade surpluses. Investment can be equal to saving, and imports equal to exports. But, recently, saving has been running ahead of investment; equivalently exports have been running ahead of imports. The trade surplus is widening: US\$ 30b in 2004, and may be running at a yearly rate as high as US\$ 100b in 2005.

This description of the strategy China has followed so far with its successes and drawbacks, suggests a number of directions for reform to which we now turn.

### **3 Directions of reform**

Large policy swings would be unwise: Notwithstanding the imbalances that have emerged, China's growth story is an extraordinary success, and one should be careful before meddling with success. Corrections of the strategy pursued so far should come more in the form of inflexion than of drastic change. We see three main directions for reform:

- Improve the ability of individuals to insure against risk. At this stage, Chinese individuals are exposed to high levels of retirement risk, health expenditure risk, and even education risk (the probability that a child is bright and requires an expensive education).
- Reduce or reallocate investment. Investment appears to be too high in manufacturing, too low in services, especially public services. This suggests in particular higher public investment in health and education, especially aimed at rural provinces where the need is more acute.

- Allow the RMB to appreciate to reduce the trade surplus. (By implication, allow for a decline in saving relative to investment.)

Each of these three directions is desirable on its own. The question is how best to combine them. A dramatic decrease in saving, by itself, would create overheating. A large appreciation of the RMB would create a recession in the export sector, and perhaps in the economy as a whole.

In some dimensions, the three directions fit well together. The combination of a decrease in saving and an appreciation of the RMB can in principle be combined to allow a decrease in the trade surplus while maintaining internal balance.

In other dimensions, they may conflict. Too large a decrease in private saving, due to the provision of insurance, may lead to a required large appreciation of the RMB to prevent overheating, reducing the export sector too much, and curtailing the process of learning by doing. Too large an appreciation of the RMB may increase the inequality between rural and other provinces.

With this in mind, we proceed in two steps. First, we consider the motivations and the effects of each reform, discussing what it would imply for China's macroeconomic imbalances if it were adopted in isolation. Next we ask how the three reforms can best be combined.

### 3.1 Private saving

A saving rate of 43% is very high. Especially so, when one realizes that, in an economy with overlapping generations, the aggregate saving rate is the net result of saving by the young, and dissaving by the old. This implies that the saving rate of the young must be even higher than 43%. How much higher? The answer depends roughly on the growth rate and the average length of an individual's life. With a growth rate of 8-10 percent per year and a half-life of 30 years, the saving of the young in China dwarfs the dissaving of the old. This implies that the saving rate of the young is higher than 43%, but not much higher.

From a macroeconomic viewpoint, is a 43% saving rate "too high"? A useful benchmark is the "golden rule". In the standard neo-classical growth model, the "golden rule" saving rate—the saving rate that maximizes steady state consumption—is equal to the share of capital in GDP: By that standard, 43%

is probably too high. But China has certainly not reached its steady state and this can justify a higher saving rate in the transition.

How much of the saving rate can be explained by life cycle considerations and how much by other considerations?<sup>3</sup> It is useful here to start with the breakdown of saving between households, enterprises, and the government. Table 8, from Kuijs (2005), provides this breakdown for China and a few other countries. Enterprise savings accounts for almost half of China’s saving rate, but the outlier in Table 8 is clearly households’ saving.

**Table 8: Sectoral saving (percent of GDP)**

	China 2001	China 2003	Japan 2001	Korea 2001	Mexico 2001
Households	16.0	16.6	8.2	4.5	8.0
Enterprises	15.0	18.9	19.4	14.8	10.6
Government	7.5	7.0	- 2.2	11.7	2.2
National saving	38.5	42.5	25.5	31.0	20.8

*Source: Kuijs, 2005*

Why is household saving so high? Modigliani and Cao (2004) conclude that it is largely consistent with the life-cycle model (which emphasizes saving for retirement), once one takes into account the high growth rate and the one-child policy in China. High growth increases the saving of the young relative to the dissaving of the old, leading to a higher net saving rate. And the one-child policy, they argue, can account for most of the rest: A child is often an effective substitute for life cycle saving. Consequently, when strict birth control measures came into effect in the 1970s (the one-child policy) the accumulation of life cycle (tangible) assets gained in importance as a substitute for children and saving increased. While life cycle saving is surely very relevant, there is however plenty of evidence suggesting that at least part of the high saving rate reflects “precautionary” saving, the result of a number of distortions that force Chinese individuals to self-insure through asset accumulation:<sup>4</sup>

3. These issues are also explored by Chamon and Prasad (2005).

4. In a poll cited by Hongbin (2005), Chinese individuals gave the following key motivations for saving: kids’ education (35%), retirement (32%), medical care (10%), home purchase (7%), children’s wedding expenditures (6%).



- With the decline of state-owned enterprises, the public retirement system has largely broken down (triggering reform projects, not yet implemented. See Diamond (2004)). Much of the risk of retirement—in particular the risk related to the expected length of life—is now borne by individuals.<sup>5</sup>
- Beginning in the early 1990s, the provision of health care services and of education has increasingly been based on a system of fees (Table 9). Rural households appear to bear a larger share of the cost of health services than urban households (Table 10), possibly because enterprises in the city provide workers with some form of health insurance. The hypothesis that the risks born by individuals are particularly severe in the countryside is indeed consistent with the evolution of the saving rate in urban and rural areas (Table 11). Safety nets are particularly weak from migrant workers who have moved from rural to urban areas and live with temporary permits (17.7 percent of the urban population according to the 2000 Census (Bian, 2004)). Table 12 shows that their access to social insurance is much more limited than that of urban permanent residents.

**Table 9: Who pays for health care and education ?**

	Health expenditures	Out of pocket % of health spending	School fees % of ed spending
1965	4.7	16%	n.a. (0 ?)
1980	10.9	18%	n.a. (0 ?)
1991	37.7	50%	2.3%
2001	101.7	61%	12.5% (*)

(\*): 1998.

*Health expenditures: Recurrent health expenditures, yuan per capita, constant prices. Source: Kanbur and Zhang (2003)*

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5. The point here is that not only do people save for retirement, but they save a lot more than they could because they cannot insure against risks associated with uncertainty about life expectancy.

**Table 10: The allocation of health care costs in 1998 (percent of total cost)**

	Cities	Countryside
Paid by the state	16.0	1.2
Labor related	22.9	0.5
Semi-labor related	5.8	0.2
Insurance	3.3	1.4
Cooperative	4.2	6.6
Self-paid	44.1	87.4
Other	3.7	2.7

*Source: China Health Yearbook 1999 (Ministry of Health, 1999), p 410, from Kanbur and Zhang (2003)*

**Table 11. Household saving rates in urban and rural areas (percent of disposable income)**

	Urban households	Rural households
1993	18.1	16.5
2003	23.1	25.9

*Source: IWEP*

**Table 12. Access to social benefits of temporary and permanent urban residents: Five major cities, 2000 (percent of all individuals in the group)**

	Migrants	Local residents
Health insurance	12.4	67.7
Pension program	10.2	74.4
Unemployment benefits	0.8	33.3
Workplace injury insurance	14.3	25.3
Maternity leave	31.0	71.1

*Source, Gao et al., 2002*

Other factors appear to contribute to the high private saving rate, also having to do with poor financial markets:

- Saving for housing. A mortgage market exists and is rapidly expanding, but remains small. One obstacle is the poor definition of property rights: For example, banks can seize a property if the borrower defaults, but are then limited in their ability to sell it.

Saving to start firms. When the growth rate is 10% there is a good probability of running into a good business idea. If that happens, the only way to transform the idea into an investment is through one's own funds. Banks lack a credit culture and bank officers are not used to taking risks: Their first concern is likely to be that, in case the idea does not work and the company defaults, they may be accused of having been bribed.

Providing retirement and health care insurance is clearly desirable. In both cases, self-insurance is an expensive and very imperfect solution to the presence of individual risk. Any measure that allows risks to be pooled across the population will increase welfare. A similar argument holds for the development of a mortgage market, or for lending less on collateral and more on projects.

Insurance can in part be provided by the market: For this to happen, what is needed most is a set of reforms of the legal system. For instance, in the case of mortgages, foreclosure needs to be made easier, otherwise banks will not lend. In the area of health services, private insurance can go some way towards pooling and diversifying risks, but improved access to health services, especially in the countryside, can hardly come entirely from the private sector.

All such measures however have one important macroeconomic implication. They will decrease the private saving rate—equivalently increase consumption. Other things equal, this may lead to overheating, or/and a decrease in capital accumulation. This implication must be kept in mind when thinking about the overall strategy below.

### **3.2 Health services, taxes, and deficits**

Among the growth imbalances we listed earlier is the unusually small share of services, among them health services. The evidence is that, in the 1990s, health services have not increased in proportion to income per capita, and that the shortfall has been particularly pronounced in rural provinces. Indexes of health personnel and of hospital beds per capita show an absolute decline in the 1990s in the countryside (Table 13). Infant mortality in the countryside has

also deteriorated relative to cities; the ratio, which stood at 1.5 in 1980, has increased to 1.7 in 1990, and 2.1 in 1995 (Kanbur and Zhang (2003)).

**Table 13: Health care in the cities and in the countryside**

	% Change in hospital beds per 1000 people		% Change in health care personnel per 1000 people	
	Countryside	Cities	Countryside	Cities
1952-78	+1.662%	+ 220%	+72%	+176%
1978-90	- 2%	+ 24%	+16%	+22%
1990-98	-23%	+5%	-9%	0%
1998-03	n.a.	n.a.	n.a.	n.a.

*Source: Comprehensive Statistical Data and Materials on 50 Years of New China (China State Statistical Bureau, 2000) from Kanbur and Kanbur (2003)*

There are likely three factors behind inadequate health services:

- We focused on the first earlier: The lack of health insurance leads people both to self insure through saving—the effect we focused on—but also to buy less health care.

The second is income distribution. With the shift to a fee-based system, health care has become too expensive for many to afford (this is conceptually different from the lack of insurance.) In a recent survey, 34% of urban respondents and 44% of rural respondents said they did not seek health care when ill because they could not afford it. As we have seen this problem is particularly acute in rural areas and among migrant workers in urban areas.

With the privatization of TVEs and an increased focus on profit rather than social insurance, much of the health care infrastructure has not been maintained. The supply of health care is inadequate, especially in the countryside.

This suggests that reforms aimed at expanding the health service sector must focus both on demand and on supply. On the demand side, we already discussed the introduction of a health insurance system. (The experience of the Vietnam health insurance program, described in World Bank (2001) and studied by Pradhan and Wagstaff (2005), suggests that such a system will improve health while, at the same time, allowing people to save less and consume more.) Distribution

considerations suggest that health provision should have a redistributive component. On the supply side, more public spending on health, from building new hospitals and clinics, to increasing the incentives to become doctors and nurses in the countryside, is also needed.

We freely admit to not knowing enough about health care in general, and about health care in China in particular, to make more specific recommendations. We also realize that some of the arguments are relevant for other publicly provided services, such as education; again we leave a discussion of spending on education to people more competent than us. We want however to discuss the fiscal aspects of financing such expenditures, which are clearly of macroeconomic relevance. Take health care. Should increased spending on health provision by the state be financed through debt or through taxes? There are three relevant considerations here.

- The first is based on standard principles of public finance. If spending is going to benefit people in the future, it makes sense to finance it through debt rather than through taxes; in this way the stream of taxes (needed to pay the interest on the debt later on) and the stream of benefits can be better aligned. This is the principle underlying the so called “golden rule” of public finance, which implies financing consumption expenditures through taxes, and investment expenditures through debt (this holds even if the investment expenditures have a low financial return, so long as the social return is high enough). These issues have been discussed in the context of the reform of the Growth and Stability Pact in Europe (Blanchard and Giavazzi 2004); the discussion and the basic conclusion are of more general relevance.

The second is based on the need to achieve internal balance. We can think of fiscal policy, and the choice of taxes versus debt, as trying to avoid overheating and maintain macroeconomic balance. A very relevant example here is the program of electrification of the countryside that China embarked on after the Asian crisis. Electrification, just like health care today, was needed. At the same time, aggregate demand was lower, because of the large depreciations in many Asian countries, that China decided not to match. Financing electrification through deficits was therefore the appropriate policy. The situation may be different this time. We argued earlier that the provision of health insurance may lead to a decrease in private

saving, an increase in consumption. If this is the case, the argument for further decreasing saving through public dissaving is weak. Indeed, what may be called for, is a smaller rather than a larger deficit. On the other hand, an appreciation of the RMB may require an increase in demand, and thus a larger deficit. This uncertainty suggests that no hard decision should be made in advance, and that the government should stand ready to finance these expenditures mostly through taxes or mostly through debt depending on the circumstances.

The third argument is based on debt dynamics. When, as in the case of China today, the growth rate is much higher than the interest rate the Chinese government has to pay on its debt, many of the standard worries associated with debt dynamics disappear. If the growth rate were to remain permanently higher than the interest rate, a government could decrease taxes and never have to increase them again: The ratio of debt to GDP would remain positive, but would not explode. If, as is likely, the growth rate will eventually become smaller than the interest rate, the relevant implication is that larger deficits today lead only to a small increase in debt over time, and to a low debt burden in the long run. In other words, larger deficits today may require only a modest eventual increase in taxes in the future. (This is discussed more formally in the box below). In yet other words, if deficits are justified on macroeconomic grounds, China should not hesitate to use them.

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### **Box: Chinese debt dynamics**

*Debt dynamics are determined by the following relation:*

$$d_{t+1} - d_t = (r - g)d_t + x_{t+1}$$

*where  $d$  is the ratio of debt to GDP,  $r$  is the average interest rate on debt,  $g$  is the growth rate of GDP, and  $x$  is the ratio of the primary deficit (the deficit excluding interest payments) to GDP.*

*The typical configuration is one in which  $r$  is greater than  $g$ , so positive debt requires, sooner or later, a primary surplus in order to stabilize debt.*

*Sometimes however, the configuration is different and  $r$  is less than  $g$ . This is*

clearly the case of China today; in 2004, the average real cost of debt service was around 2.5%, and the growth rate was around 9%. Under this configuration, a country can run a primary deficit and still maintain a stable debt ratio. If we take  $r = 2.5\%$  and  $g = 9\%$  for example, the equation above becomes:

$$d_{t+1} = 0.935 d_t + x_{t+1}$$

If  $r$  and  $g$  did not change in the future, this would imply that, if China were to run a 2% primary deficit ratio forever (the primary deficit ratio was equal to about 1.7% in 2004), the debt ratio would asymptotically reach 30%—no matter what the initial debt level. (To see this, assume  $x = 2\%$ . Then, check that the debt converges to  $d = 2\% / (1 - 0.935) = 30.7\%$ .)

It is unlikely however, both on empirical and theoretical grounds, that China will be able to maintain a growth rate above its interest rate on debt forever. But if we think that it will be able to do it for some time, say another 10 years, a conclusion with a similar flavor obtains. A deficit of 2% for 10 years will only increase the debt to GDP ratio by about 15 percentage points, thus imposing a small burden of the debt in the future.

A similar argument applies to recapitalization of banks by replacing the bad loans they hold on their balance sheets by government bonds. It is generally agreed that making bad loans explicit and replacing them by government bonds in banks' balance sheets, eliminates overhang effects and is therefore desirable. A typical objection however is that this implies a potentially large increase in explicit government debt, and dangerous debt dynamics. It is true that eliminating bank debt overhang this way will lead to an increase in explicit (i.e. financial) government debt today. But the implied increase in debt 10 years out, and so the ultimate burden of the debt, may be small:

The stock of non-performing loans at the end of 2004 was estimated at US\$ 602 billion, or 38% of GDP. Assuming a recovery rate of 20%, recapitalizing the banks would add 30 percentage points to the debt-GDP ratio—up from 25%, the cost estimated by Dornbusch and Giavazzi in 1999. More bad loans are probably in the making. Roubini and Salter (2005) estimate the fraction of current new loans that may end up non performing and come up with a figure close to 15-25% of GDP. Adding these numbers to the current debt GDP ratio of about 33% implies that the overall financial debt ratio could rise as

high as 80-90 percent of GDP. Even in that case, and for a given path of the primary deficit at 2%, a debt ratio of 80% today would translate, under our assumptions, in a debt ratio of 55% in ten years ( $0.8 \text{ times } 0.935^{10} + .02 \text{ times } (1 - 0.935^{10}) / (1 - 0.935)$ ), a much less worrisome number.

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### 3.3 The RMB appreciation

On July 22, 2005 China stopped pegging its currency to the U.S. dollar. In the new regime, a managed float, the RMB is allowed to fluctuate inside a small band centered around a dollar parity. Inside the band the exchange rate will fluctuate responding to "supply and demand in the market" and to intervention by the PBC. The crucial element of the new regime is obviously the determination of the central parity.

The central bank says that it will announce the closing price of the U.S. dollar in the inter-bank foreign exchange market after the closing of the market on each working day, and will make it the central parity for the trading against the RMB on the following working day. The closing parity, and thus the central parity the following day, will depend on intervention. In principle, with excess demand for RMB and limited intervention, the currency could hit the top of the band each day. The regime would turn into a crawling peg with a 6% monthly revaluation. The observation that the PBC has not ruled out such an outcome gives an indication of what the final revaluation might be. This possibility by itself will put upward pressure on the RMB: The result is that the accumulation of reserves—required simply to avoid a revaluation in excess of 0.3 percent per day—might be even larger than in the fixed exchange rate regime (the data on reserve accumulation since July suggest that this has not happened so far). Eventually China might find it easier to allow the RMB to float.

How large might the appreciation be in the end? In 2004 the PBC accumulated \$200 billion in foreign exchange reserves. One half was related to trade and FDI: 50 billion from the trade surplus and 50 billion from FDI. The remaining 100 billion was largely speculative, in anticipation of revaluation: portfolio investment, remittances and repatriated profits.

Under floating, these one-way speculative flows would disappear. Under pure floating, that is with no further accumulation of reserves on the part of the



PBC, the revaluation would need to cancel the sum of the trade surplus and the FDI flows. How large this might be is impossible to tell. The elasticity of exports to the exchange rate is likely to be low; nobody really knows. The most relevant margin may be the loss of competitiveness vis-à-vis countries behind China, Pakistan, Egypt, and the Maghreb in particular. In any case a very large appreciation could not be ruled out. Using U.S. elasticities, which are likely to be larger than those relevant for China, an appreciation of at least 30% would be likely.<sup>6</sup> 20-30% is the relative price difference among Chinese goods and similar goods produced by some of China's main competitors, for instance other South-East Asian countries or the Maghreb.

To relieve the pressure on the RMB, the PBC could do two things:

First, it could remove capital controls asymmetrically, that is remove them on capital outflows but not on inflows. The bank could let Chinese investors acquire foreign assets, or announce a path for the gradual removal of capital outflows; this does not need to happen right away for it to have an effect on the exchange rate today. The extreme RMB exposure of Chinese investors suggests that portfolio diversification might significantly add to the supply of RMB, limiting the appreciation.

Would the gradual removal of capital controls create problems in the banking system? The concern is that portfolio diversification would reduce deposits at a rate faster than the speed at which banks can liquidate their loan portfolio. This risk is probably limited. The central bank has sterilized the reserve inflow by issuing sterilization bonds, and most of these bonds are held by commercial banks. So, consider the simple case where private Chinese investors diversified by buying all the reserves of the central bank and reduced their deposits with commercial banks by the same amount. In this case the effects on the balance sheet of commercial banks would cancel. On the asset side the banks would lose the equivalent of \$700 billion in sterilization bonds, and the same would happen on the liability side, through the fall in deposits.

What if Chinese private investors wanted to acquire more dollar assets than the dollar assets currently held by the PBC? A simple computation is useful here.

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6. Typical estimates for the United States imply that an appreciation of 10% decreases exports by 9% and increases import volumes by 8%. Using these numbers for China, assuming export and import ratios to GDP of 25%, and the need for a change of 5% in the ratio of the current account to GDP implies an appreciation of about 30%.

The reserves of the PBC are roughly equal to 40% of Chinese GDP. Financial wealth, measured by broad money, is equal to 180% of GDP. If Chinese investors were to hold 25% of their wealth in the form of US assets, they would want to accumulate US assets equal to 45% (180% times 25%) of GDP, so more than the PBC currently holds. In this case a credit squeeze would become a possibility. Even more serious would be the possibility that banks might be unable to recover loans fast enough since the moment they attempted to do so, they would discover that many of these loans can no longer be recovered. Some banks may become bankrupt. This suggests that liberalization of capital outflows, while necessary to relieve the pressure on the RMB, should be gradual. This could for example be done along the lines suggested by Prasad and Rajan (2005), namely the creation of a closed-end mutual fund, available to domestic investors, and invested in foreign assets. Wider liberalization could then take place after the improvement of the banking system, in particular after the creation of a "credit culture" and better screening of loans by banks.

The second way in which the PBC can limit the appreciation, at least for some time, is by continuing to accumulate reserves. There is potentially a good argument for doing so: By limiting the appreciation, reserve accumulation allows for higher exports, and potentially higher learning by doing and productivity growth. The capital loss on the accumulated reserves when the appreciation eventually takes place could in principle be smaller than the output gain from the higher productivity growth; in that case, it makes sense to accumulate further reserves, at least for some time. Whether this condition is satisfied is obviously very difficult to assess. In the box below, we offer a computation which suggests that, while some reserve accumulation may be justified, the current rate of accumulation is almost certainly too high.

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### **Reserve accumulation and learning by doing.**

- *Suppose that an appreciation of  $x\%$  would be needed to balance the current account of China.*
- *Suppose that because of capital controls, the exchange rate can be maintained at its current level, but at the cost of reserve accumulation per year equal to  $z\%$  of GDP.*

- Suppose that delaying the appreciation for one year implies larger exports, higher learning by doing, and thus higher growth for a year of  $y\%$ .

Delaying the appreciation for a year therefore has a cost, the cost of the expected capital loss on accumulated reserves, so  $x\%$  times  $z\%$  of GDP. It has a benefit, namely the higher level of output now and forever, equal to  $y\%$  of GDP. (One may instead assume that learning would have come later anyway so that, in the long run, output returns to the same value, whether or not the exchange rate appreciates this year. This would lead to a declining stream of benefits.)

In 2004, reserve accumulation was roughly equal to \$200 billion, or 12% of GDP. If we assume that the eventual appreciation will have to be of the order of, say, 30%, this implies a cost of 3.6% of GDP.

As to the benefits, the (very difficult) question is how much more growth can we expect from an undervalued exchange rate. (Unpublished) work by Hausmann and Rodrik give us a useful hint. Using panel data on countries and time, they first compute a measure of undervaluation of the exchange rate for each country and each year as the residual of a regression of the real exchange rate on the level of income per capita and the population of the country. (They find the Chinese exchange rate to be undervalued by roughly 30%). They then show that, among emerging countries, undervaluation has typically been associated with fast growth. To formalize this idea, and again using data on countries and time, they estimate the coefficient on the real exchange rate residual in a panel data regression of the growth rate on this residual and a number of other controls. The coefficient they obtain implies that a 1% undervaluation is associated with a 0.015% increase in growth.<sup>7</sup> If we interpret the relation as a causal relation from undervaluation to growth, a 30% undervaluation, as may be the case in China, implies higher growth of GDP of 0.45%.

Thus, under these assumptions, reserve accumulation equal to 3.6% of GDP for a year implies a level of output higher by 0.45% forever, or at least for many years. This implies a high social internal rate of return.

So why not continue to do it? Apart from the caveats due to the limits of the computation, and the internal (and international) tensions from an undervalued RMB, which are left out of this computation, the rate of reserve accumulation required to maintain the exchange rate is likely to increase rapidly, as Chinese

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7. We are indebted to Ricardo Hausmann for providing us with the results of these regressions.

*investors find more and more ways around capital controls. This makes the trade-off less and less appealing as time passes.*

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Turn now to the macroeconomic effects of an appreciation. They are likely to be twofold (The appendix at the end of the paper discusses both aspects more formally):

- First, to the extent that the appreciation worsens China's competitiveness, exports will decrease, and so will the export sector. In the absence of other measures, the fall in exports is unlikely to be accompanied by an increase in demand in the rest of the economy. The positive terms-of-trade effect of the revaluation (an argument used by the PBC in explaining the reasons for the new exchange rate regime) is likely to be limited. To maintain internal balance, the revaluation must be accompanied by an increase in internal demand.

This takes us back to our earlier discussion of saving. The reduction in risk and the implied decrease in saving may be justified not only on welfare grounds, as discussed earlier. They may also be justified as the right policy to accompany the revaluation.

- Second, the appreciation is likely to worsen inequalities between regions, and between skilled and unskilled workers. The reason is that China is a price taker in world agricultural markets. Given a price in dollars, the appreciation will lower the domestic currency price of agricultural products and thus real income in countryside.<sup>8</sup> Furthermore, through migration, it will put downward pressure on the wage of unskilled workers in the industrial sector: The skilled-unskilled differential will also widen.

The fall in local food prices induced by the appreciation is a transfer from farmers to urban (and rural) consumers. With equal propensities to consume, there will be no effect of the transfer on aggregate demand. Propensities to consume may be different however. If it is higher in the countryside than in the cities, the fall in rural incomes (with an official

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8. Two examples from the past: In the inter-war period, when Italy returned to the gold standard revaluing the Lira by 50%, the result was a deep recession in the countryside. Agricultural prices fell notwithstanding the attempt to isolate the Italian market through a tax on imported wheat. Similarly—as Keynes vividly describes in his *Essays on Persuasion*—the return to gold in the UK destroyed the coal industry.

population count of 800 million in the countryside) will have an independent depressing effect on domestic demand. This reinforces the first argument above.

Even if there is no effect on aggregate demand from the transfer, increasing inequality is undesirable. This takes us back to our discussion of inequalities earlier. The provision of health care, or measures aimed especially at rural provinces such as the elimination of the poll tax, are justified on welfare grounds, whether or not the RMB is revalued. But they are even more justified in the face of the revaluation induced change in income distribution.

Are there other ways to reduce manufacturing exports while avoiding the adverse effect of an appreciation on farm income and inequality? In principle, yes, and these should be explored. For example, the introduction of a pollution tax and a decrease in subsidies to FDI, would limit the extent of currency appreciation needed to reduce the incentive to invest in the export sector. (Some have suggested the use of an export tax, which would potentially limit the fall in agricultural prices. We are skeptical that such an export tax can be implemented without major distortions in China today.)

#### **4 A tentative package**

Our discussion suggests the following package.

- Eliminate some of the imperfections behind the high precautionary saving rate. Measures here range from the design of a more robust retirement system, to the provision of health insurance, to the development of private insurance, to better property rights leading banks to lend less on collateral and more on projects.

These measures will increase welfare directly, but also decrease saving in the process.

Let the RMB appreciate, so as to reallocate activity away from the export sector. The announced gradual removal of controls on capital outflows and of tax breaks on FDI's would limit the upward pressure on the RMB. Eventually, China should consider replacing the exchange rate rule announced in July with a simple clean float, since the new rule is more likely than not to induce an acceleration of capital inflows.

Other tools can help here. A pollution tax, for instance, would reduce the incentive to invest in the export sector without negatively affecting rural incomes. The larger the pollution tax, the smaller the required appreciation for a given reallocation, and the smaller the effect on rural/urban inequality.

Increase the public provision of health and other public services. Do so in such a way that these are especially targeted to the countryside, all the more so since the appreciation which will redistribute income from rural to urban areas. Avoiding that the funds transferred from the center to the rural provinces disappear through corruption is obviously a first order priority.

The three ingredients, however, need to be carefully balanced:

- Too much reduction in individual risk would lead to a large drop in saving. To avoid overheating this would require a large appreciation. Too large an appreciation would increase inequalities: regional (price of agricultural goods) and skill (the implied wage in export sector). It would also slow down the process of learning by doing in the export sector, reducing TFP growth.

So, how to make sure that the transition does not run into a recession, or into overheating, or into too sharp a reduction in the role of exports? The right instrument is probably fiscal policy, in particular the degree of tax versus debt financing of the new health care expenditure. Given the current growth and interest rate, debt dynamics allow for potentially large primary deficits, at little cost in terms of the ultimate burden of debt.

Could monetary policy help as well? In principle, with capital controls, an increase in interest rates would help slow down domestic demand if needed. But capital controls have large leakages and may not prevent an upward pressure on the exchange rate.

Two final remarks: If successful, such a strategy is likely to *reduce* the (measured) growth rate of China. This is because productivity growth in services (at least measured productivity growth) is lower than in manufacturing. Lower growth would not however mean lower welfare. Think of the extreme case of a country fully specialized in high-tech manufacturing, but with no health care.

The growth rate would be even higher than it is today; welfare would nevertheless be quite low. Nor does lower output growth imply lower employment growth. If productivity growth is lower by  $x\%$ , then output growth lower by  $x\%$  is compatible with the same employment growth rate as before. The notion of a given “employment elasticity of growth,” invariant to the composition of output, used in some analyses of Chinese growth and discussions of the appropriate growth rate for China, makes no sense and should be discarded.

## Appendix. RMB appreciation, reallocation and income distribution

In this appendix, we look at the general equilibrium effects of the RMB appreciation. We proceed in two steps. First, we build a standard model of tradables/non-tradables. Then, we introduce two Chinese specificities: The importance of the agricultural sector, and labor mobility between agriculture and non agriculture, leading to partial arbitrage between farm income and wages.

### Non-tradables/tradables, home and foreign goods

Think of Chinese consumers/firms as buying three types of goods:

- Non-tradables, denoted  $N$ , with price  $P_N$  in terms of domestic currency;
- Home tradables (tradables produced at home, and sold either domestically or abroad as exports), denoted  $H$ , with price  $P_H$ ;
- Foreign tradables (tradables produced abroad, sold either abroad or in China as imports), denoted  $F$ , with price  $P_F$ . Let  $E$  be the exchange rate, defined as the price of domestic currency in terms of foreign currency (so an increase in  $E$  is an appreciation). Given the world price  $P_F^*$ ,  $P_F = P_F^*/E$ .

### Internal balance

Write the supply and demand functions for the two goods produced at home, non-tradables and home tradables, as:

$$Y_N(P_N/W) = D_N(X) \tag{1}$$

$$Y_H(P_H/W) = D_H(P_H/P_F, X) + D_H^*(P_H/P_F) \tag{2}$$

The supply of non-tradables is an increasing function of the relevant product wage,  $P_N/W$ . The demand for non-tradables is taken to be just a function of real domestic expenditure,  $X$ , a convenient simplification for expository purposes.

The supply of home tradables is an increasing function of the relevant product wage,  $P_H/W$ . The demand for home tradables is the sum of domestic and foreign demand. Domestic demand is a function of real domestic expenditure,



$X$ , and the terms of trade,  $P_H/P_F$ . Foreign demand is a function of real foreign expenditure, omitted for simplicity, and the terms of trade.

Assume that the labor force is fixed. Labor market equilibrium gives us another relation between the two product wages:

$$L_N(P_N/W) + L_H(P_H/W) = \bar{L}$$

Together, these equations give us a relation between domestic expenditure and the terms of trade required for internal balance. Consider for example an increase in domestic expenditure,  $X$ . This increase leads to an increase in the demand for non-tradables, requiring an increase in the price of non-tradables relative to the wage. From labor market equilibrium, this implies a decrease in the price of home tradables relative to the wage. From equilibrium in the home tradables market, the decrease in supply must be matched by a decrease in demand, and thus an increase in the relative price of home versus foreign tradables, an increase in the terms of trade.

This *internal balance relation* is drawn as the upward sloping locus in Figure 1. In short, an increase in expenditure requires a shift in production towards non-tradables away from home tradables; this is achieved by decreasing demand for home tradables, by making home tradables more expensive relative to foreign tradables, thus through an increase in the terms of trade.

### **External balance**

Assume the domestic demand for foreign tradables to be a function of domestic expenditure, and of the terms of trade:

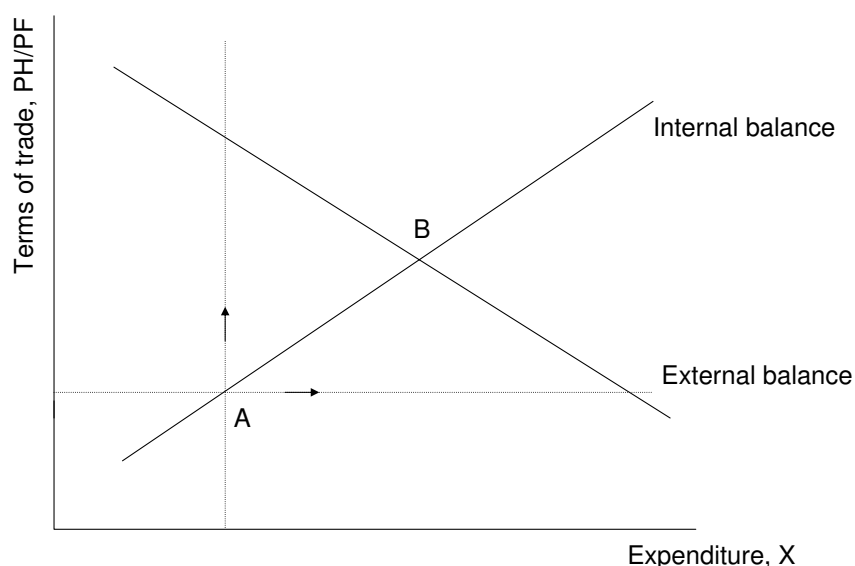
$$D_F = D_F(P_H/P_F, X)$$

The trade balance, expressed in terms of home goods, is thus given by:

$$TB = D_H^*(P_H/P_F) - (P_F/P_H)D_F(P_H/P_F, X)$$

This equation gives us the relation between domestic expenditure and the terms of trade required for external balance. An increase in domestic expenditure leads

Figure 1.



to an increase in the demand for foreign tradables. If the trade balance is to remain equal to zero, this increase must be offset by a decrease in the relative price of home tradables, a decrease in the terms of trade (this assumes that the Marshall Lerner condition is satisfied). This external balance relation is drawn as the downward sloping locus in Figure 1.

### Adjustment

A country can be at any point in Figure 1, depending on its level of expenditure and terms of trade. Different points correspond to different trade positions and activity levels. China can be thought to be at a point such as *A*. The economy is roughly at full employment (on the internal balance locus), but China is running a trade surplus (it is below the external balance locus).

Consider measures to decrease saving. By themselves, these will increase domestic expenditure, and shift the economy to the right from point *A*. They will reduce the trade surplus (the economy is closer to the external balance locus) but they will lead to excess demand in the labor market, and overheating.

Consider instead measures to reduce the trade surplus, such as an appreciation of the RMB, leading to an increase in  $P_H/P_F = EP_H/P_F^*$ . By itself, the appreciation will increase the terms of trade, moving the economy up from point  $A$ . The trade surplus will be reduced, but at the cost of excess supply in the goods market, and the risk of a recession.

The right combination is obvious, a decrease in saving and an appreciation. Together, these can take the economy from  $A$  to  $B$ , maintaining internal balance while achieving external balance.

So far, the analysis has been standard. We now introduce two aspects more specific to the Chinese economy, which turn out to be important.

### **Agriculture, income distribution, and appreciation**

Agricultural prices in China are closely linked to world prices. Using data from 1990 on, the correlation between the price of rice in China (expressed in U.S. dollars) and the price of rice in the United States is 0.66; the corresponding correlation for the price of wheat is 0.57. Put another way (and assuming similar standard deviations for world and Chinese prices), a 10% appreciation of the RMB relative to the dollar implies a fall in agricultural prices on Chinese markets of approximately 6%.

Agricultural prices are in turn the main determinant of rural incomes. Using data from 1991 on, the correlation between the change in wheat prices and the growth rate in rural incomes is 0.64.

With these facts in mind, we introduce a second tradable good, agriculture, with price  $P_A$  in terms of domestic currency. Assume that China is a price taker in world agricultural markets, so  $P_A = P_A^*/E$ : An appreciation leads to a decrease in the domestic currency price of agricultural goods.

### **Internal balance**

Assume that the equations for non-tradable and home tradable goods are unchanged (this is again a simplification, as one might expect the relative price of agricultural goods to affect them).

Solving equation (1) for  $P_N/W$  gives:

$$P_N/W = f(X), \quad f' > 0 \quad (3)$$

An increase in expenditure implies an increase in the demand for nontradable goods, and thus requires an increase in supply, so an increase in the price—equivalently a decrease in the product wage.

Solving equation (2) for  $P_H/W$  gives:

$$P_H/W = g(X, P_H/P_F), \quad g'_X > 0, \quad g'_t < 0 \quad (4)$$

where  $g'_t$  is the derivative of  $g$  with respect to the terms of trade. An increase in expenditure implies an increase in the demand for home tradables, and thus requires an increase in supply, so an increase in the price—equivalently, a decrease in the product wage. An increase in the terms of trade implies a decrease in demand and requires a decrease in supply, so a decrease in the price—equivalently, an increase in the product wage.

Turn now to the labor market. People can work either in the non-tradable sector, in the home tradable sector, or in agriculture. Assume a common labor market and thus a common wage in the non-tradable and tradable non agricultural sectors. And assume that the supply of labor to that labor market is an increasing function of the ratio of the wage to agricultural income, which we shall take to be proportional to the price of agricultural goods:

$$L_N(P_N/W) + L_H(P_H/W) = L(W/P_A)$$

Rewrite  $W/P_A$  as:

$$W/P_A = (W/P_H)(P_H/P_F)(P_F^*/P_A^*)$$

and replace in the labor market equilibrium condition to get:

$$L_N(P_N/W) + L_H(P_H/W) = L((W/P_H)(P_H/P_F)(P_F^*/P_A^*))$$

Combine the two equations characterizing goods market equilibrium, equations (3) and (4) with the labor market condition above to get the internal balance

relation:

$$L_N(f(X)) + L_H(g(X, P_H/P_F)) = L((1/g(X, P_H/P_F))(P_H/P_F)(P_F^*/P_A^*))$$

This gives us again a relation between expenditure,  $X$ , and the terms of trade  $P_H/P_F$ :

- An increase in  $X$  increases both  $P_N/W$  and  $P_H/W$ , increasing labor demand. It decreases  $W/P_H$ , decreasing labor supply. The result is an excess demand for labor.
- An increase in  $P_H/P_F$  decreases the demand for home tradables, decreasing  $P_H/W$ , and decreasing labor demand. It also leads to an increase in labor supply, both directly and indirectly (through  $W/P_H$ ). The result is an excess supply of labor.

Internal balance delivers therefore a positive relation between  $X$  and  $P_H/P_F$ . The slope of the relation is given by:

$$\frac{d(P_H/P_F)}{dX} = \frac{L'_N f' + L'_H g'_X + (L'/g^2)g'_X}{-L'_H g'_t - (L'/g^2)g'_t + L'/g} > 0$$

The internal balance locus is still unambiguously upward sloping. The main difference is that an increase in the terms of trade now leads to a positive labor supply effect: The price of agricultural goods decreases, making it more attractive to work outside agriculture.

To see this, consider the extreme case of perfect labor mobility between agriculture and the rest of the economy, so  $L' = \infty$  and  $W/P_A$  remains constant. Recall that we can rewrite  $W/P_A$  as:

$$W/P_A = (W/P_H)(P_H/P_F)(P_F^*/P_A^*)$$

so constancy of  $W/P_A$  implies that the product wage in home tradables vary inversely with the terms of trade. The higher the terms of trade, the lower the product wage:

$$W/P_H = \text{constant} \frac{1}{P_H/P_F}$$

Now return to the equilibrium condition for home tradables, equation (2). An increase in the terms of trade,  $P_H/P_F$ , decreases demand for home tradables as before. But now, we know that it decreases the product wage  $W/P_H$ , leading to

an increase in supply. So the supply of home tradables now goes up. A (larger than before) increase in domestic expenditure  $X$  is needed to maintain market equilibrium; the internal balance locus is upward sloping. Given  $X$ , equilibrium in the market for non-tradables determines in turn  $P_N/W$ ; the increase in  $X$  implies a decrease in  $W/P_N$ .

So, as we move up the internal demand locus, an important implication is that the wage decreases in terms of  $P_H$  and in terms of  $P_N$ . As, by assumption (perfect mobility), it does not change in terms of  $P_A$  and  $P_F$  ( $P_A$  and  $P_F$  move together with the exchange rate when there is an appreciation), and given that the price of the consumption basket depends on all four prices, the real consumption wage must decrease.

### **External balance**

The derivation of the *external balance relation*, and the need for both a decrease in  $X$  and an increase  $P_H/P_F$  to achieve internal and external balance, is basically unchanged (except for the presence of agricultural exports in the trade balance relation).

### **Implications**

The important conclusion from this extension is the following:

Relative to the case we considered in the previous section, an appreciation leads to a shift from agriculture to the other sectors, to a decrease in the real wage, and a decrease in real farm income. In other words, an appreciation worsens income distribution, both across regions (agriculture, non agriculture), and across individuals (the wages of the unskilled workers, who are the relevant group thinking about moving out of agriculture, are likely to decrease).

There may be other implications as well. After proper use of expenditure and appreciation to decrease the trade surplus while maintaining internal balance, both the non tradable sector and the home tradable sectors may actually be larger—at the expense of the agricultural sector. This comes again from the labor supply effect, and the potential migration flow from the countryside.

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