HARVARD | BUSINESS | SCHOOL

The End of Chimerica

Niall Ferguson
Moritz Schularick

Working Paper

10-037

Copyright © 2009 by Niall Ferguson and Moritz Schularick

Working papers are in draft form. This working paper is distributed for purposes of comment and discussion only. It may not be reproduced without permission of the copyright holder. Copies of working papers are available from the author.

The End of Chimerica

Niall Ferguson
Harvard University
nferguson@hbs.edu

Moritz Schularick
Freie Universität Berlin
moritz.schularick@fu-berlin.de

October 2009

Abstract

For the better part of the past decade, the world economy has been dominated by a world economic order that combined Chinese export-led development with US over-consumption. The financial crisis of 2007-2009 likely marks the beginning of the end of the Chimerican relationship. In this paper we look at this era as economic historians, trying to set events in a longer-term perspective. In some ways China's economic model in the decade 1998-2007 was similar to the one adopted by West Germany and Japan after World War II. Trade surpluses with the U.S. played a major role in propelling growth. But there were two key differences. First, the scale of Chinese currency intervention was without precedent, as were the resulting distortions of the world economy. Second, the Chinese have so far resisted the kind of currency appreciation to which West Germany and Japan consented. We conclude that Chimerica cannot persist for much longer in its present form. As in the 1970s, sizeable changes in exchange rates are needed to rebalance the world economy. A continuation of Chimerica at a time of dollar devaluation would give rise to new and dangerous distortions in the global economy.

For the better part of the past decade the world economy has been dominated by a unique geo-economic constellation that we have called “Chimerica”: a world economic order that combined Chinese export-led development with US over-consumption on the basis of a financial marriage between the world's sole superpower and its most likely future rival (Ferguson and Schularick, 2007). For China, the key attraction of this marriage was its potential to propel the economy forward by means of export-led growth. Thanks to the Chimerican symbiosis, China was able to quadruple its GDP since 2000, raise exports by a factor of five, import western technology and create tens of millions of manufacturing jobs for the rural poor. For America, Chimerica meant being able to consume more, save less and still maintain low interest rates and a stable rate of investment. Over-consumption meant that between 2000 and 2008 the United States outspent its national income by a cumulative 45 percent, i.e. total U.S. spending over the period was 45 per cent higher than total income (Reisen, 2009). Purchases of goods from China in excess of income accounted for about a third of over-consumption.

For a time, it seemed like a marriage made in heaven. Chimerica accounted for around 13 per cent of the world’s land surface, a quarter of its population, more than a third of its gross domestic product, and around two fifths of global economic growth in the past ten years. It also seemed like a marriage with positive externalities for the rest of the world. Global trade boomed and nearly all asset prices surged. Yet, like many another marriage between a saver and a spender, Chimerica was not destined to last. We believe the financial and economic crisis of 2007-9 has put the marriage on the rocks. The reduction of the imbalance between the United States and China—in short, the dissolution of Chimerica—is now indispensable if equilibrium is to be restored to the world economy.

In this paper, we consider the much-discussed problem of global imbalances as economic historians, trying to set events in a longer-term perspective. We argue that China's economic ascent came about as a result of a strategy of export-led growth following the earlier examples of West Germany and Japan after World War II. However, a key difference was the sheer scale of Chinese currency intervention and the corresponding reserve accumulation. The resulting distortions for the world economy were also far greater than anything seen in the 1950s and 1960s. In the presence of highly

integrated and poorly regulated financial markets, this massive reserve accumulation sparked a debt-fuelled asset bubble in the West, again unlike anything seen in the post-war decades Taken together, these differences render comparisons with the Bretton Woods system of very limited use (Dooley et al., 2003).

We believe that the imbalances of the past decade were to a large degree a function of exchange rate undervaluation and will not be resolved automatically without major exchange rate adjustments. The historical record has shown time and again that policies of real exchange rate undervaluation can be sustained for a long time without generating the inflationary pressures predicted in economic theory. Indeed, economic historians have often seen real exchange rate policies as important factors in explaining growth performance, in particular in the postwar catching-up process in Europe (Eichengreen, 2007). Cheap relative production costs supported the profitability and hence investment in manufacturing industries, while surplus labor or organized wage restraint avoided a loss of competitiveness. Thus we do not agree that Chinese surpluses can be explained simply in terms of household savings behavior. We see the Chimerican world as the result of a policy of intervention in foreign exchange markets that served two goals: to promote export-led industrialization and to build a cushion against future financial crises. Due to the pervasive role of the state in China's financial sector, the effectiveness of capital controls and the large supply of surplus labor, a policy of real exchange rate undervaluation and reserve accumulation was not automatically corrected by inflation in the way that some economic models predict. Growing real exchange rate undervaluation can account for many of the striking features of China's recent growth spurt that are otherwise hard to reconcile: a sharp increase in domestic investment, which was accompanied by an even stronger rise in national savings. The savings surge was driven by corporate profits, not by households, and was especially pronounced in exchange-rate sensitive manufacturing industries.

Nor do we think the precipitous decline of the U.S. savings rate and the widening of the current account deficit were simply consequences of behavioral changes by the American public. Government policies on the other side of the Pacific were also partly responsible for the build-up of the imbalances. The Federal Reserve mistakenly turned a blind eye to the asset bubble being inflated by excessive financial and household leverage

and the distortion of interest rates by Chimerica. The Congress was much too cavalier in promoting home ownership regardless of households' ability to service their mortgages. The Treasury and other responsible bodies underestimated the systemic risks created by financial engineering and particularly by the explosive growth of the over-the-counter derivatives market.

The financial crisis of 2007-2009 marks the beginning of the end of the Chimerican relationship. First, the Chinese authorities understand that heavily indebted American consumers cannot be relied upon to return as buyers of Chinese goods on the scale of the period up to 2007. Second, the Chinese dislike their exposure to the U.S. dollar in the form of close to two trillions of USD-denominated reserve assets. But the temptations to continue business as usual are also great on both sides. In order to stimulate their ailing export industries, the Chinese authorities seem resolved to carry on pegging their currency to the dollar. American policy makers seem equally willing to prolong America's addiction to cheap money as long as the economy is in precarious state.

This paper argues that the end of Chimerica is desirable, though the divorce needs to be amicable and its costs kept down. In the light of our analysis, currency adjustments must become a top priority in the international political debate. The world economy's key structural imbalance is that the second biggest economy in the world has pegged its currency to that of the largest economy at a strongly undervalued exchange rate. In the depressed conditions caused by the financial crisis, this peg poses a double threat. First, it limits U.S. recovery by overvaluing the dollar in key Asian markets. Secondly, as the dollar weakens against other developed world currencies—notably the euro and the yen—the burden of adjustment falls disproportionately on Europe and Japan, since dollar depreciation translates automatically into renminbi depreciation, through the action of the peg. This is a recipe for protectionist responses and new distortions.

Historically, big adjustments in relative production costs and income levels have generally come about as exchange rate adjustments. Between 1960 and 1978, for example, the deutsche mark appreciated cumulatively by almost 60 per cent against the dollar, while the Japanese yen appreciated by almost 50 per cent. The lesson from history is that exporters can live with substantial exchange rate revaluations when major gains in

productivity are being achieved. The world—and particularly China—should prepare for similar adjustments if it is to draw the right conclusions from the current financial crisis.

I. Chimerica and the crisis

China's integration into the world economy was by far the most important development of the economic history of the past decade. In the 1990s Zhu Rongji and his right-hand man Wen Jiabao embraced foreign trade and foreign direct investment as cornerstones of a new Chinese development strategy (Bernstetter and Lardy, 2002). They convinced other members of the leadership in Beijing to embark on a strategy of export-led growth following the examples of its East Asian neighbors, Japan and Korea, but also imitating the policies adopted by many European economies under the post-war Bretton Woods system (Dooley et al., 2003; Eichengreen, 2007). Following substantial renminbi devaluation in 1994 and the opening up of the economy to FDI, the strategy quickly bore fruit as multinational companies started to relocate production to China. The Chinese export machine began to take off rapidly after WTO accession in 2001, generating higher and higher trade surpluses. Exports in 2000 were in the range of $250 billion, but climbed to $1.3 trillion in 2008. China's current account surplus in 2001 was a mere $17 billion. By the end of 2008, it was approaching $400 billion.

As exports expanded, the authorities in Beijing consistently bought dollars to avoid appreciation of their currency. China's currency interventions served two goals: first, to promote export competitiveness, since export industries provided rapid productivity gains as well as new jobs and income; second, to build up reserves as a cushion against the risks associated with growing economic and financial integration, painfully illustrated by the experience of other countries in the 1997-8 Asian Crisis (Feldstein, 1999; Obstfeld et al., 2009). For political reasons, the Communist Party leadership in Beijing feared financial instability even more than other governments and was unwilling to subject itself to the vagaries of international capital markets.

The result of sustained currency intervention was a vast accumulation of dollar-denominated securities in the reserves of the People’s Bank of China and the State

Agency for Foreign Exchange (SAFE). Already by 2000 China had currency reserves of $165 billion, slightly above 10 per cent of GDP. In 2009 currency reserves reached $2.3 trillion, equivalent to more than 50 per cent of China's annual output (Setser and Pandey, 2009). As we and others have argued, such persistent currency intervention caused a growing distortion in the global cost of capital: the real economic shock of China's integration into the world economy should have led to a lower capital-labor ratio and hence higher real interest rates (Ferguson and Schularick, 2007). But global interest rates—both long-term and short-term—continued to fall.

The accumulation of large war chests of foreign reserves through currency intervention opened up a Pandora's box of financial distortions. Ben Bernanke argued that a “glut” of savings from emerging markets was a key factor in the decline of U.S. and global real-long term interest rates, despite the parallel fall in U.S. savings and the fact that the U.S. deficit manifested itself before the Chinese surplus. Lower interest rates in turn enabled American households to increase consumption levels and worsened the imbalance between savings and investment. And, because foreign savings were predominantly channeled through government (or central bank) hands into safe assets such as Treasuries, private investors turned elsewhere to look for higher yields. This led to a more general re-pricing of financial risk, which in turn incentivized financial engineers to develop new financial products such as securitized debt instruments.[1]

This is not to say that reserve accumulation was the only cause for the current crisis. The financial disaster that began in 2007 had multiple causes: regulation built on the idea of the efficiency of financial markets; incentives for bankers that encouraged them to focus on short-term profits and stock market performance; a Federal Reserve policy of ignoring asset bubbles; and, last but not least, the willingness of Anglo-Saxon households to turn themselves into highly leveraged, unhedged investment vehicles that speculated on real estate. Beijing cannot be blamed for the reckless lending and borrowing engaged in by Western financial institutions. Yet had it not been for the Chinese willingness to fund America’s consumption and real estate speculation habit, long-term interest rates in the United States would almost certainly have been substantially higher, acting as a circuit breaker for the housing bubble. It was not

[1] Economic Report of the President (2009); see also Hunt (2008).

"financial terror" that brought Chimerica to an abrupt end, as some commentators had feared (reference to Summers here?). The main threat, as it turned out, was the distortion of global interest rates and the complacency it generated. Bankrolled by China, the U.S. economy overdosed on debt.

With the benefit of hindsight, it is easy to argue that a world order built on net capital flows from China to America was bound to end in tears. (That was why our term "Chimerica" was always intended as a play on the word "chimera".) In the past decade capital was flowing in large quantities on a net basis to an economy that presumably had a lower marginal productivity of capital than the lender economy. Capital flows that were not driven by higher rates of return on investment financed a boom in consumption and a decade of household dis-saving. Investment spending in the U.S. did not increase in the past decade and capital inflows merely substituted for household savings.

II. Export-led growth and reserve accumulation: a historical perspective

An export-centered growth strategy coupled with currency intervention and reserve accumulation is nothing new. After all, Western Europe and Japan as well as South Korea and Taiwan all successfully pursued similar strategies. In all cases, productivity gains coupled with wage restraint led to the rapid development of the manufacturing sector and sustained export growth. Rising corporate profits financed rising investment, which in turn supported manufacturing capacity and productivity (Eichengreen, 2007). For some commentators, the resemblance between these past growth strategies and modern China's was so close that it was legitimate to refer to "Bretton-Woods II" (Dooley et al., 2003).

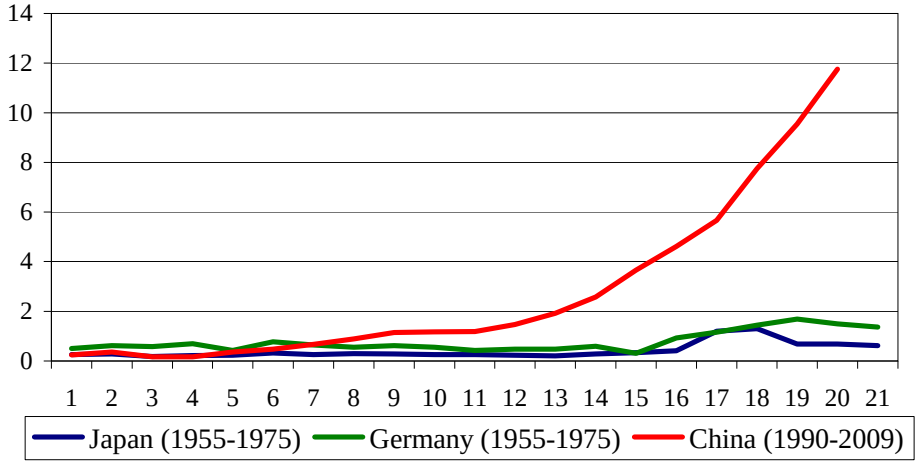
It is therefore illuminating to compare China with West Germany and Japan during their phase of rapid catching-up. At first sight, the analogy is close. In terms of gross domestic product measured in current dollars, both West Germany and Japan in the 1960s were about 10-15 per cent of size of the United States. China's economy in the year 2000 was also about 12 per cent of the size of the U.S. economy (though it is much bigger on the basis of purchasing power parity). All three countries owed much of their rapid growth to manufacturing, albeit with very different specializations. However, there

the resemblances end. Figures 1 and 2 show the amount of dollar-denominated reserves accumulated by West Germany and Japan from the 1950s to the 1970s and by China since 1990. In the first chart we scale the stock of dollar reserves by U.S. GDP to show the relative size and impact of currency interventions on the American economy.[2] The second chart displays the accumulated reserve stocks in percentages of national GDP.

The charts demonstrate how outsized China's reserve accumulation has been compared with previous periods of export-led growth. At the height of post-war growth in the 1960s, West Germany and Japan grew their dollar reserves basically in line with U.S. GDP, keeping the ratio stable at about 1 per cent before moving slightly higher in the early 1970s when capital flows and valuation gains led to an increase. On a yearly basis, reserve accumulation was about 1 per cent of GDP on average in Germany, and not even 0.5 per cent in Japan. By contrast, a dramatic shift in Chinese reserve accumulation occurred in the early 2000s. Starting at a level of dollar reserves equivalent to about 1 per cent of US GDP in 2000, China's reserves reached 5 per cent of U.S. GDP in 2005, rising to 8 per cent in 2007 and finally reaching about 10 per cent in 2008. At the end of 2009, China's USD reserves are likely to be equivalent to 12 per cent of U.S. GDP, compared to about 1 per cent a decade ago. The picture is similar if we scale reserve assets by national GDP. Both Germany and Japan during their periods of export-led growth kept reserve stocks relatively stable to their GDP at around 5 per cent. From 1992 on, China’s reserves rose from 5 per cent to above 50 per cent of national GDP. Annual average net accumulation over the past decade stands at 7.5 per cent of GDP.

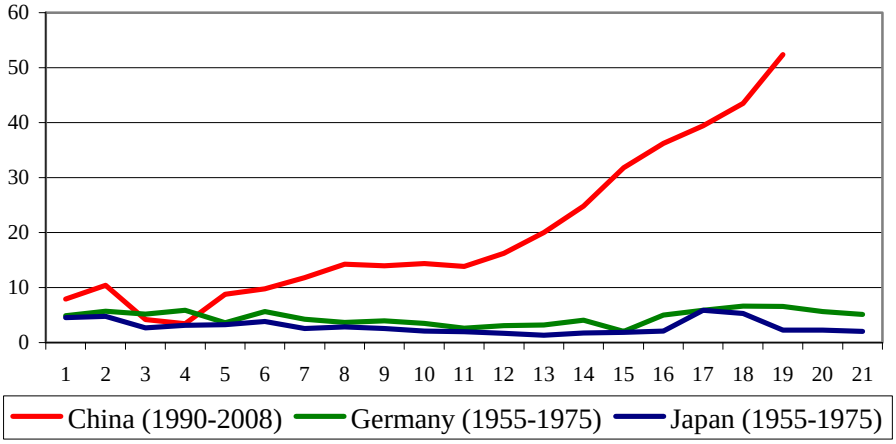
[2] In China's case we assumed 70 per cent of reserves are held in dollars: for Germany and Japan we assumed all reserves were held in dollars, certainly a generous assumption in this context.

Fig.1: Foreign currency reserves, per cent of US GDP



Source: IFS

Fig. 2: Foreign currency reserves, per cent of own GDP



Source: IFS

What accounts for the unprecedented amount of reserve accumulation in China? In table 1 we show current account, capital account and reserve account flows by country and year, contrasting the 1955-1975 period for Germany and Japan with the past two decades for China. First, China's reserve accumulation was mainly driven by the trade account surpluses. These in turn are far higher than anything seen by either Germany or Japan. Second, China had much higher capital inflows, a reflection of a higher degree of financial integration today than under the Bretton Woods system and more outsourcing of production. Clearly, then, the comparison with Bretton Woods is somewhat misleading.

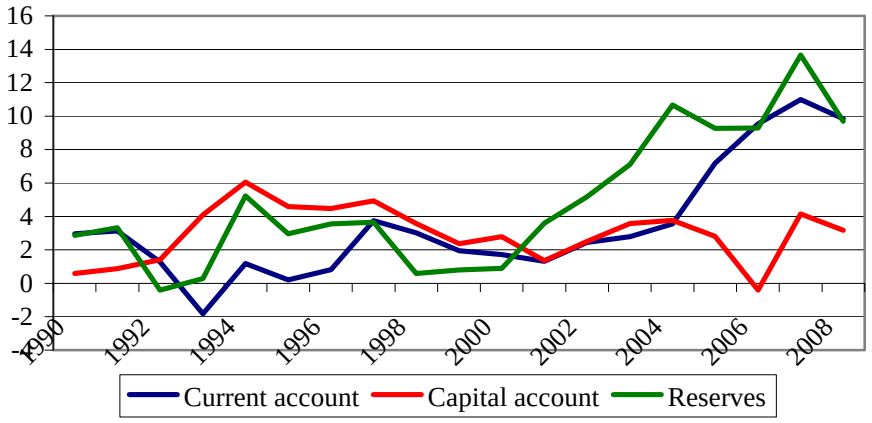
Figure 3 makes clear that despite high capital inflows, Chinese reserve accumulation has mainly been a function of a massive trade surpluses which the authorities prevented from translating into a stronger currency by continued market interventions. This time really *was* different.

Table 1: Current account, capital account and reserve growth, per cent of GDP

	Germany, 1955-1975			**Japan, 1955-1975**				**China, 1990-2008**		
	Current account	**Capital account**	**Reserve increase**	**Current account**	**Capital account**	**Reserve increase**		**Current account**	**Capital account**	**Reserve increase**
1955	1.24	-0.35	1.02	0.98	0.34	0.13	*1990*	2.97	0.60	2.86
1956	2.24	-0.08	2.52	-0.13	0.09	0.66	*1991*	3.13	0.87	3.32
1957	2.73	-1.23	2.37	-2.06	0.38	-1.38	*1992*	1.28	1.42	-0.41
1958	2.59	-1.01	1.49	0.82	0.29	1.05	*1993*	-1.81	4.08	0.28
1959	1.66	-2.56	-0.68	0.99	-0.75	1.26	*1994*	1.19	6.06	5.23
1960	1.58	0.42	2.65	0.32	-0.16	1.13	*1995*	0.21	4.58	2.97
1961	0.96	-1.51	-0.69	-1.83	0.02	-0.63	*1996*	0.81	4.46	3.55
1962	-0.44	-0.17	-0.24	-0.08	0.46	0.58	*1997*	3.75	4.94	3.64
1963	0.26	0.16	0.72	-1.12	0.82	0.05	*1998*	3.01	3.58	0.60
1964	0.12	-0.32	0.10	-0.58	0.41	0.15	*1999*	1.95	2.38	0.80
1965	-1.36	0.47	-0.28	1.02	-0.52	0.12	*2000*	1.71	2.79	0.89
1966	0.10	-0.12	0.40	1.18	-0.82	-0.03	*2001*	1.31	1.36	3.58
1967	2.02	-2.40	-0.03	-0.15	-0.25	-0.06	*2002*	2.44	2.51	5.17
1968	2.22	-1.15	1.31	0.71	-0.02	0.60	*2003*	2.80	3.57	7.10
1969	1.25	-3.13	-2.40	1.23	0.01	0.35	*2004*	3.55	3.77	10.67
1970	0.45	2.14	3.21	0.97	-0.43	0.44	*2005*	7.19	2.81	9.27
1971	0.39	1.36	1.40	2.52	0.59	4.71	*2006*	9.53	-0.40	9.29
1972	0.29	1.41	1.78	2.17	-0.83	1.03	*2007*	10.99	4.14	13.65
1973	1.21	1.34	1.70	-0.03	-1.77	-1.48	*2008*	9.85	3.17	9.68
1974	2.42	-0.61	-0.89	-1.02	-0.46	0.28				
1975	1.10	0.00	0.22	-0.14	-0.28	-0.14				
Mean	*1.10*	*-0.35*	*0.75*	*0.27*	*-0.14*	*0.42*		*3.47*	*2.98*	*4.85*

Sources: Bundesbank, Statistics Bureau Japan, IFS.

Fig. 3: Current account, capital account, reserve growth in China 1990-2008, per cent of GDP



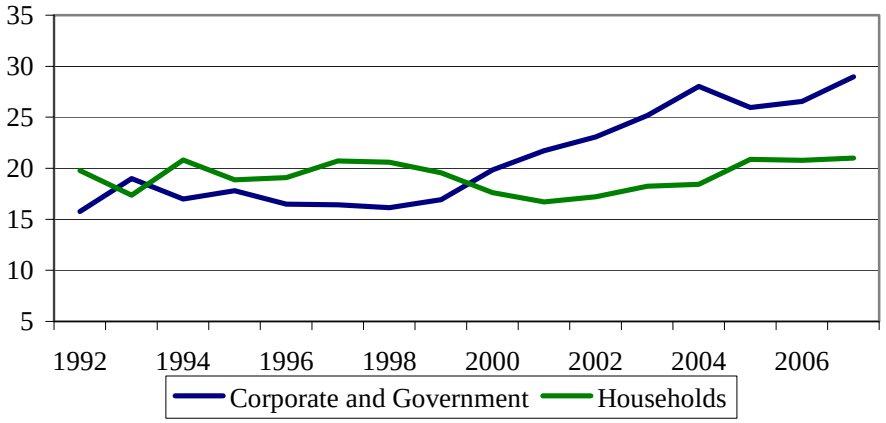
Source: IFS

Given the scale of Chinese currency interventions, a natural question to ask is how the authorities were able to maintain internal equilibrium. Economic historians are familiar with the Bundesbank's fight for internal price stability in the face of capital inflows and current account surpluses under the Bretton Woods regime (Emminger, 1977; Holtfrerich, 1998). These problems seem negligible by comparison with the Chinese case. In a standard model, exchange rate intervention should lead to monetary expansion, which in turn drives up domestic prices, nullifying the real effect of intervention (McKinnon, 2006). China's financial system, however, is owned and managed by the government. Capital controls are in place for most non-FDI types of flows and give monetary policy considerable room for maneuver. Sterilization and bank lending policies are dealt with by decree, so that the government can force banks to buy trillions of low-yielding renminbi sterilization bonds or alter their reserve ratios. Deposit and lending rates are also set by the government. This has allowed China to intervene in the currency market, while retaining control over domestic monetary aggregates. Reserve accumulation has not translated into runaway growth of monetary aggregates (at least not until the unprecedented loosening in financial conditions that took place in the first half of 2009).

III. The exchange rate and the savings glut

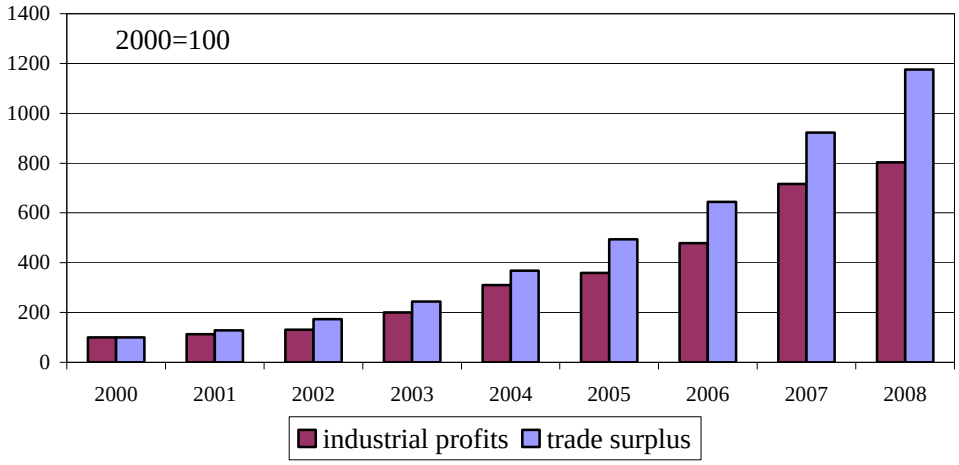
Looking at China's massive reserve accumulation, some commentators routinely point to the savings behavior of Chinese households. The Chinese current account surplus is seen as a function of underlying savings, largely unaffected by the exchange rate (McKinnon, 2007). Cultural factors are thought to lead to a very high precautionary household savings rate. The trouble with this view is that there has been no change in the savings rate of Chinese households in the past decade while the current account surplus has climbed to double digits (Kuijs, 2005; Wolf, 2009). In reality, the increase in total savings in the past decade has come mainly from retained corporate earnings and surpluses of government-owned companies, as shown in figure 4. The increase in corporate profits in the past decade has been very strong and tracked the ballooning trade surplus as shown in figure 5. Profits of Chinese industry have risen eightfold since 2000 while the trade balance expanded almost 12 times.

Fig. 4: Savings rates in China, per cent of GDP



Source: CEIC, Goldman Sachs (Hong Kong)

Fig. 5: The trade surplus and industrial profits in China, 2000-2008



Source: CEIC, Goldman Sachs (Hong Kong)

A key question is what role currency undervaluation played in generating the increase of both the trade surpluses and corporate profits. To be sure, some economists argued for a long time that the renminbi was undervalued (see Goldstein, 2006; 2008) and warned of the inherent dangers of this distortion. But their warnings were not popular in a world of low interest rates and booming asset markets. The immediate effects on America and the West were seductively positive. Rising consumption and low bond yields promoted growth and sustained asset prices. Cheap Chinese goods kept goods inflation low. Even the Fed bought into the argument that credibility gains and higher productivity of the U.S. economy were behind the decline in interest rates.

By how much is the Chinese currency undervalued? Estimates for the undervaluation range widely from zero to 50 per cent (Goldstein, 2008) depending on the methodology adopted. In our view, the most promising approach has been to focus on the unit labor cost based real exchange rate between the renminbi and the dollar (Ferguson and Schularick, 2007).[3] Unit labor costs are defined as the cost of the labor inputs (total wages) needed to produce a unit of output. If these productivity gains (relative to the productivity gains abroad) are not reflected in proportionate exchange rate changes, the

[3] These distortions render official CPI and PPI data less meaningful. Moreover, China's economic ascent is a story of job creation in manufacturing industries with a great role played by labor costs.

economy gains in competitiveness and more production will be relocated to the cheaper currency area. Table 2 shows the key metrics needed to calculate unit labor costs in China. We find that, that while wages and employment in China have grown rapidly in recent years, the increase in output has been even faster thanks to rapid productivity gains. Chinese unit labor costs fell in eight out of last nine years, sometimes substantially. The nominal revaluation of the renminbi by approximately 15 per cent since July 2005 has not been enough to counteract this trend.

Table 2: Unit labor costs in Chinese manufacturing 2000-2008, yearly change per cent

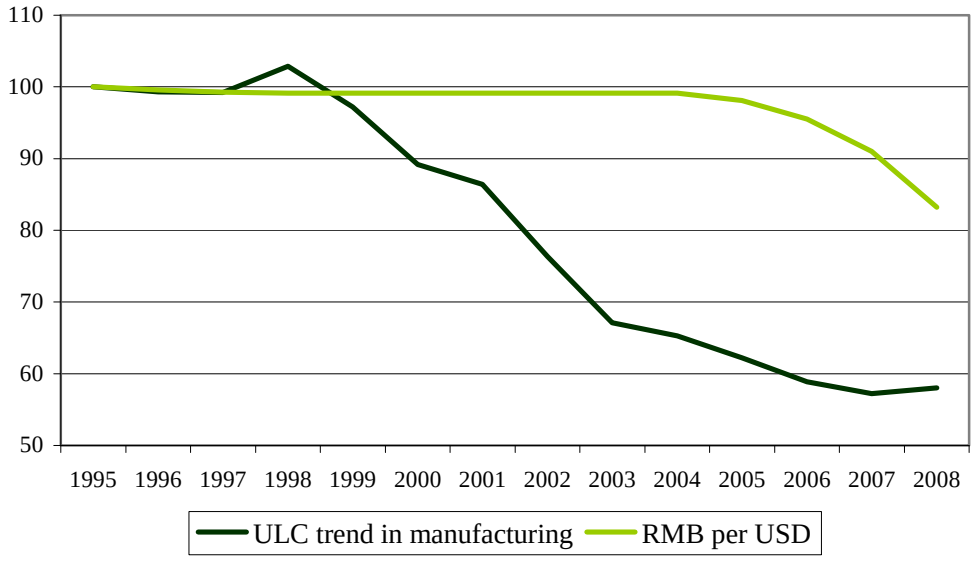
	Real output	Nominal wages	Employ-ment	Unit labor cost	US unit labor cost	*ULC change differential*	*Change fx rate*	*Depreciation of RMB on ULC basis*
2000	14.0	12.3	-1.6	-3.4	4.9	*-8.3*	*0.0*	*8.3*
2001	14.5	11.7	0.4	-2.4	0.8	*-3.1*	*0.0*	*3.1*
2002	20.1	12.6	-3.8	-11.3	0.4	*-11.6*	*0.0*	*11.6*
2003	27.0	13.6	2.1	-11.3	0.8	*-12.1*	*0.0*	*12.1*
2004	21.1	12.3	5.9	-2.9	-0.2	*-2.7*	*0.0*	*2.7*
2005	27.0	12.3	7.2	-7.5	-2.9	*-4.7*	*-1.0*	*3.7*
2006	23.6	14.0	7.2	-2.4	3.1	*-5.4*	*-2.7*	*2.8*
2007	26.6	16.2	7.7	-2.7	0.1	*-2.8*	*-4.7*	*-2.0*
2008	13.8	11.0	2.7	0.0	2.6	*-2.6*	*-8.5*	*-5.9*

Sources: Output, employment and wage figures from CEIC and Banister (2005, 2007, 2009); US unit labor costs come from the BLS database.
Note: Chinese data for 2008 are estimates based on Goldman Sachs, Hong Kong.

As figure 6 shows, Chinese unit labor costs today are about 40 per cent lower than in 1998, while the nominal exchange rate has only appreciated by 15 per cent, leaving a net gain in wage competitiveness of 25 per cent. Despite the currency adjustment, in other words, manufacturing production today in China is much cheaper in dollar terms than it was eight years ago. The table demonstrates that the mechanism which is supposed to correct international imbalances – by raising China's price level relative to America's – was not operating in the past decade. Nor did revaluation after 2005

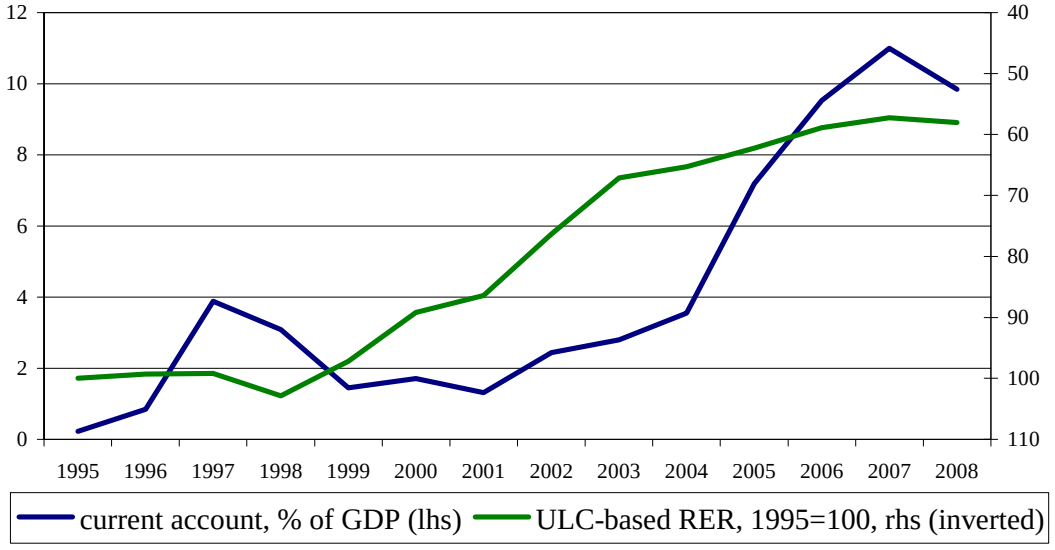
compensate for the growing competitiveness of Chinese manufacturing. As figure 7 shows, the current account surplus continued to widen rapidly.

Fig. 6: Unit labor costs in Chinese manufacturing and the RMB/USD exchange rate



Source: CEIC, Bureau of Labor Statistics; Goldman Sachs (Hong Kong).

Fig. 7: The ULC-based real exchange rate and China's current account surplus, 1995-2008



Source: own calculations, IFS

Economists are usually quick to doubt the long-run sustainability of policies based on real exchange rate undervaluation. Yet, as the financial crisis has reminded us, inductive economic theory can be convincing on paper but misleading in practice. Recent empirical and historical studies have painted a nuanced picture of growth strategies based on real exchange rate undervaluation (Rodrik, 2008; Eichengreen, 2008; Levy-Yeyati and Sturzenegger, 2007). These authors have argued that in practice policies of real exchange rate undervaluation are possible over relatively long periods and often seem to deliver success. One mechanism through which a cheap exchange rate leads to growth is through changing the relative prices of domestic and foreign goods, depressing real wages and thereby boosting corporate savings and investment (Gala, 2007; Levy-Yeyati and Sturzenegger, 2007). Essentially the same thing can be said about China's development over the past decade. Moreover, the massive supply of unskilled labor from the countryside prevented broad-based wage pressures from emerging. Spill-over effects from the tradable to the non-tradable sector – the so-called Balassa-Samuelson effect – were therefore slow to materialize. With a combination of capital controls, tight regulation of credit and a huge pool of unorganized labor, Beijing was able to operate a consistently undervalued real exchange rate without generating high inflation.

IV. The 64,000 Renminbi question

Plenty of estimates for the fair value of the Chinese currency already exist. Our aim here is not to give yet another questionable estimate for a fundamental equilibrium exchange rate for China.[4] Instead, we want to focus on a measure of competitiveness of manufacturing production in China. In order to get an idea about the competitiveness advantages conveyed to Chinese industry by a "cheap" exchange rate, we compare the level of dollar wages in China with dollar wages in other economies, controlling for differences in labor productivity. Simply speaking, one would expect that differences in wages, expressed in the same currency (i.e. in dollars), should ultimately reflect

[4] An excellent survey can be found in Goldstein and Lardy, 2008.

differences in worker productivity. In other words, wages in China should be considerably lower than in the U.S. on the grounds that Chinese workers have less capital to work with and are therefore less productive. Yet persistent differences in wages – even after adjusting for productivity differences -- could signal exchange rate misalignments.

The data for 2008 show hourly Chinese dollar wages in manufacturing of about $1.20 compared to $31.00 in the U.S. Thus, Chinese wages were on average only about 4 per cent of those in US industry. At the same time, Chinese GDP per capita stood at about 20 per cent of the US level, hence aggregate productivity was considerably higher than the wage level implies. While this gap might seem big at first, such deviations are not uncommon in developing countries. We therefore aim to make the comparison more systematic and look at a broad historical sample of 10 developing countries over the past 30 years. The question we ask empirically is whether the gap between wages and productivity in China is artificially low judged by the experience of other developing countries in the past three decades. This simple and intuitive approach we have in mind has proven particularly useful in the context of economies that transition from communism to free market. As prices are not fully liberalized in transition economies, reliable estimates of the price level are hard to come by (Wyplosz, 1996; Krajnak et al., 1998).

We use the data on hourly wages in manufacturing from the Bureau of Labor Statistics, which are available for a broad sample of developing and developed economies since 1996. We complement these figures with Chinese data that have recently been made available by the BLS thanks to the painstaking effort of Judith Banister (2005, 2007, 2009). Chinese wage data are very difficult to compile and many institutional differences such as in-kind payments, various additional wage-like benefits and the differences between state-owned enterprises and private as well as between coastal and western regions have to be taken into account. To give an example, in Banister's calculations the average hourly wage in Chinese manufacturing in the year 2007 was about $1.77 for urban workers and 97 cents for all workers. Assuming a 45 hour work week, this would correspond to monthly wages of $345 in urban areas and about $190 for all workers. Such numbers are accepted as realistic by experts on the ground.

We control for productivity differences using GDP per capita data in purchasing power parities from the World Bank. If anything, this approach is likely to understate labor productivity in Chinese manufacturing. First, we use the 2005 variant of the World Bank PPP data, which show a Chinese GDP per capita almost 40 per cent lower than previously assumed.[5] Second, we denominate output by population, not workers, which, given China's large remaining agricultural workforce, almost certainly understates the productivity levels in the tradable sector. Productivity could also be understated in light of considerable growth rates of physical investment in China which have led to a much higher stock of capital per worker than in comparable developing countries. All in all, we therefore think that our estimates are more likely to understate than to overstate Chinese manufacturing productivity.

The dependent variable in the regression is the dollar wage level relative to the United States. The results of the panel estimation, using data for ten developing economies over the 1980-2008 period, are shown in table 3. On the base of the estimated coefficients, we then perform out-of-sample calculations of the "fair" exchange for China. This is the exchange rate that would eliminate such differences in wages between China and other countries as are not accounted for by lower productivity of Chinese workers. The result is telling: the point estimates vary, but the current exchange rate, after adjusting for differences in productivity, is clearly undervalued by somewhere between 30 and 48 per cent. As noted above, there are some good reasons to believe that these estimates are likely to mark to the lower bound. To put things into perspective, an exchange rate adjustment of 30-50 per cent would simply erase the competitive advantage that China has built up relative to other developing countries over the past thirty years. Even a 50 per cent adjustment would result in Chinese wages reaching about 8 per cent of U.S. levels, instead of the current 4 per cent (compared to a productivity level of 20 per cent). In short, given the rapid productivity gains of recent years, China's export sector remains highly competitive and the real exchange rate strongly

[5] The latest ICP study showed a surprisingly high Chinese price level which was almost 40 per cent higher than previously assumed. However, the study was carried out by the Chinese National Bureau of Statistic and international verification was limited. The higher price had the effect of lowering Chinese per capita GDP in purchasing power parities by the same amount with the effects of making China a lot poorer than previously thought.

undervalued. The consequences of this exchange undervaluation have become too big for the world economy to bear.

Table 3: Wages and productivity in manufacturing (1980-2008)

Dependent variable: dollar wage level relative to US (log)

	pooled	random effects	fixed effects
Observations	149	149	149
Countries	10	10	10
R-squared	0.84	0.84	0.83
GDP per capita relative to US (log)	1.096***	1.204***	1.300***
	(0.000)	(0.000)	(0.000)
Constant	-0.333***	-0.257*	-0.146
	(0.000)	(0.066)	(0.166)
Exchange rate that would align Chinese dollar-wages with productivity:			
RMB/USD	3.56	4.18	4.52
undervaluation in per cent	48%	39%	34%

Note: P-values in brackets; *** denotes a p-value smaller than 0.01, ** p-value smaller than 0.05, * p-value smaller than 0.1, country sample 1980-2008: Brazil, Mexico, Korea, Taiwan, Singapore, Spain, Philippines, Poland, Czech Republic, Hungary. Source

V. Exchange rate adjustments in history

The story so far is that the Chinese economy underwent rapid gains in productivity over the past decade. Unit labor costs continued to fall for most of the period in absolute terms and relative to other countries. These gains were not translated into exchange rate realignments, leading to massive gains in competitiveness for China. Despite the vagaries of Chinese statistics, we think there is strong evidence that productivity-adjusted production in China today is 40 per cent cheaper than a decade ago. As a result, trade surpluses have jumped, corporate profits have boomed and inward investment has surged, resulting in unprecedented reserve accumulation. This has been a major contributor to the global imbalances which have played such an important role in the financial crisis. Currency adjustment is clearly much needed. We have shown that a 30-40 per cent

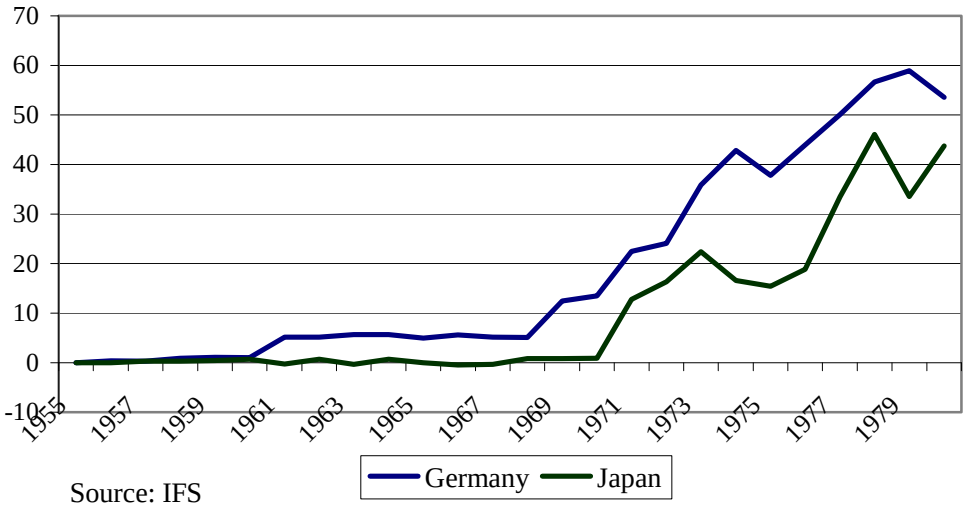
revaluation of the renminbi would barely suffice to bring productivity-adjusted wage costs in China into line with what they should be. Yet a currency adjustment of this magnitude is likely to be strongly opposed by China. In the following, we again take a look at the postwar rise of Germany and Japan to put the Chinese case into historical context. In particular, we want answers to two crucial questions. First, how large would such an alignment of the value of the currency be by historical standards? Second, what does the historical experience tell us about how changes in relative unit labor costs occur over time?

Owing to the rapid productivity gains during the "economic miracle" in the 1950s, Germany started to run external surpluses soon after the transition to full current account convertibility was made in 1958 (Emminger, 1977). Against the background of full employment and rising inflationary pressures the Bundesbank quickly faced a conflict between internal and external goals, i.e. between domestic price stability and exchange rate stability, which became a central policy issue for the following decade. Interestingly, the Bundesbank was at first inclined to give priority to the external equilibrium, and it was government that pushed for revaluation, arguing that internal stability should take priority (Holtfrerich, 1998). This prepared the ground for the first revaluation from 4.20 to 4 DM per dollar in March 1961. The realignment was generally seen as too small, however, and by the end of the decade the German currency was back under pressure to appreciate against both the dollar and the other European currencies. A number of devaluations of close trading partners (such as the 14 per cent devaluation of the British pound in 1967) effectively resulted in a continuous trade-weighted appreciation of the currency. The next revaluation (by 9.3 per cent) was forced on the authorities in 1969 as a reaction to the weakness in the other European currencies and the dollar. As the Bretton Woods System slowly disintegrated, the mark became the "antipode" of the dollar and large swings in capital flows complicated the management of the currency. Faced with another wave of capital flows, on May 5, 1971, Germany closed the exchange window in order to preserve the internal value of the currency and the mark floated freely in 1971 until the Smithsonian agreement led to a new parity that was about 14 per cent stronger against the dollar. But the Smithsonian agreement provided only temporary relief. Another 10 per cent revaluation followed on February 12, 1973. Finally, the mark

revalued by another 3 per cent before the joint float of the European currency snake against the dollar started later that same year. In the following years, the dollar continued to weaken. By 1975 the cumulative appreciation of the mark against the dollar since 1960 approached 60 per cent.

Japan's postwar development strategy was even more focused on exports. The exchange rate was the center of the macroeconomic policies (Eichengreen and Hatanase, 2007). The rate was fixed at 360 yen per dollar and remained at that level until 1970. In the tumultuous year 1971, the Bank of Japan at first tried to resist pressure to appreciate, but finally allowed the yen to float to 314 per dollar. After the collapse of the Smithsonian agreement in 1973, the yen floated upwards to 265 per dollar and by 1978 it had broken the critical mark of 200. However, unlike the German authorities, the Bank of Japan was more willing to forsake some internal stability to keep the exchange rate stable and at competitive levels. In 1974, the Japanese inflation rate briefly reached 25 per cent. In total, the Japanese currency appreciated by about 45 per cent in the course of the 1970s as shown in figure 8.

Fig. 8: Germany and Japan: cumulative currency revaluation against the dollar 1955-1980, in percent

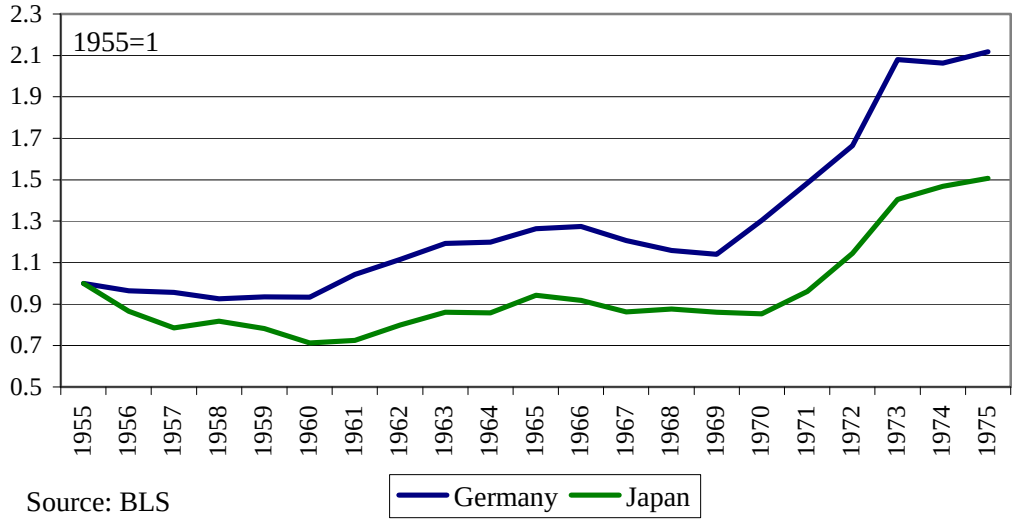


Source: IFS

A number of important lessons can be learned from these two historical episodes. First, a nominal appreciation of the order of 40 per cent within a few years would be no historical novelty. Many of the same questions that Chinese policy-makers are raising

now about the potential consequences of revaluation – such as the loss of competitiveness, a less dynamic export sector and a decline in investment growth – have been asked before. Second, the currency adjustments of the early 1970s were successful in stabilizing the external balance of Germany and Japan. Between 1975 and 1985 the German current account surplus was 0.5 per cent of GDP on average, close to zero. While Japan's appreciation path was somewhat slower than the German one, the country continued to have moderate current account surpluses of less than 1 per cent of GDP on average. Finally, an interesting insight emerges from figure 9, which plots how unit labor costs evolved relative to the United States in these years. It is evident that only a small part of the difference in unit labor costs was corrected by wage increases ahead of productivity gains. Both Germany and Japan (like China in the past decade) were successful in limiting wage increases to the pace of productivity gains, leaving competitiveness unchanged. Some limited wage pressure was visible in Germany in the late 1960s, but the large adjustments in relative production costs and the catching-up in dollar incomes happened mainly through large exchange rate adjustments. We do not find convincing historical evidence for the adjustment mechanism of wage and price pressure that standard economic models postulate.

Fig. 9: US-dollar based unit labor costs
in Germany and Japan (relativ to US), 1955-1975



Source: BLS

VI. The case for Chinese currency adjustment

The Chimerican era is drawing to a close. After the bursting of the debt and housing bubbles, U.S. household savings will have to rise again. Washington aims to buffer this necessary adjustment by running sizeable budget deficits. Public dis-saving can temporarily compensate for higher private savings to maintain final demand, but the American consumer faces a lengthy adjustment period and will ultimately have to pay the bill for this fiscal largesse. Beijing's first response to the collapse in global demand was to loosen credit and pump money into domestic construction and infrastructure projects. In the first six months of 2009 the government in Beijing ordered the banks to make new loans of close to 10 trillion renminbi or about 40 per cent of GDP. If these numbers can be trusted, China is going through one of the most remarkable experiments in monetary history. Stimulating domestic demand is, of course, the right policy response. But while these policies may ease the transition towards a more balanced economy, albeit at a cost to future taxpayers, a structural adjustment will still have to occur in the international economy. U.S. consumption will have to grow considerably less than U.S. production for a sustained period.

As long as exchange rate policy implicitly taxes consumption and subsidizes exports in China, surpluses will persist and a reorientation towards domestic growth will face important structural headwinds. Sooner or later relative prices between the two economies will have to change (Feldstein, 2008). A major exchange rate revaluation is in the American interest for at least three reasons. First and foremost, exchange rate adjustment would help the reorientation of the U.S. economy. Chinese currency policy effectively forces an overvalued real exchange rate on the United States. Simply put, because Beijing keeps the exchange rate fixed, the dollar cannot devalue against China (and other parts of Asia) despite the large U.S. trade deficits. This makes it impossible for the American economy to earn its way out of the slump. Without an exchange rate adjustment, the United States will be forced to run expansive domestic policies if it wants to achieve full employment (Wolf, 2009). In theory, to be sure, the United States could

deflate to regain competitiveness against Asia, but deflation is out of the question for such a highly leveraged economy.

Second, by allowing the United States to import demand from abroad, exchange rate adjustment would lessen the potentially dangerous reliance of U.S. economic policies on measures to stimulate domestic demand. American fiscal policy is clearly on an unsustainable path and it is hard to judge the consequences of the financial distortions and potentially inflationary outcomes caused by zero interest rates and quantitative easing. To the extent that exports could become a meaningful source of U.S. growth again, such highly experimental policies could be ended sooner.

Finally, a Chinese exchange rate adjustment would reduce the risk of potentially grave trade frictions not only between the United States and Asia, but also between Europe and Asia. China's implicit dollar peg leads to the paradoxical situation that the renminbi devalues on a trade-weighted basis as the dollar continues its downward trajectory against the other major currencies. Sooner or later Europe, Japan and the other Asian economies will have to object if Chimerica as a bloc devalues against the rest of the world. If the United States is serious about its commitment to globalization and free trade, it cannot connive at a policy of Sino-American competitive devaluation that creates new distortions for the world economy.

A case can also be made that revaluation is in the Chinese interest. A further substantial increase in the volumes of U.S. government debt and dollars in circulation cannot be in the interest of biggest holder of U.S. Treasuries. After a decade of rapid reserve accumulation, policy makers in Beijing discovered in early 2009 how far their growth strategy had made them dependent on policy choices in Washington D.C. that were dictated primarily by domestic concerns (Dyer, 2009). In short order, the U.S. government announced a $1.5 billion budget deficit and the Federal Reserve decided to buy hundreds of billions of government and agency debt. Recent Chinese statements questioning the future of the dollar as an international reserve currency (for example the proposal that the IMF's Special Drawing Rights become an alternative to dollars) have to be understood in this context. Beijing knows very well that in the short term there is no good alternative to the dollar. It is the vehicle currency for more than 80 per cent of Asian trade (Goldberg, 2005). It remains the predominant currency in central bank reserves. For

historical and political reasons, Asian governments are reticent to accept their neighbors' currencies as a store of value.

True, the euro now offers financial markets of depth and liquidity comparable with those of the United States. Yet meaningful diversification of reserves is ultimately incompatible with a dollar-only peg. In theory, Beijing could diversify out of Treasuries into other fixed income assets or equities. But not many countries will accept large equity stakes of the Chinese government or government-controlled companies in key sectors of domestic industries. This explains why the preferred Chinese strategy at the time of writing is to acquire stakes in commodity-producing assets like mines and oilfields in comparatively poor and politically unstable countries where concerns about foreign ownership are less of a political obstacle. But such a policy does not address the underlying problem of renminbi undervaluation.

In brief, the sooner China faces the fact that it cannot avoid sizeable losses – say about 20 per cent of GDP in renminbi terms – on its dollar reserves, the better. These financial losses will be a modest price to pay for a development model that propelled China from Third World status to an economic powerhouse in less than 15 years (Subramanian, 2009) and will in any case be more than compensated for by the increase in the dollar value of China's vast stock of RMB assets. With seven million jobs lost, the U.S. economy so far has taken a disproportionate share of the economic costs of the Chimerican divorce. It is in the interests of both sides that China play its role in the rebalancing of the world economy—to say nothing of the interests of the rest of the developed world, notably America's partners in Europe and Japan, who are taking most of the strain of the dollar-renminbi slide.

VII. Conclusion

The lesson of German and Japanese history is that exporters can live with significant exchange rate appreciation when major gains in productivity are being made. Today, as in the 1970s, sizeable changes in exchange rates are needed to rebalance the world economy. The world economy's key structural imbalance is that the second biggest

economy in the world has pegged its currency to that of the largest economy at a strongly undervalued rate. The troubling possibility is that China is unwilling to risk the consequences of revaluation, much less a transition to convertibility, and would prefer to keep Chimerica going at the price of further increasing SAFE's holdings of dollar denominated bonds. The implications of such a continuation of Chimerica for the rest of the world are clear. A continuation of Chimerica and Beijing's undervalued dollar peg at a time of dollar weakness would introduce new and dangerous distortions to the global economy. The dollar depreciation that seems a likely consequence of current U.S. fiscal and monetary policy would be accompanied by a further Chinese depreciation relative to other major currencies. Ironically, the principal sufferers from a Chimerican depreciation would be Germany and Japan, whose export-led growth strategy China has so successfully copied, but without the exchange rate appreciation that made their economic rise so much less destabilizing to the global economy.

While the temptation to continue business as usual might be great, it is ultimately no longer in the American interest to remain in such a dysfunctional marriage. A policy of Sino-American competitive devaluation at the expense of U.S. allies in Europe and Japan is politically short-sighted and dangerous for global trade. A renminbi revaluation would help the reorientation of the U.S. economy and potentially allow a quicker exit from the extreme policies currently being implemented by the Fed and the Treasury, which carry uncertain risks for the inflation outlook, global liquidity and capital flows. It would also solve at a stroke the problem of China’s excessively large international reserves and dollar exposure. Historically, periodic exchange rate revaluation has been hallmark of economic success. It is time for China –and its currency – to step up.

References

Banister, Judith and Erin Lett (2009), China's manufacturing employment and compensation costs: 2002–06, Monthly Labor Review, April 2009.

Banister, Judith (2007), "Manufacturing in China Today: Employment and Labor compensation", Conference Board Working Paper 07-01, September 2007.

Banister, Judith (2005), "Manufacturing earnings and compensation in China", Monthly Labor Review, August 2005.

Barnett, Steven and Ray Brooks (2006), "What's Driving Investment in China?", IMF Working Paper No. 265, November 2006.

Bernanke, Ben (2005), "The Global Saving Glut and the US Current Account Deficit", Homer Jones Lecture, St. Louis, Missouri, April 15, 2005.

Bernanke, Ben (2007), "The Global Saving Glut and the US Current Account Deficit", Bundesbank Lecture, Berlin, September, 2007.

Branstetter, Lee and Nicholas Lardy (2006), "China's Embrace of Globalization", NBER Working Paper 12373, July 2006.

Bureau of Labor Statistics (2009), International Labor Comparisons Database, http://www.bls.gov/data/.

Deutsche Bundesbank (1976), Deutsches Geld- und Bankwesen in Zahlen 1876-1975, Fritz Knapp, Frankfurt am Main 1976.

Dooley, Michael and David Folkerts-Landau/Peter Garber (2003), "An Essay on the Revived Bretton-Woods System", NBER Working Paper No. 9971, September.

Dyer, Geoff (2009), "China's dollar dilemma", Financial Times, February 22nd 2009.

Economic Report of the President (2009), Council of Economic Advisors, Washington D.C., January 2009.

Eichengreen, Barry (2007), The European Economy Since 1945, Princeton, Princeton University Press.

Eichengreen, Barry (2004),"Global Imbalances and the Lessons of Bretton Woods", NBER Working Paper 10497, May 2004.

Eichengreen, Barry and Mariko Hatase (2007), Can a Rapidly-Growing Export-Oriented

Economy Smoothly Exit a Peg? Lessons for China from Japan.s High Growth Era, Explorations in Economic History 44 (3), pp. 501-521.

Eichengreen, Barry (2008), "The Real Exchange Rate and Economic Growth", Commission on Growth and Development Working Paper No.4.

Emminger, Otto (1977), "The D-Mark in the Conflict Between Internal and External Equilibrium 1048-1975, Essays in International Finance No.122, June 1977.

European Central Bank (2006), “The Accumulation of Foreign Reserves”, ECB Occasional Paper No. 43, February 2006.

Feldstein, Martin (1999), "A Self-Help Guide for Emerging Markets," Foreign Affairs, March/April 1999 issue, Vol. 78

Feldstein, Martin (2008), " Resolving the Global Imbalances: The Dollar and the US Savings Rate", Journal of Economic Perspectives, 22/3, 113-125.

Ferguson, Niall and Moritz Schularick (2007), "Chimerica and the Global Asset Market Boom", International Finance 10(3): 215-239.

Freeman, Richard B. (2006), “The Great Doubling: The Challenge of the New Global Labor Market”, Draft, Harvard University, August 2006.

Gala, Paulo (2008), "Real Exchange Rate Levels and Economic Development ", Cambridge Journal of Economics 2008 32(2): 273-288

Goldberg, Linda and Cedric Tille (2005), "Vehicle Currency Use in International Trade", NBER Working Paper No. 11127, February.

Goldstein, Morris and Nicolas Lardy (2008), "China's Exchange Rate Policy: An Overview of Some Key Issues", in: Goldstein and Larday (eds.), Debating China's Exchange Rate Policy, Washington D.C., pp.1-75

Goldstein, Morris (2006), “Renminbi Controversies”, Cato Journal, Vol. 26, No.2, 251-265.

Hagen, Juergen von (1998), "Geldpolitik auf neuen Wegen (1971-1978)", in: Deutsche Bundesbank (ed.), Fuenfzig Jahre Deutsche Mark, Munich 1998, pp. 439-474.

Halpern, Lazlo and Charles Wyplosz (1997), "Equilibirum Exchange Rates in Transition Economies, IMF Staff Papers, 44 (December), 430-461.

Holtfrerich, Carl-Ludwig (1998), "Geldpolitik bei festen Wechselkursen (1948-1970)", in: Deutsche Bundesbank (ed.), Fuenfzig Jahre Deutsche Mark, Munich 1998, pp. 347-438.

Hunt, Chris (2008) "Financial Turmoil and Global Imbalances - the End of Bretton Woods II?", Reserve Bank of New Zealand Bulletin, Volume 71 No. 3, September 2008

International Monetary Fund (2009a), International Financial Statistics, Washington D.C.

International Monetary Fund (2009b), World Economic Outlook Database, Washington D.C.

Jeanne, Olivier (2007) " International Reserves in Emerging Market Countries: Too Much of a Good Thing?", Brookings Papers on Economic Activity 1:2007

Krajnyak, Kornelia and Jeromin Zettelmeyer (1998), "Competitiveness in Transition Economies", IMF Staff Papers, 45/2 (June).

Kuijs, Louis (2005), “Investment and Saving in China”, World Bank Policy Research Working Paper No. 3633, June 2005.

Levy-Yeyati, Eduardo and Federico Sturzenegger (2007), "Fear of Appreciation", World Bank Policy Research Working Paper 4387.

McKinnon,Roland and Gunther Schnabl (2009), "The Case for Stabilizing China’s Exchange Rate: Setting the Stage for Fiscal Expansion", China & World Economy, Vol. 17, No. 1, 2009, 1-32

McKinnon, Ronald (2007), " Why China Should Keep Its Exchange Rate Pegged to the Dollar: A Historical Perspective from Japan", International Finance, March 2007.

McKinnon, Ronald (2006), "China's Exchange Rate Trap", American Economic Review Papers and Proceedings, 427-431.

Obstfeld, Maurice, and Kenneth Rogoff (2005), "Global Current Account Imbalances and Exchange Rate Adjustments," Brookings Papers on Economic Activity:1, pp. 67-146.

Obstfeld, Maurice, and Kenneth Rogoff (2007), "The Unsustainable U.S. Current Account Position Revisited," in: G7 Current Account Imbalances: Sustainability and Adjustment, Chicago: Chicago University Press for NBER.

Obstfeld, Maurice, Jay Shambaugh and Alan Taylor (2009) "Financial Instability, Reserves, and Central Bank Swap Lines in the Panic of 2008", Paper presented at the ASSA Meetings, January 2009, American Economic Review, Papers and Proceedings.

Pettis, Michael (2009), "China's Great Demand Challenge", Far Eastern Economic Review, January 2009, 8-13.

Prasad, Eswar (2007), "Is the Chinese Growth Miracles Built to Last?", Working Paper, Cornell University, July 2007.

Reisen, Helmut (2009), “Shifting Wealth: Is the U.S. Dollar Empire Falling?,VoxEu.org, June 20.

Rodrik, Dani (2008), "The Real Exchange Rate and Economic Growth", Working Paper, October 2008.

Schularick, Moritz and Thomas Steger (forthcoming) " Financial Integration, Investment, and Economic Growth. Evidence From Two Eras of Financial Globalization", Review of Economics and Statistics.

Setser, Brad and Arpana Pandey (2009), "China’s $1.7 Trillion Bet - China’s External Portfolio and Dollar Reserves", Council on Foreign Relations, Working Paper, January 2009

Statistics Bureau of the Japanese Ministry of Internal Affairs (2009), Historical Statistics of Japan, http://www.stat.go.jp/english/data/chouki/index.htm

Subramanian, Arvind (2009), "China and the dollar: Having it both ways", VoxEU.org, March 26.

Summers, Lawrence (2006) "Reflections on Global Account Imbalances and Emerging Markets Reserve Accumulation", Speech at the Reserve Bank of India, March 24, 2006

World Bank (2007), World Development Indicators 2006, Washington D.C.: 2006.

Wolf, Martin (2009), Fixing Global Finance, New Haven: Yale University Press