

Fulbright Economics Teaching Program

Making Sense of China's Sterilized Foreign Exchange Intervention Policy

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Corden's Definition of Exchange Rate Protection

“There is exchange rate protection when a country protects its tradable goods sector relative to its non-tradable goods sector by devaluing its exchange rate, allowing the exchange rate to depreciate more than it would otherwise, or preventing an appreciation that would otherwise take place.” (p.277)

W. Max Corden, “Exchange Rate Protection,” in R.N. Cooper, et. al. (eds), *The International Monetary System under Flexible Exchange Rates: Global, Regional and National. Essays in Honour of Robert Triffin*, Cambridge MA: Ballinger. 1981. 272-287.

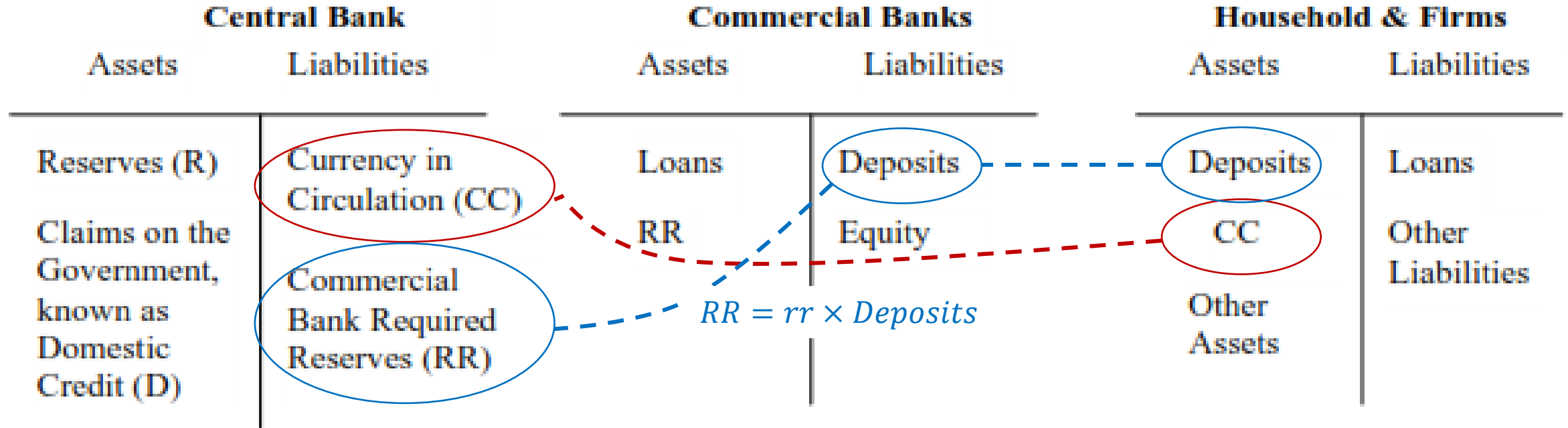
Case study of China

From 2002 to 2010, China ran large and growing trade surpluses, during which time it accumulated several trillion dollars of foreign reserves. China was harshly criticized by trade-partner countries (especially the US) and many eminent economists for manipulating its currency and practicing protectionism on a macro scale.

1. Was China “manipulating” its currency?
2. Was China practicing “exchange rate protectionism”?
3. Did China’s massive accumulation of foreign reserves contribute significantly to a “global saving glut”?
4. If so, did China’s massive outflow of savings (via foreign reserve accumulation) contribute to the global financial crisis of 2009-10?

The answer to these questions requires an understanding of (1) how exchange rate protection is practiced, and (2) how sterilized foreign exchange market intervention works to sustain exchange rate protection.

Some basics: The money supply process



$$M^S = CC + Deposits = CC + RR/rr = h(CC + RR) = h(R + D) = h(B)$$

(rr) The reserve requirement ratio (rr) is the fraction of deposits that commercial banks are required to hold as reserves at the central bank: $rr = RR/Deposits$.

(h) The money multiplier (h) is the ratio of money supply (e.g. M2) to the central bank assets (=liabilities), known as “reserve money” or “base money”: $h = M^S/B$.

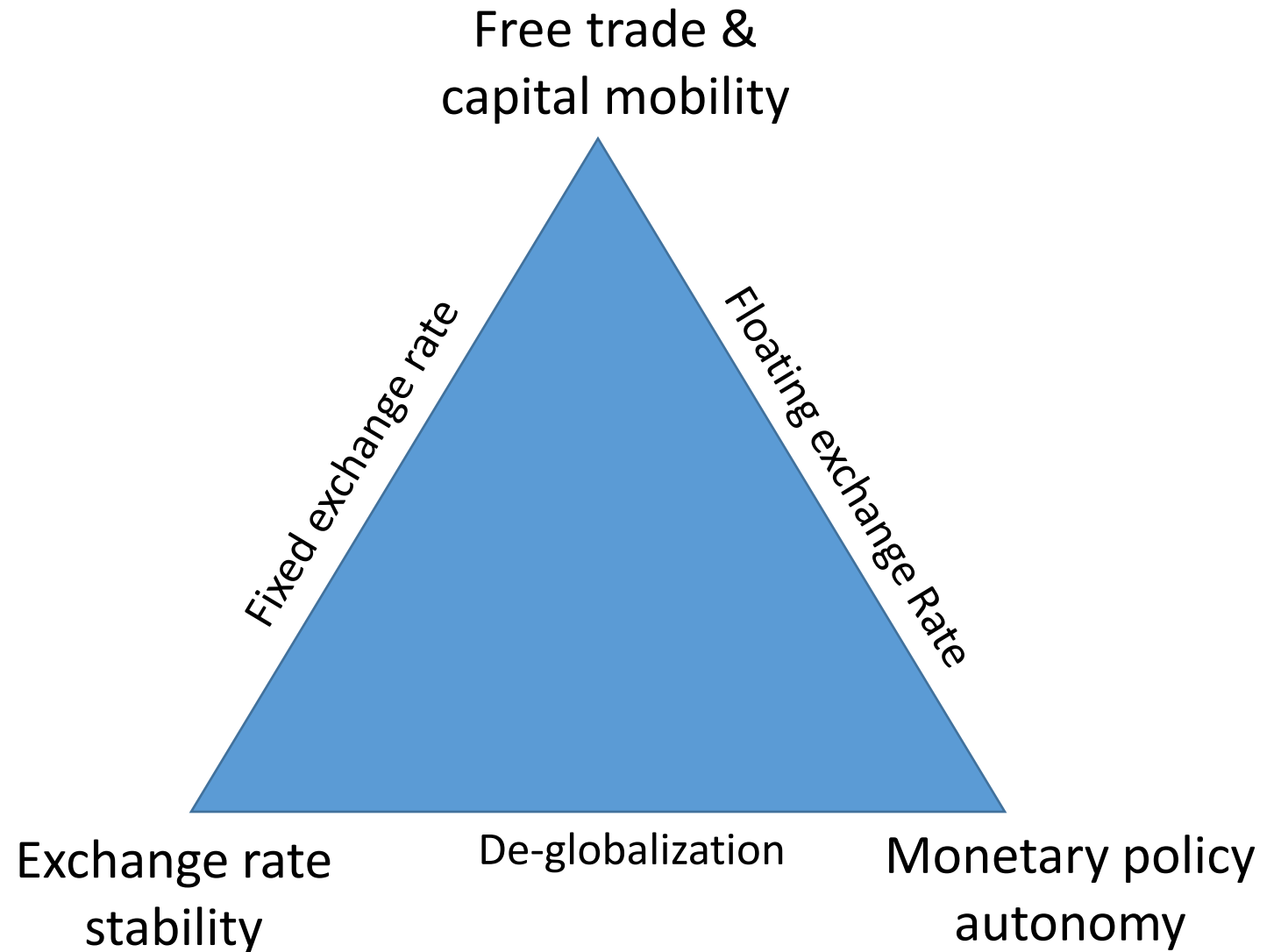
The central bank changes the money supply by changing B (buying and selling domestic and foreign assets) and/or changing h by changing rr: $\Delta M^S = h \cdot \Delta B + B \cdot \Delta h$

Some more basics: The Policy Trilemma

Here is the standard presentation of the POLICY TRILEMMA (or impossible trinity).

If integration into world goods and asset markets is desired, then a country must choose either to:

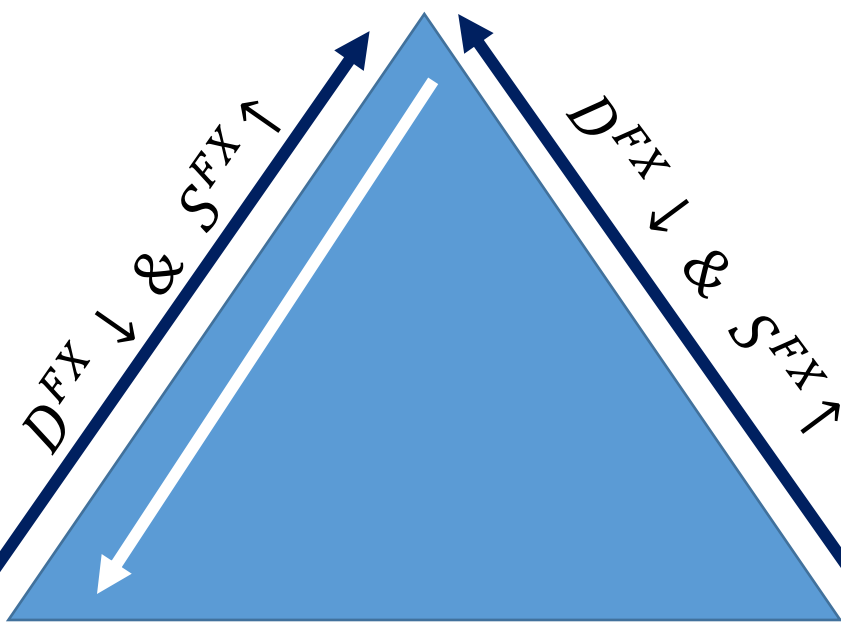
1. **Fix** the exchange rate and give up an independent monetary policy, or...
2. **Float** the exchange rate and retain monetary policy for domestic policy objectives



Foreign Exchange Market Intervention and Sterilization

Foreign exchange excess demand
(i.e. overvalued currency)

$$D^{FX} > S^{FX}$$



Currency depreciation

or

Central bank sells foreign assets

Money supply ↓
Interest rates ↑
Price level ↓

Central bank buys domestic assets

Money supply ↑
Interest rates ↓
Price level ↑

The two Central Bank operations (selling foreign assets and buying domestic assets) cancel each other and no monetary adjustment occurs...

The foreign exchange market disequilibrium persists, requiring further intervention...

Until, the country depletes its stock of foreign reserves and then...

Sterilizing foreign exchange market intervention

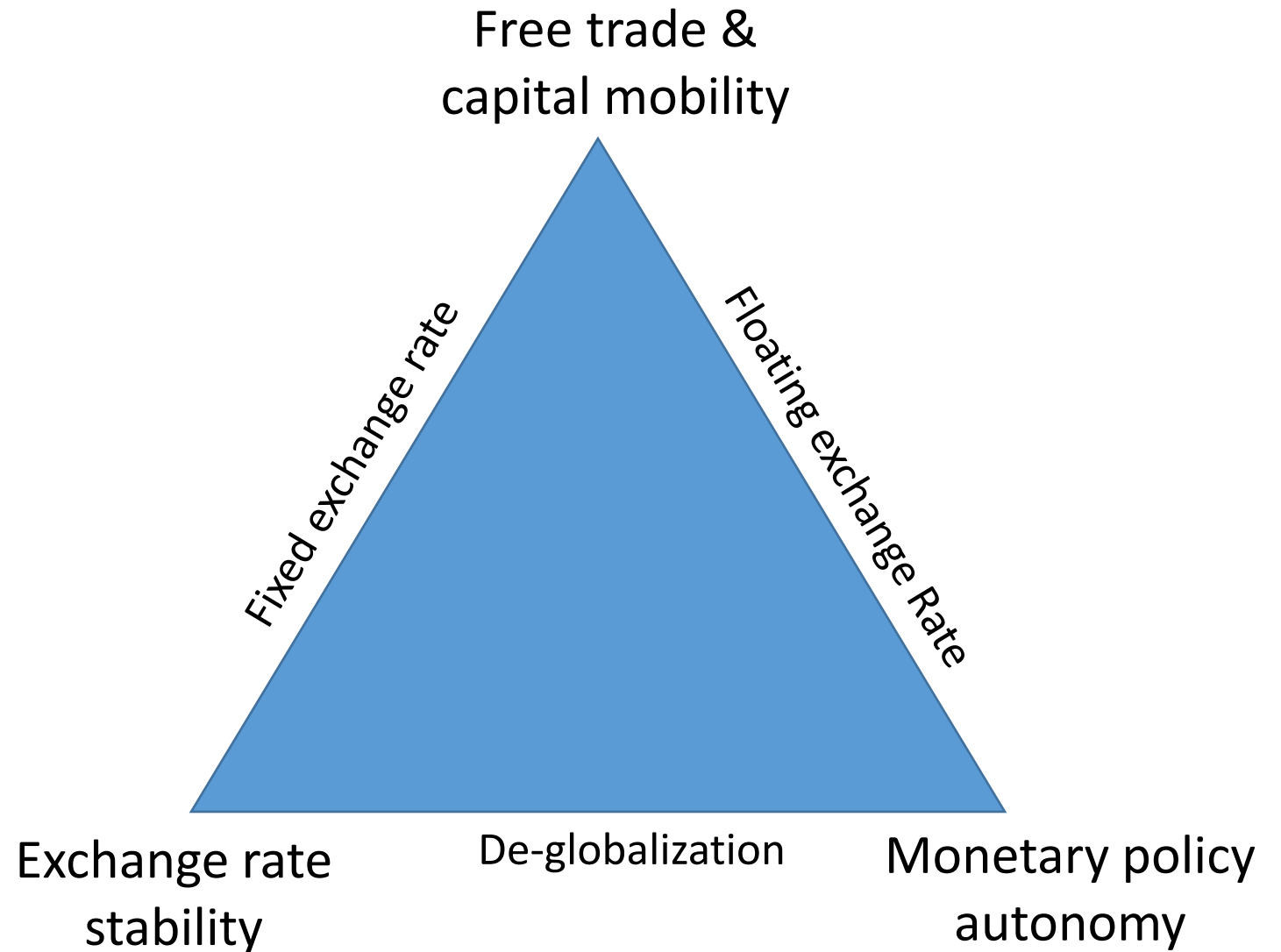
Sterilization as an escape from the Policy Trilemma

Sterilization is a means of escaping the policy trilemma, if only temporarily.

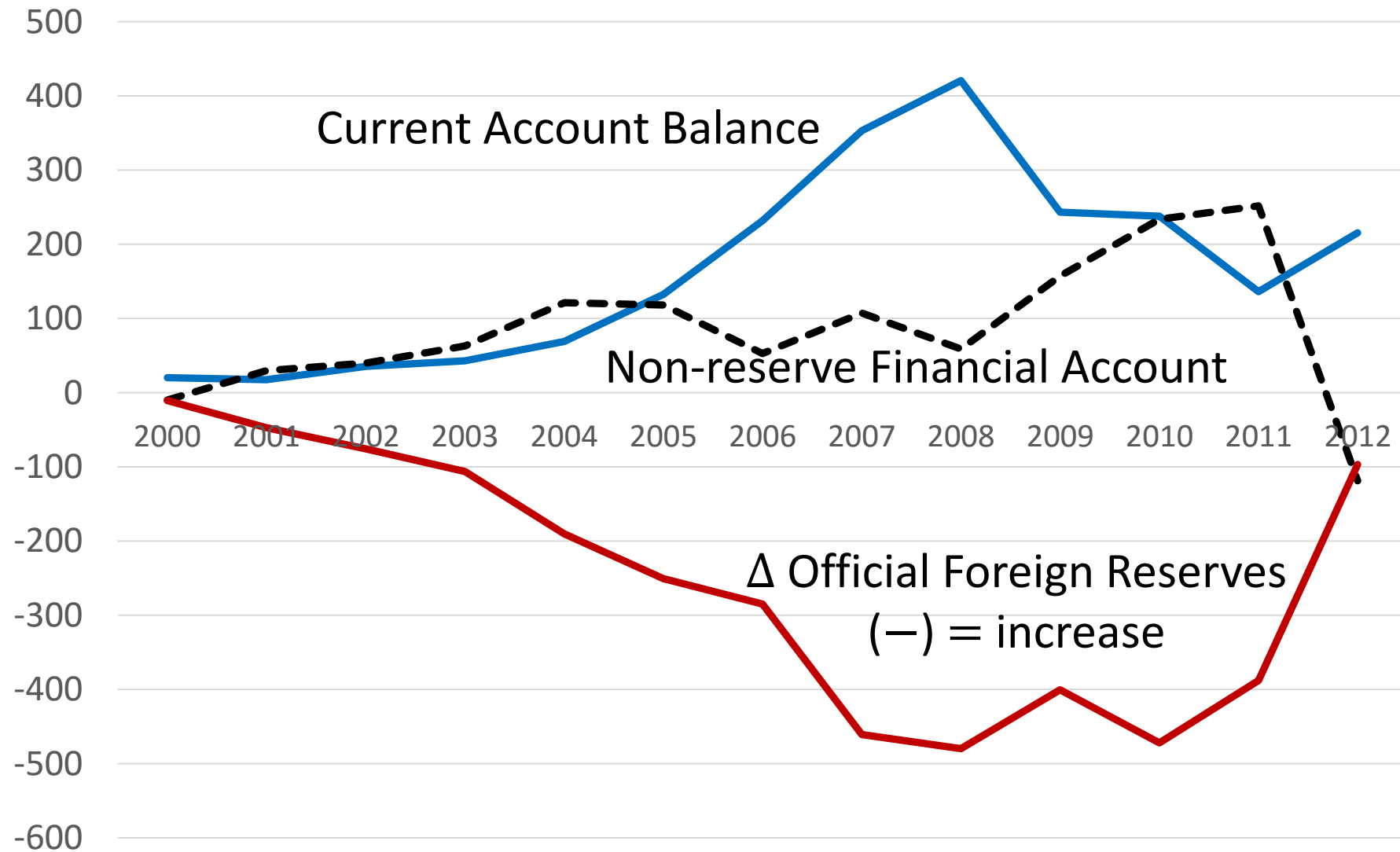
A countries with excess FX demand (i.e. overvalued currencies) can sterilize only so long as the market perceives that it has sufficient reserves to defend the exchange rate. When that fails, there is a speculative attack on the currency and the game is over.

But, what about countries with excess supply of FX (i.e. undervalued currencies)?

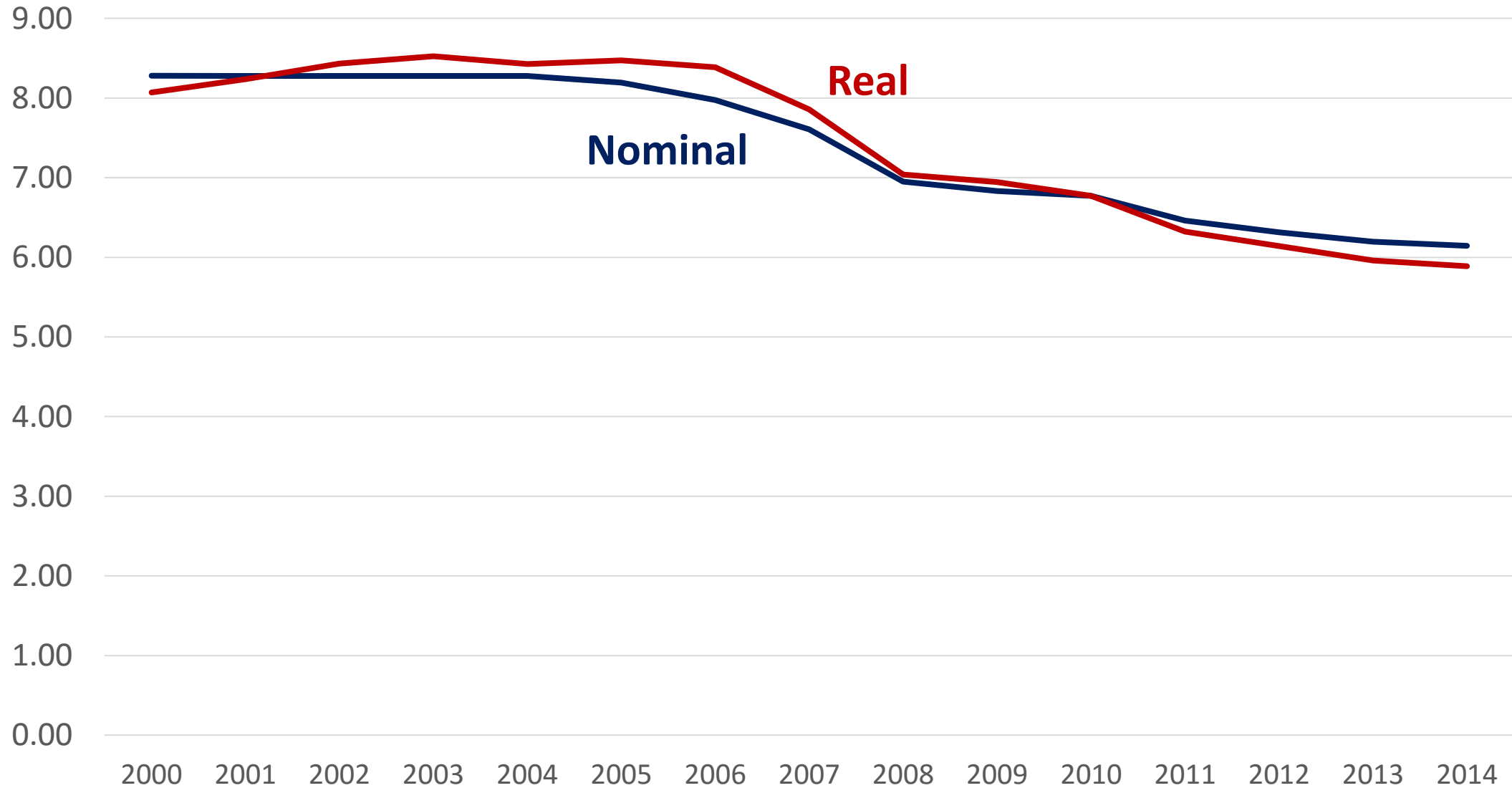
That is the case of China...



China's Balance of Payments: 2000-2012 (USD billions)

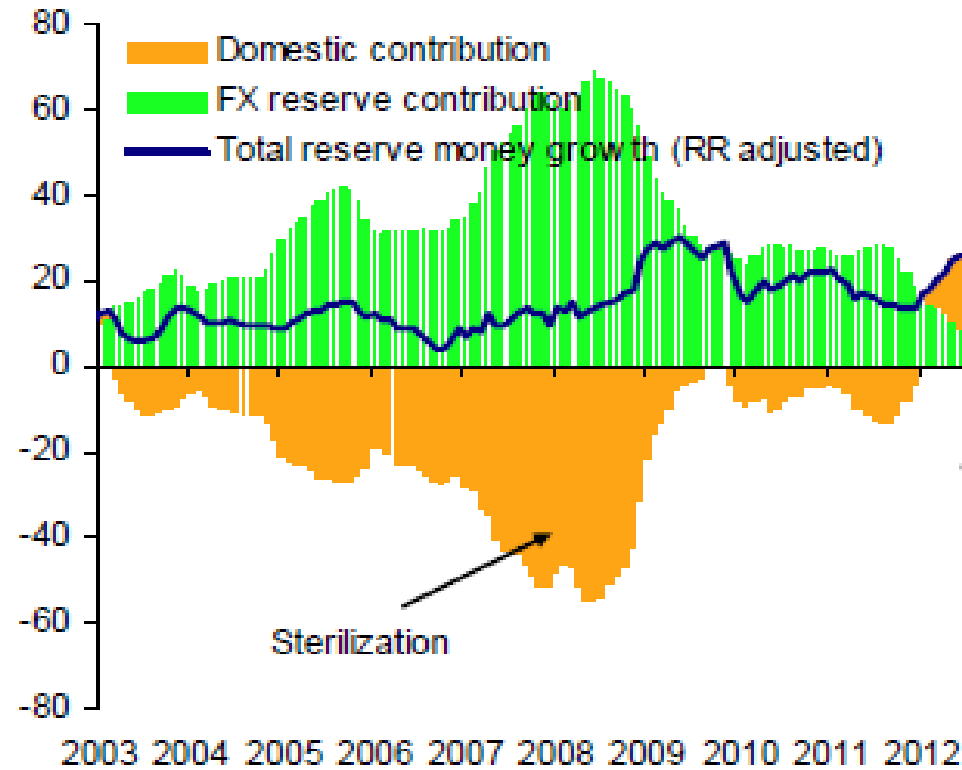


Nominal and Real RMB/USD Exchange Rates



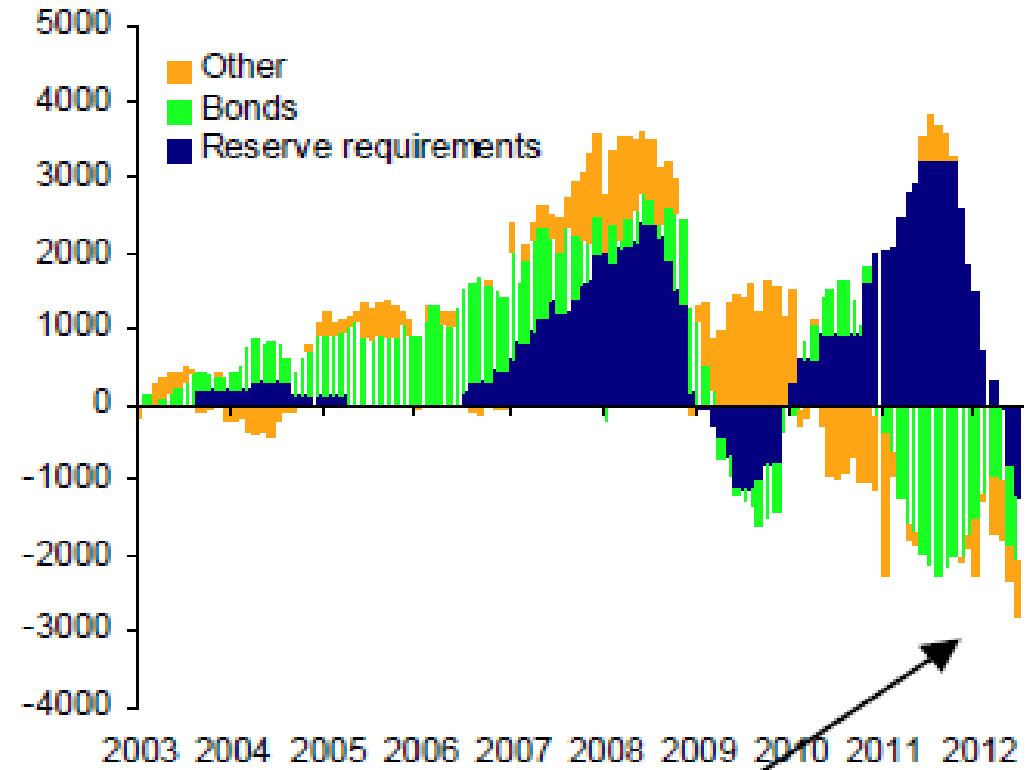
From 2003 to 2009, the PBC intervened heavily in the foreign exchange market, amassing more than \$2 trillion in foreign reserves, but avoided the monetary consequences by offsetting reserve purchases by simultaneously selling “sterilization bonds” and raising bank reserve requirements.

Growth rate (% y/y 3mma)



Source: CEIC, UBS estimates

12-month cumulative sterilization (RMB bn)



Source: CEIC, UBS estimates

The PBC has reduced the size of sterilization in light of weakening FX accumulation

Questions

- What was the rationale for China's policy of sterilized intervention?
- What were the costs and benefits of this policy?

Competing Hypotheses

- Exchange rate protection undertaken to increase employment (Riedel, 2007, 2009)
- Undervaluation to capture positive externalities in the tradable goods sector (Rodrik, 2008)
- The consequence of domestic financial frictions that limited firms' to borrow (Song, et. al., 2011)

James Riedel, *How China Grows: Investment, Finance and Reform*, Princeton University Press, 2007

Yi Huang, "From World factory to World Creditor: The External Wealth of China and Excess Returns," 2011

Dani Rodrik, "The Real Exchange Rate and Economic Growth," *Brookings Papers on Economic Activity*, Fall 2008.

Zhen Song, Kieth Storesletten and Fabrizio Zilibotti, "Growing Like China," *American Economic Review*, (February 2011).

Exchange rate protection: hypothesis

There is exchange rate protection when a country protects its tradable goods sector relative to its non-tradable sector by:

- devaluing its exchange rate,
- allowing the exchange rate to depreciate more than it would otherwise,
- or preventing an appreciation that would otherwise take place.

Here a model (Corden, 1981) is presented to explain and illustrate that the KEY to exchange rate protection is STERILIZED INTERVENTION...without sterilized intervention exchange rate protection doesn't work!!

W. Max Corden, "Exchange Rate Protection," *Protection, Growth and Trade: Essays in International Economics*, Basil Blackwell, 1981

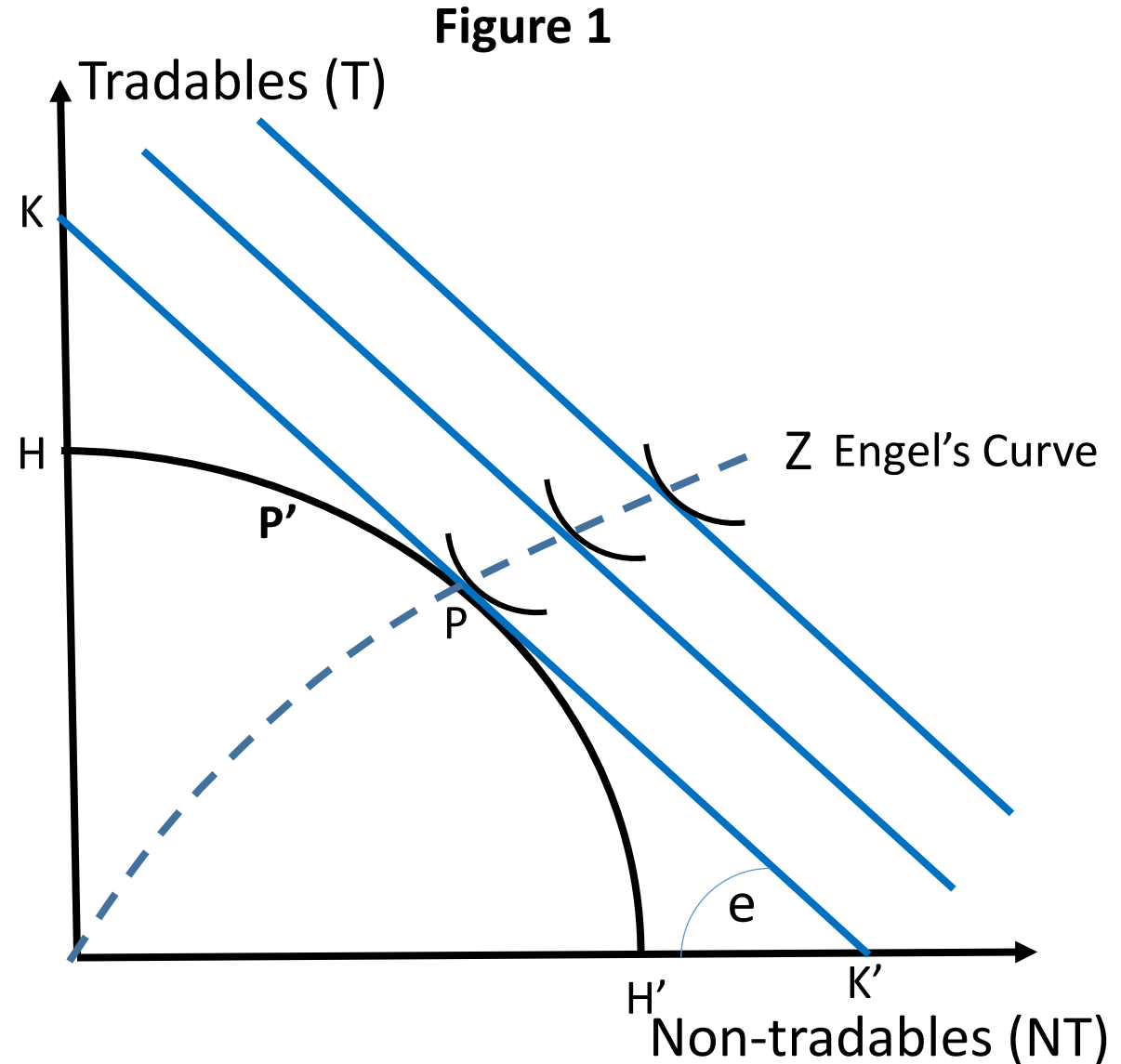
Exchange Rate Protection (ERP): The Model

- HH' is the production possibility frontier
- P is the laissez faire equilibrium output and P' is the policy-chosen output.
- The slope of KK' is the real exchange rate (e) at P

$$e = P_{NT} / (E \cdot P_T)$$

- E is the nominal exchange rate (domestic currency per unit of foreign currency)
- P_{NT} is the price of Non-Tradable goods (NT)
- P_T is the exogenously given foreign-currency price of Tradable goods (T).
- Z is the Engels curve associated with the real exchange rate, the slope of KK' .

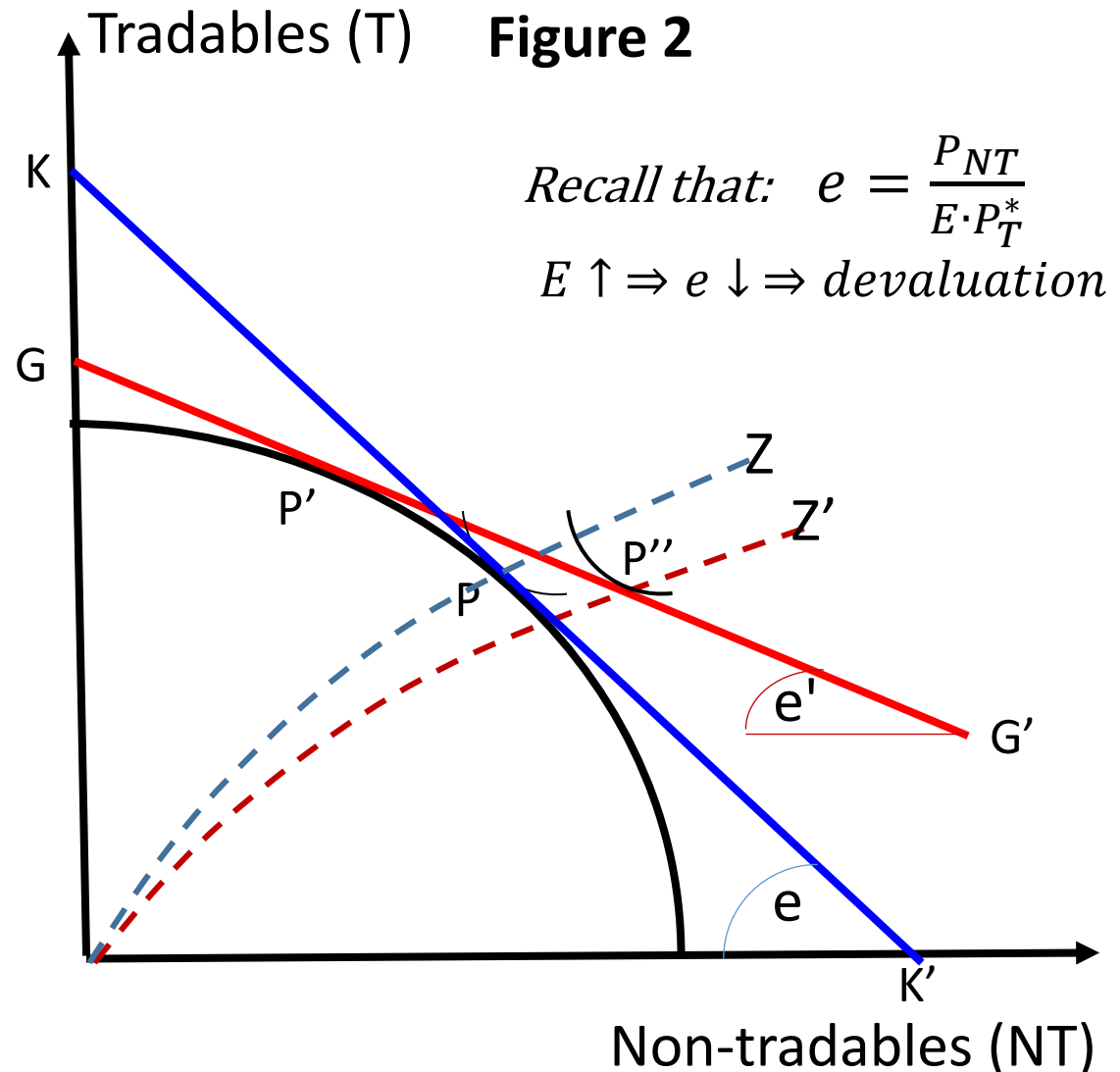
Note: ERP is a policy of shifting from P to P' or preventing a shift from P' to P . Here we illustrate the former.



Instruments of Exchange Rate Protection: Nominal Devaluation

A nominal devaluation ($E \uparrow$) lowers the relative price of NT (to GG') and, other things equal, shifts production from P to P' , but other things are not equal. Desired consumption also shifts, from P to P'' (Z' is the Engles curve associated with the real exchange rate GG'). The result is an excess supply of T , which is sustainable because the country can run a trade surplus, and an excess demand for NT , which is not sustainable. Excess demand pushes up the price of NT and restores the real exchange rate returns to its original level (KK'').

This is an example of the well-known rule in macroeconomics that you need as many instruments as you have objectives. If we want to produce more tradable goods and maintain macro stability then we need at least two instruments.

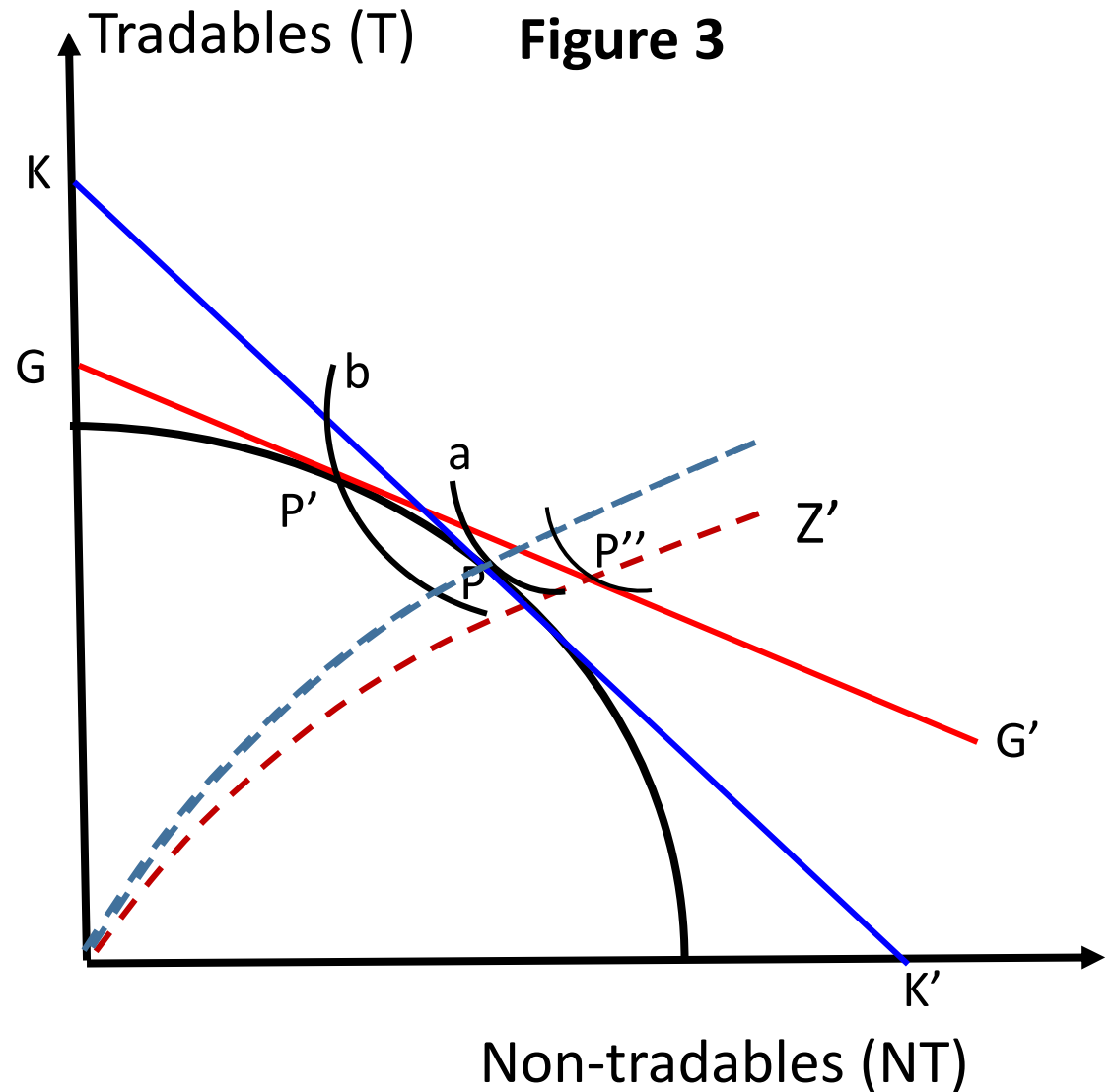


Instruments of Exchange Rate Protection: Devaluation + Tax cum Subsidy

One way to make a nominal devaluation an effective and sustainable instrument for shifting production from P to P' is to combine it with a subsidy to consumption of T , financed by a tax on consumption of NT . By this means the supply/demand balance is maintained in both sectors (i.e. with both production and consumption at P').

The cost of exchange rate protection by this means is illustrated by the movement from a higher to lower indifference curve (from a to b).

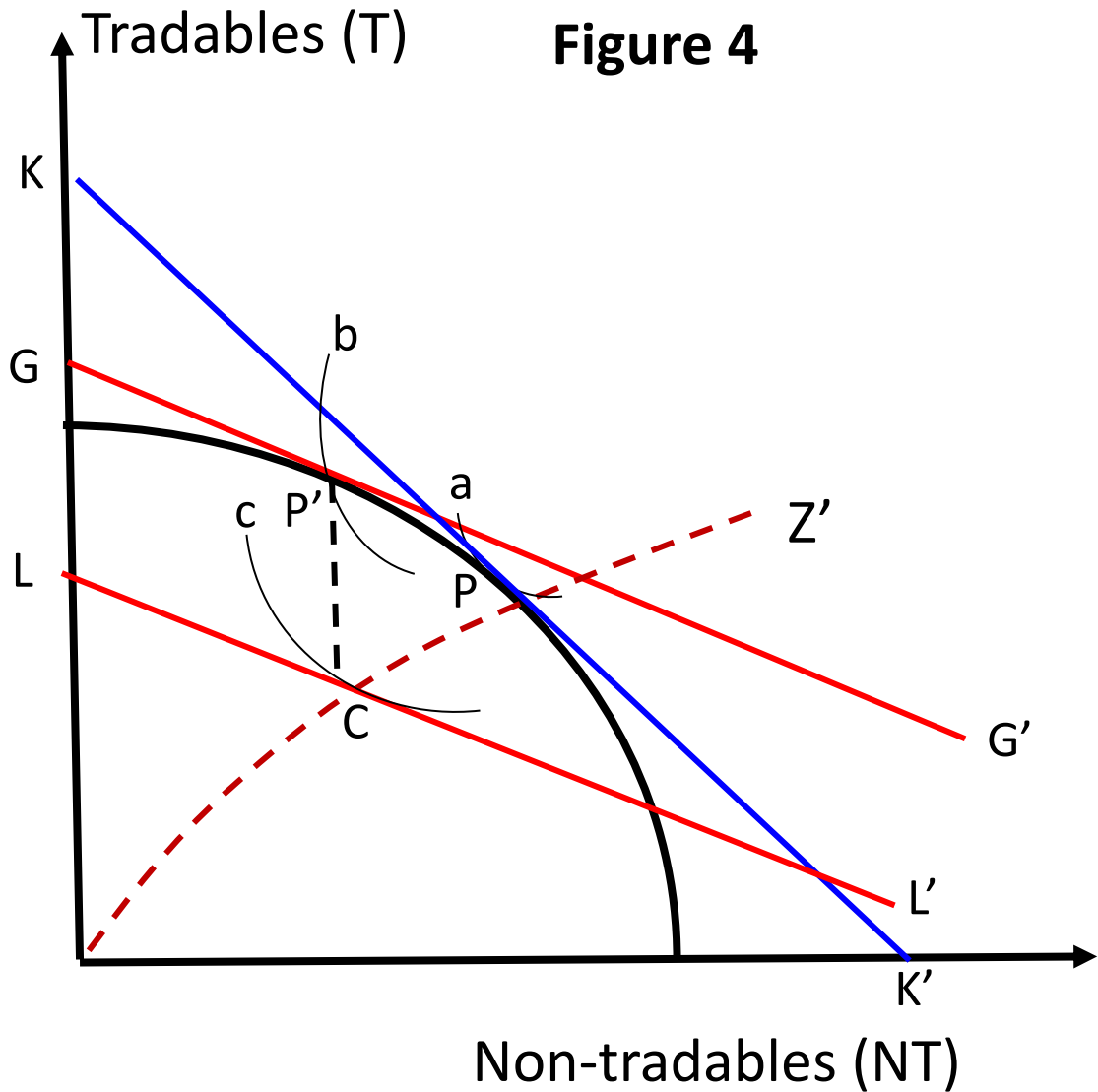
It is possible, however, that this means of exchange rate protection may violate WTO commitments and/or meet domestic political resistance, since it may be seen to benefit unfairly producers and consumers in tradables at the expense of those in non-tradables.



Instruments of Exchange Rate Protection: Devaluation + Sterilized Intervention

Another way to make a nominal devaluation effective and sustainable is to combine it with an expenditure reduction policy (e.g. income tax increase) sufficient to eliminate excess demand in the NT sector, as illustrated in Fig. 4, where “G” is the level of national income and “L” the level of national expenditure. In this equilibrium, the country has a currency account (CA) surplus (GL = P’C), but supply/demand balance in the NT sector.

For the CA surplus to be sustained, there must be an equivalent capital outflow. If that is not forthcoming, the central bank is obliged to buy up the CA surplus and hold it as international reserves. To prevent reserve purchases from inflating the money supply and price level, they must be sterilized by an equivalent reduction in the central bank’s domestic-currency net asset position.



Exchange Rate Protection: Two key points

1. The above illustrates the case where the government's aim is to increase the size of the tradable sector (from P to P'), but the analysis is the same if its aim is to prevent a contraction of the tradable sector. For example, an equilibrium at P' will lead to a real appreciation moving equilibrium to P . If the government uses either of the above policies to prevent real appreciation, then it is practicing exchange rate protection.
2. Suppose there is an exogenous increase in the risk-adjusted return on foreign assets. The relative price of tradeable goods will increase and a current account surplus and equivalent saving-investment balance will emerge. The equilibrium will look exactly like that analyzed above, suggesting exchange rate protection, but since there is no sterilized intervention there is no exchange rate protection.

Currency depreciation and sustained current account surpluses indicate a policy of exchange rate protection only when these outcomes are sustained by sterilized intervention.

The Cost of Exchange Rate Protection

Exchange rate protection, like other forms of protection, lowers the welfare of the countries practicing it.

When implemented by tax and subsidy policies, welfare (represented by indifference curve b) is lower than the laissez faire level (represented by indifference curve a).

When implemented by absorption-cum-sterilization policies, current welfare is still lower yet (represented by indifference curve c). But the difference between welfare represented by indifference curves b and c is offset by the increase in foreign assets (future consumption).

If the country's initial (laissez faire) holding of foreign assets was optimal, the absorption contraction cost (bc) must be greater than the gain from increased foreign assets, which indicates that absorption-cum-sterilization is second-best to the tax-subsidy policy approach to exchange rate protection.

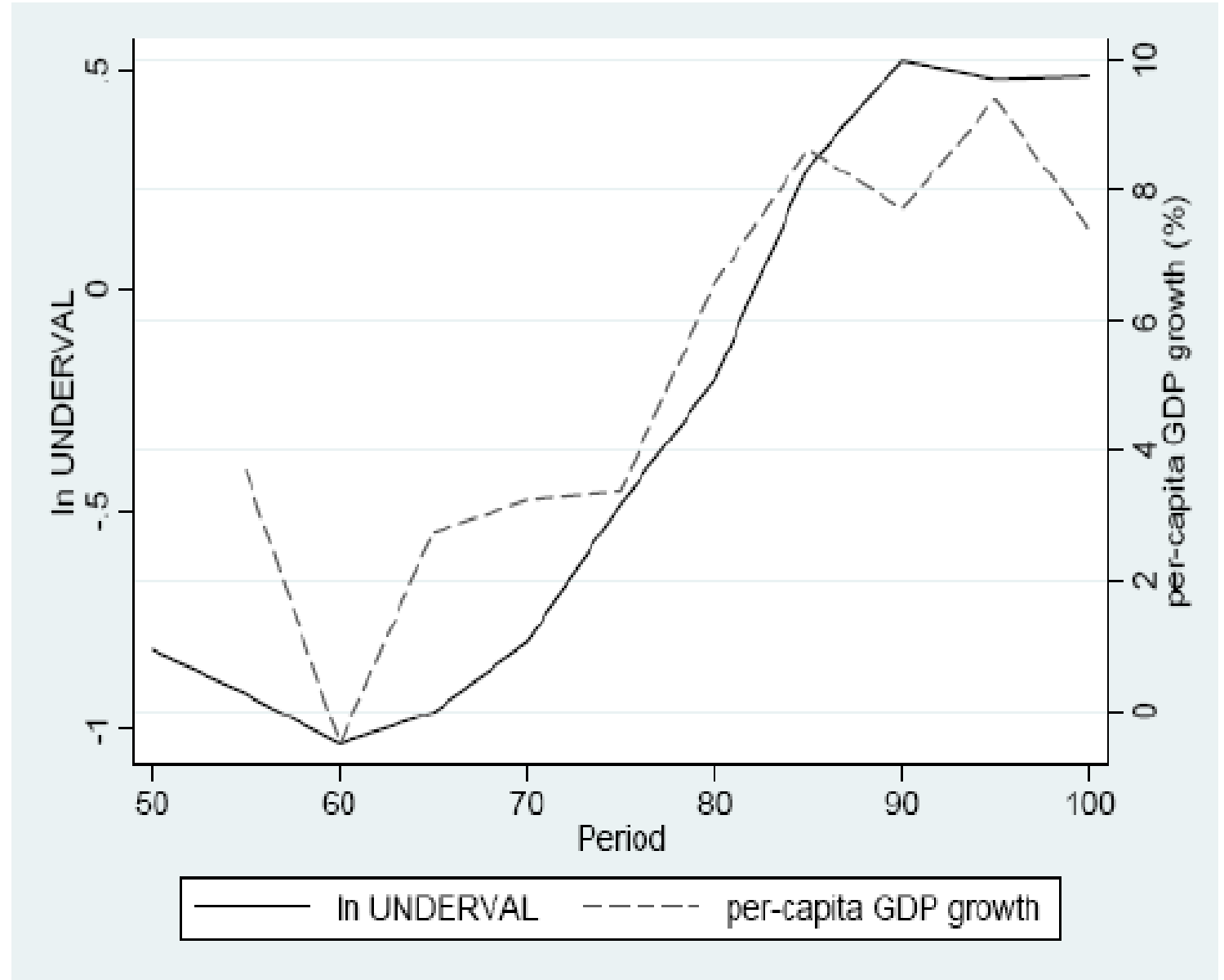
Therefore, exchange rate protection can be justified only if there is a market failure that makes the laissez faire outcome suboptimal.

The market failure case for undervaluation (Rodrik, 2008)

A case for exchange rate protection could be made if there are positive externalities in the tradable goods sector.

Rodrik (2008) argues that tradeable goods industries suffer disproportionately from information and coordination failures that undermine the incentive to invest.

As a result a case can be made for protecting the tradable goods sector.

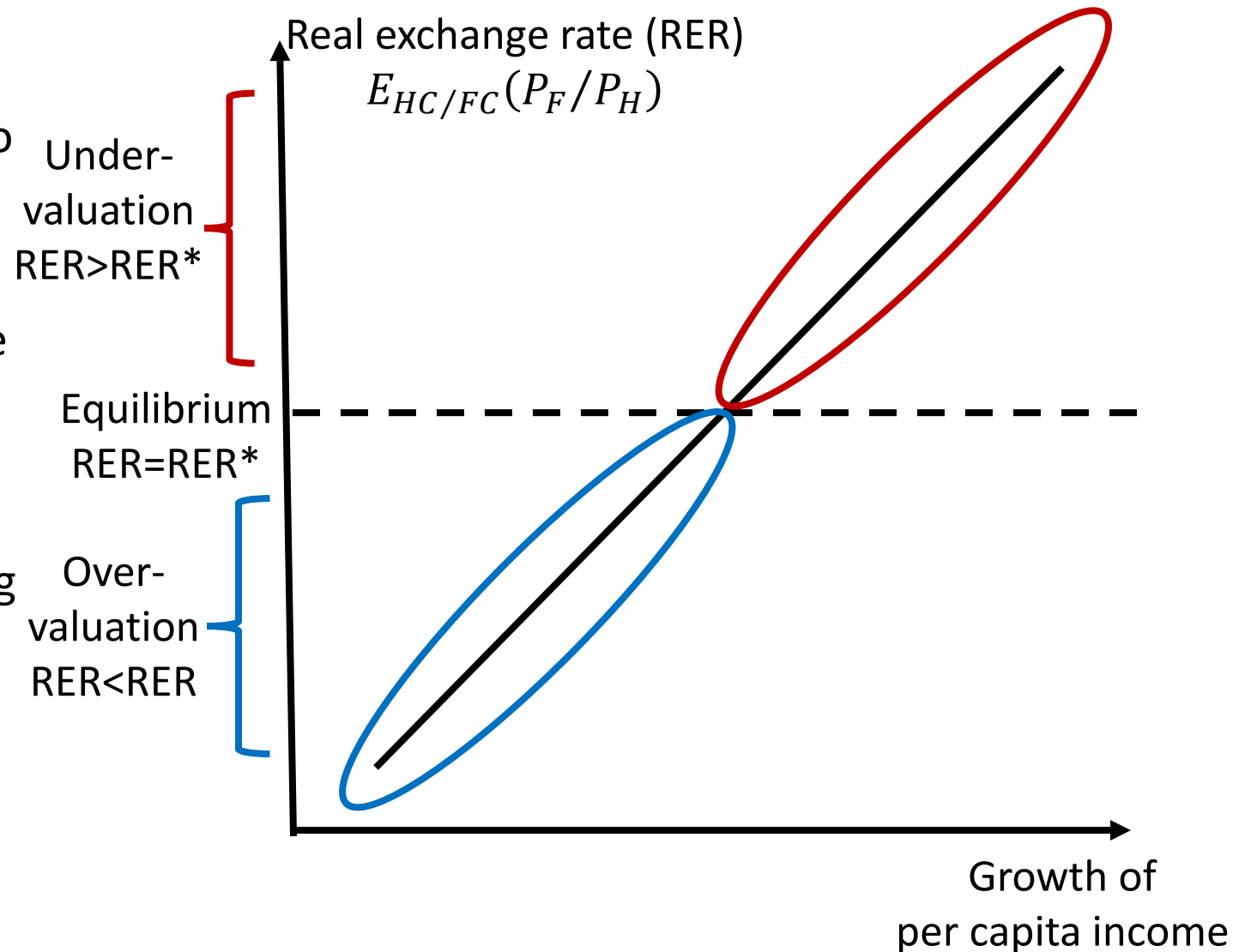


The market failure case for undervaluation (Rodrik, 2008)

Rodrik's measure of the real exchange rate, adjusted for the Balassa-Samuelson effect, has been criticized in the literature on grounds that it amounts to circular logic (i.e. growth determines growth).

Aside from the measurement issue, the correlation could simply indicate that raising the real exchange rate in countries where $RER < RER^*$ benefits growth, but that is a well-known finding and has nothing to do with externalities.

Pushing the exchange rate above RER^* may be justified if there are positive externalities in the tradable goods sector, but Rodrik offers no direct evidence that externalities are present.



Financial Market Frictions versus ERP (Song, et. al. 2011)

It looks puzzling when a country with a high growth rate and high return to capital invests a large share of domestic savings in foreign financial markets, as China did from 2002 to 2010.

Song, et. al. (2011) argue that the puzzle can be solved by taking account of frictions in the domestic financial system that prevented domestic savings from flowing to high return investments in the tradable goods sector, and hence were invested abroad. Productivity in the tradable goods sector (in particular in export-oriented, labor-intensive manufacturing) grew much faster than in the non-tradable goods sector, with the result that the volume of domestic savings diverted abroad increased significantly over time.

Song's solution to the puzzle is logical, but not practical because of government restrictions on capital outflows. In the absence of restrictions on capital outflows, Song's solution would be quite convincing. But, the fact is that capital outflows were restricted. Therefore, it was up to the government to divert savings abroad by means of sterilized intervention in order to preserve rapid growth in the tradable goods sector (labor-intensive manufacturing in particular).

Structural Change as a Motivation for Exchange Rate Protection

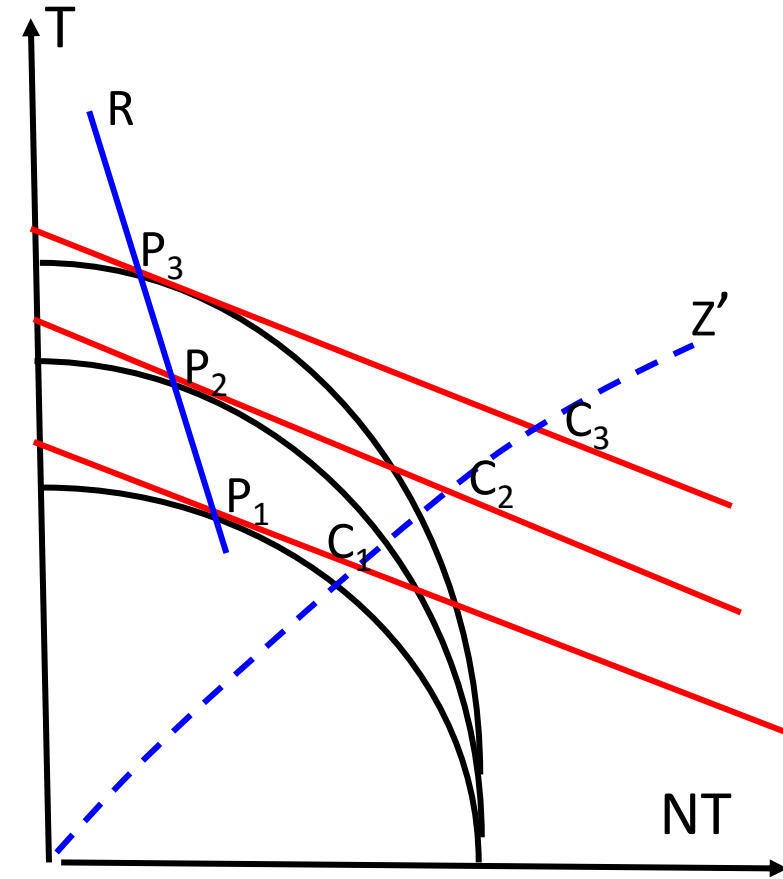
In a labor-abundant low-wage economy, (1) productivity growth, (2) the return to capital and (3) employment growth are higher in relatively labor-intensive, export-oriented manufacturing.

However, as incomes rise, in large measure as a result of the expansion of the tradable goods sector, the demand for non-tradable goods increases relative to supply, putting upward pressure on prices, wages and real exchange rate (i.e. real appreciation).

Governments may be motivated to resist real exchange rate appreciation and the consequent growth slowdown in the tradable goods sector.

Surplus labor in the rural sector is a structural (if not market failure) severe social and economic consequences that deserve a policy response. Exchange rate protection may be the most effective.

Figure 6



A Cost-Benefit Analysis of Exchange Rate Protection

To make sense of China's Sterilized Foreign Exchange Intervention policy we must go beyond theory; we must have sound empirical estimates of the costs and benefits.

Employment benefit

The main benefit, I would argue, was the absorption of un- and under-employed people mainly residing in the rural countryside into productive employment, mainly in export-oriented manufacturing industry. If they were previously unemployed, then all of the value-added their employment created would count as a social gain.

VERSUS

Financial cost

The main cost, on the other hand, at least the cost that can be counted, was the financial cost deriving from the negative differential between China's return on assets and liabilities.

STILL A WORK-IN-PROGRESS

Reducing unemployment in the rural sector

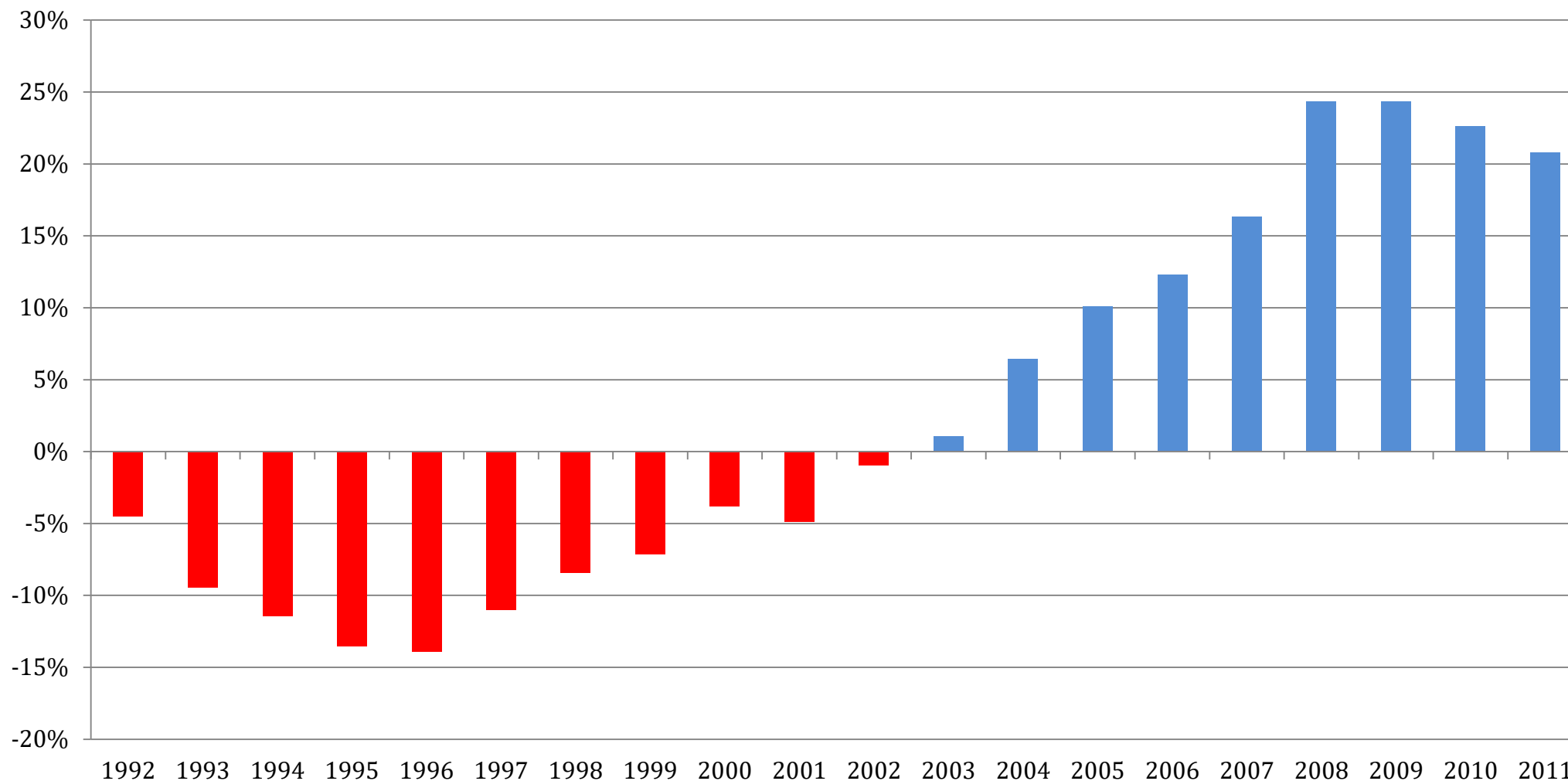
Employment data of the we need to measure the welfare gain from the growth of employment in export-oriented manufacturing are hard to come by. Look to the bottom line: employment in private urban manufacturing grew 12% p.a., adding 35 million jobs. It would be interesting to put a value on that number.

	2003		2013		Annual rate of change (%)
	Millions	%	Million	%	
Urban Employment	262	100	382	100	4
State-owned enterprises	69	26	64	17	-1
Collective enterprises	10	4	6	1	-6
Other (joint ventures and private)	184	70	313	82	5
Urban manufacturing					
State-owned	10	34	2	4	-14
Collectives and cooperatives	3	12	0	0	-44
Other (private and joint ventures)	15	54	50	95	12

Source: Chinese Statistical Yearbook, 2003 and 2014

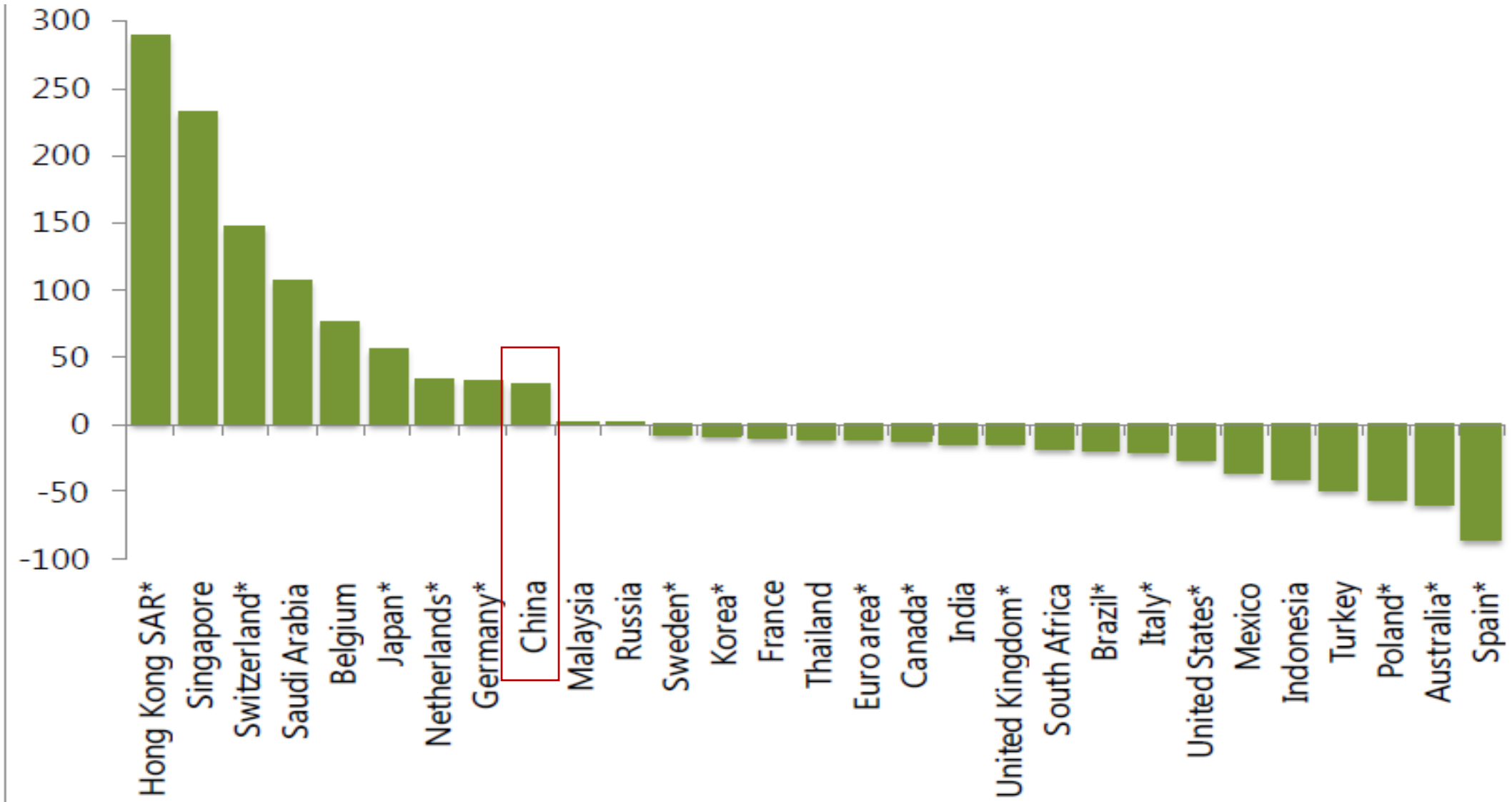
From Debtor to Creditor Under the Sterilized Intervention Policy

China's Net Foreign Assets: 1992-2011 (% of GDP)



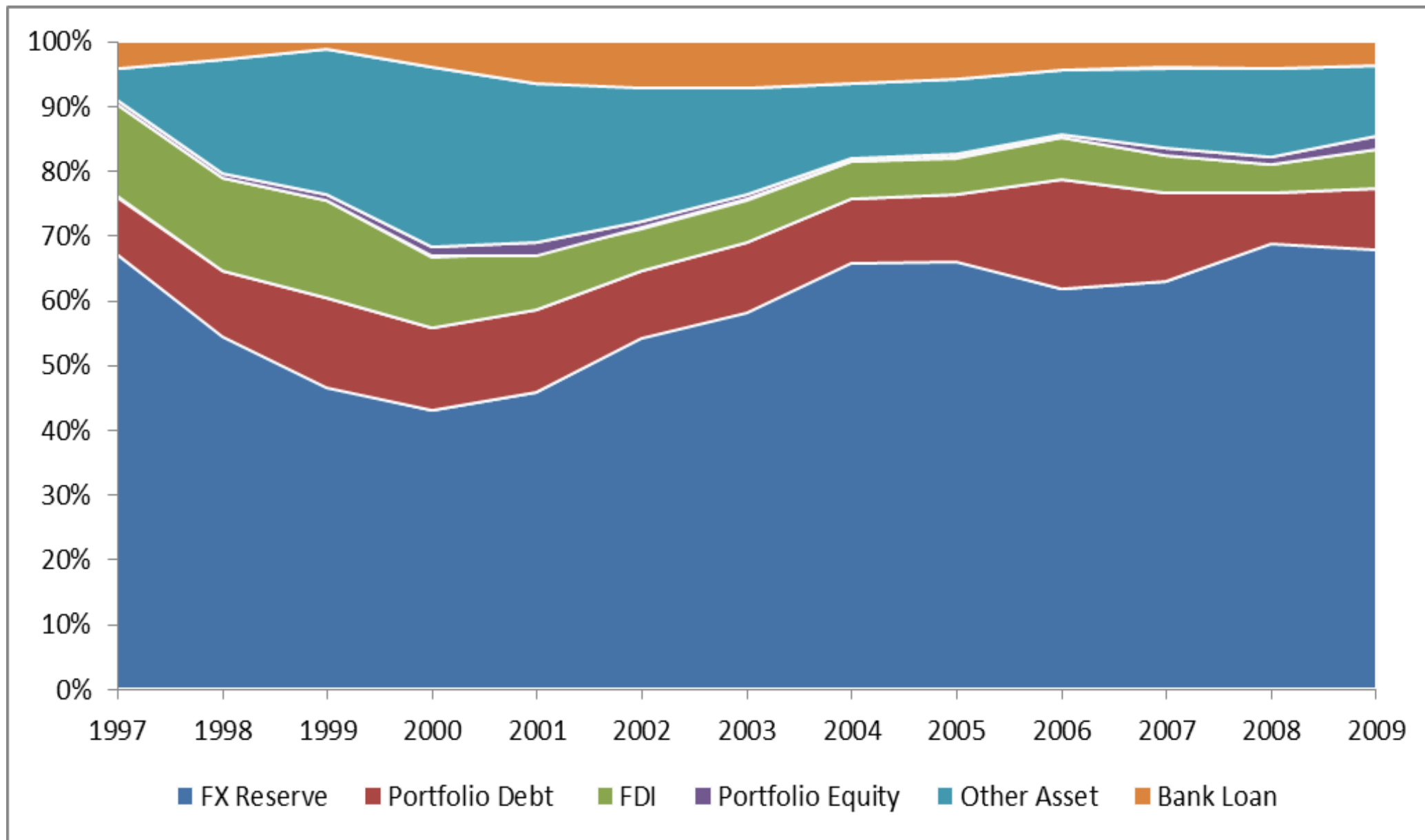
Source: IMF, Lane and Milesi-Ferretti (2013)

International Comparisons of Net Foreign Assets: 2011 (% of GDP)

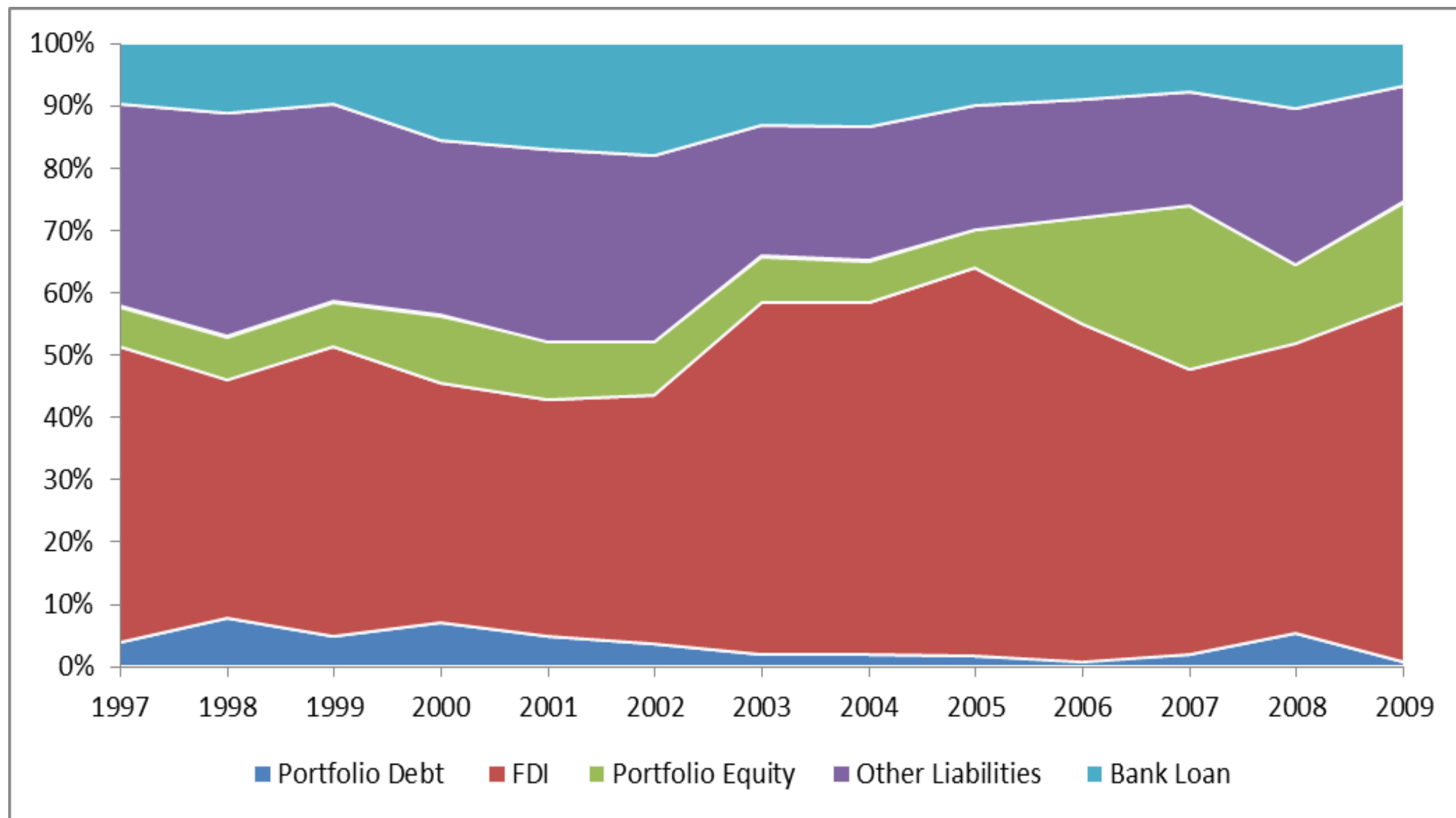


Source: IMF, World Economic Outlook Database(2011)

China's Gross Assets by Asset Class



China's Gross Liabilities by Asset Class

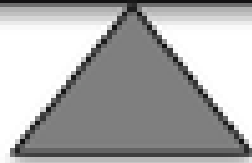


The Financial Cost of China's Policy of Sterilized Intervention

Real Returns on China's Foreign Assets and Foreign Liabilities (%)

	2001-2005	2006-2009
Return on foreign assets (FA)	-0.5	-0.6
Yield on FA	1.3	1.1
Capital gain on FA	-1.8	-1.7
Return on foreign liabilities (FL)	5.0	6.1
Yield on FL	4.8	3.7
Capital gain on FL	0.2	2.4
Return on net foreign assets	-5.5	-6.7

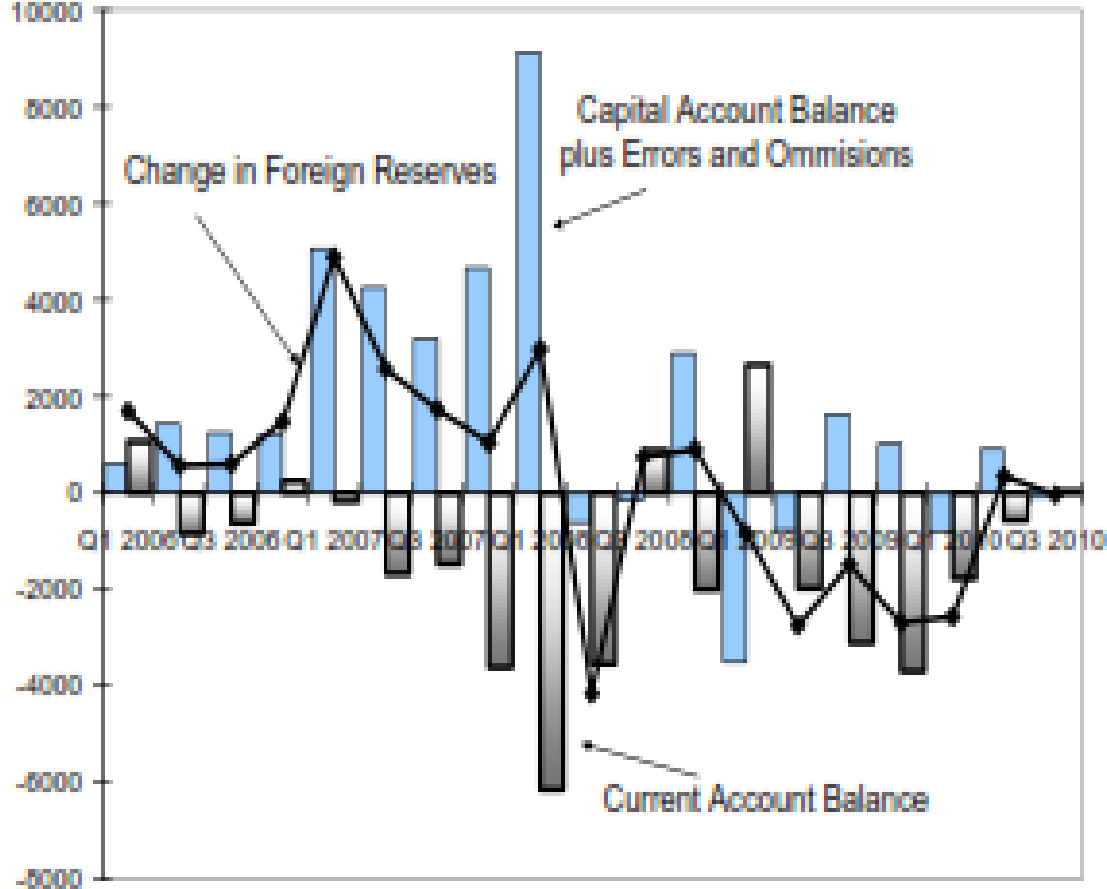
Source: Yi Huang, "From World factory to World Creditor: The External Wealth of China and Excess Returns," 2011



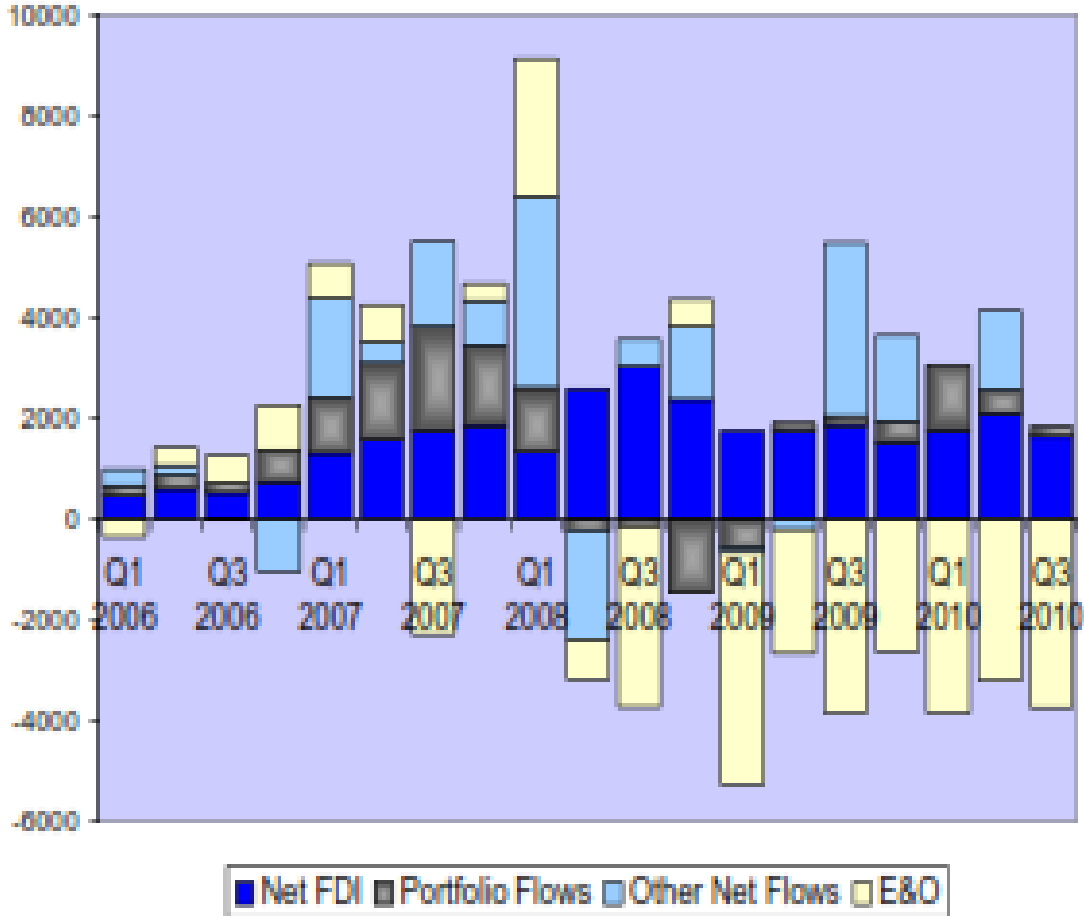
theBigRocks.com

Capital Inflows and Foreign Exchange Market Intervention in Vietnam: 2006-2010

Balance of Payment: Quarterly (USD millions)



Financial Account of BOP: Quarterly (USD millions)

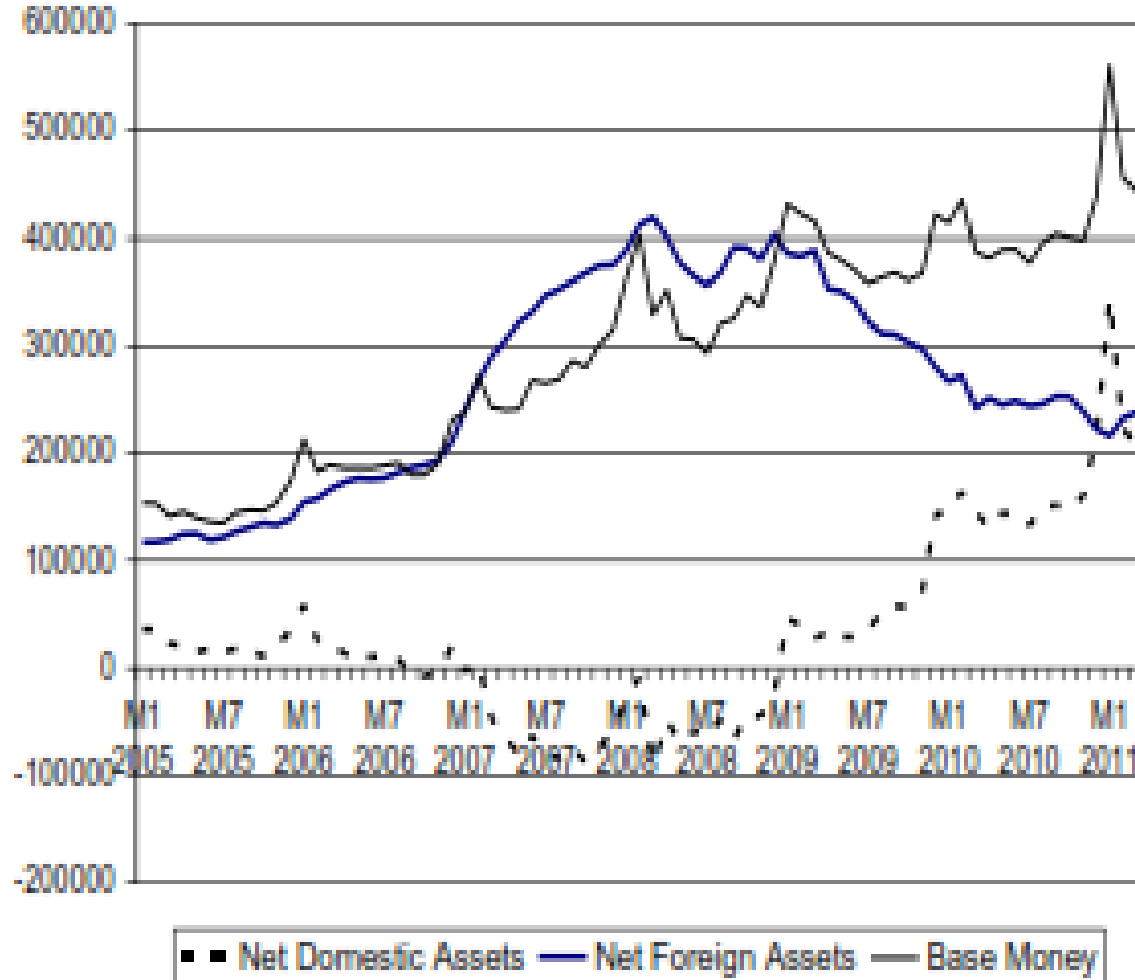


Source: IMF, International Financial Statistics, online.

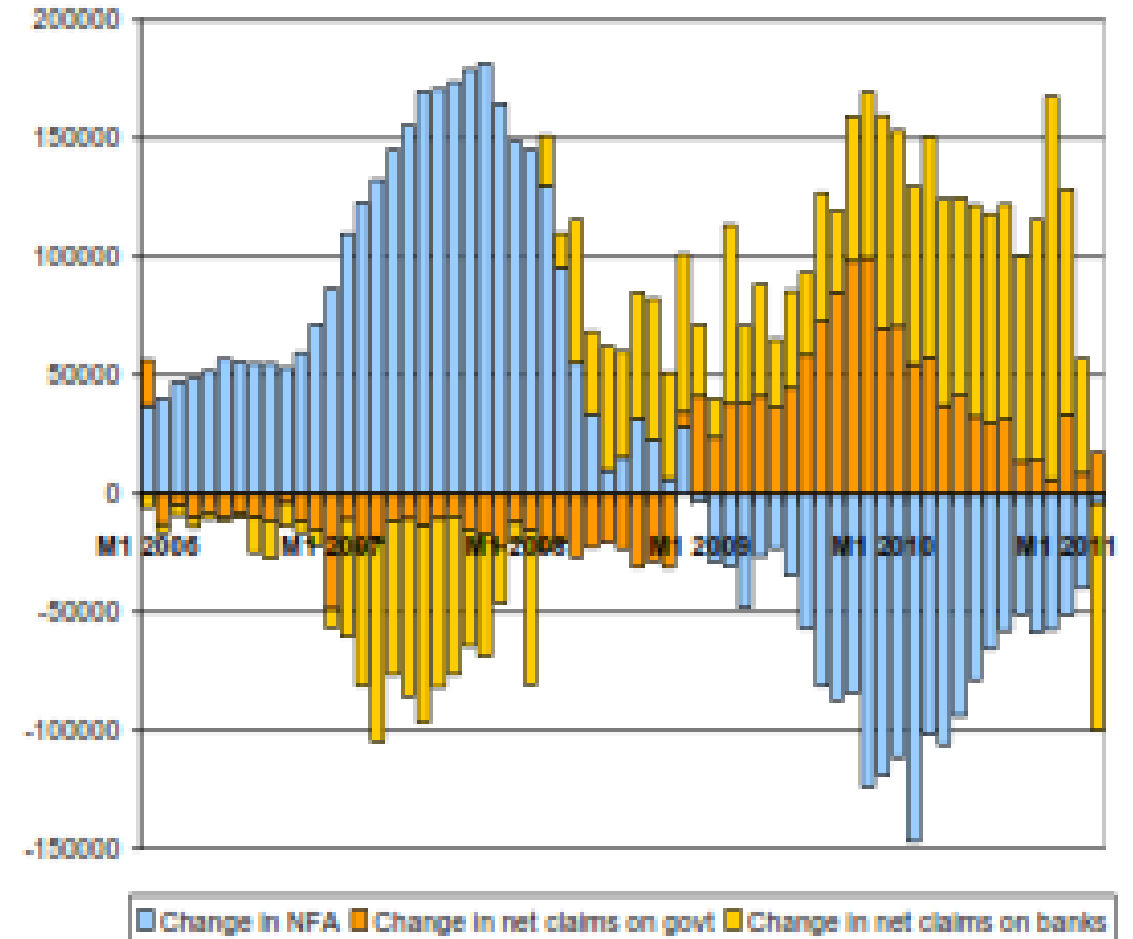
Source: Pham and Riedel, "On the Conduct of Monetary Policy in Vietnam," *Asia Pacific Economic Literature*, 2012.

Foreign Exchange Market intervention and Sterilization in Vietnam: 2005-2012

Base Money and Its Components: Quarterly (VND billions)



Change in Base Money: Quarterly (VND billions)



Source: IMF, International Financial Statistics, online

Source: Pham and Riedel, "On the Conduct of Monetary Policy in Vietnam," *Asia Pacific Economic Literature*, 2012.