Alessandro Missale

FINANCIAL INTEGRATION AND CRISES
2021

Lecture 6

Lecture 6

Sudden Stops*

- Sudden Stops of capital inflows
  - Main features
  - The cost of CA adjustment
  - Evidence from sudden stops
- Crisis Prevention; reserve assets accumulation
- Real Exchange Rate depreciation following a sudden stop
  - The Tradables Non-Tradables model

Reference: Calvo (1998), Calvo, Izquierdo, Mejia (2004), SUW Chap. 10

*The term "sudden stop" was inspired by a banker's comment that "It is not speed that kills, it is the sudden stop" quoted in Dornbusch, R. Goldfajn, I., Valdes, R.O. (BPEA 1995).

Sudden stops of capital inflows

- **Sudden Stops are sharp contractions of international capital inflows** that force a change in the Current Account from a deficit into a surplus which implies:
  - Output contraction;
  - Large real exchange rate depreciation;
  - Firms' and banks' failures, and financial disruption.

Sudden stops characterized the financial crises of the 1990s–2000s.
They usually followed periods of **sustained private capital inflows** that led to CA deficits and credit booms.
These inflows were often the result of the removal of capital controls.

Sudden Stops and Expectations

- **Sudden stops are often triggered by a change in investors' expectations** about the sustainability of the foreign liability position.
- Remember that sustainability depends on investors' expectations about future surpluses:

$$NFL_0 = \frac{E_0 TB_1}{(1+r)} + \frac{E_0 TB_2}{(1+r)^2} + \frac{E_0 TB_3}{(1+r)^3} \ldots + \frac{E_0 TB_\infty}{(1+r)^\infty} \qquad IBC$$

- **A change in expectations can trigger a crisis**: Foreign investors don't want to hold the country's liabilities and stop lending.
  As investors stop lending and liquidate their assets a crisis breaks up.
- The proximate cause of the crisis is '**the lack of foreign credit**' more than **the inability to pay**.

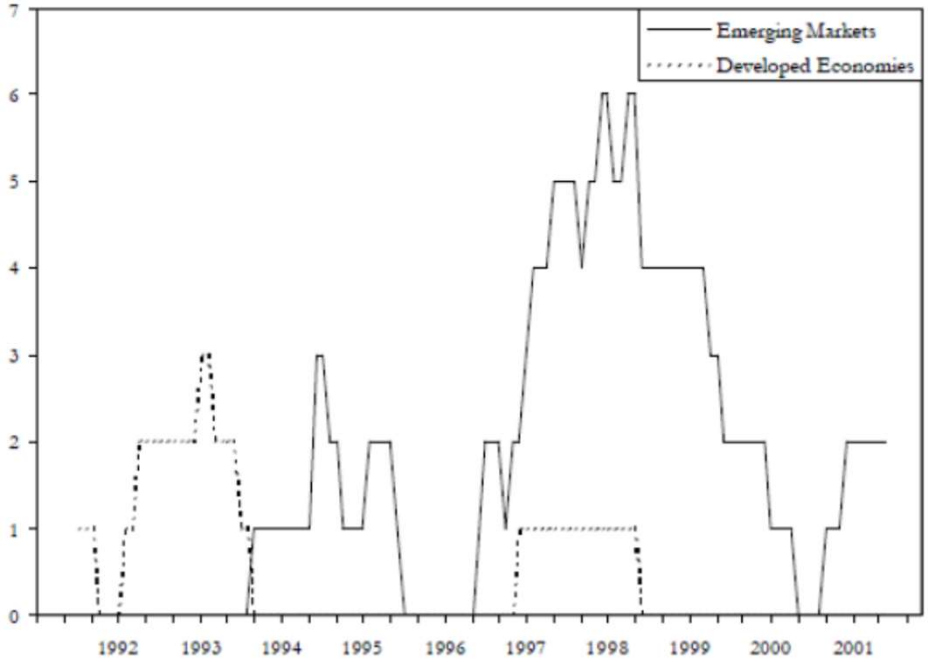
Sudden Stops Features

- Sudden Stops can be distinguished from debt crises because:
  - **The stop is not motivated by bad fiscal fundamentals**, say, twin deficits and the accumulation of debt, but in poor credit, weak banking sector, indebted firms, slow growth.
  - **Many countries are affected at the same time** which suggests an external origin, i.e. a role for: i) global shocks; ii) financial market spillovers; iii) contagion.
  - **Pessimistic Expectations** emerge around countries with no economic links; there is a generalized **change in market sentiment.**

Bunching of sudden stop events

Sudden stops tend to occur at the same time in different countries, with different fiscal fundamentals, also without trade and financial links

Calvo, Izquierdo, Meja (2004): Stops have an external origin; possibly a change in "market sentiment"; a revision in expectations.



Market sentiment plays an important role; Expectations may change because of news, wake up calls, similarities, etc.

Sudden stops can be self-fulfilling

- **Sudden stops *may* have a self-fulfilling nature:**
  - The expectations of an incoming crisis that trigger the sudden stop can be self-fulfilling because the stop causes a severe output contraction validating the initial pessimistic expectations.
  - Also note that sudden stops and capital reversals are similar to bank panics: For an investor it is rational to stop lending and liquidate her assets if she expects that everybody else will do the same.
- **However, multiple equilibria are not needed to rationalize sudden stops**. In fact, expectations may change and capital flows may stop because of news about fundamentals, bad shocks, and crises in other countries.

Sudden stops versus debt crises

The nature of capital flows and type of lenders play and important role.

The sudden stops (liquidity crises) of the 1990s-2000s were preceeded by large capital inflows following the removal of restrictions.

- Such flows came from many dispersed investors difficult to coordinate.
- Foreign investment could be easily liquidated as it was in liquid instruments: marketable bills and bonds, and short-term loans.

The debt crises of the 1980s took place in a world of low financial integration with restrictions to capital movements. Foreign capital came from:

- Loans arranged by coordinated banks' syndicates;
- Official sources: Governments and International organizations (WB, IMF)

In modern crises investors suddenly stops lending because of a change in expectations about the country's fundamentals and fears that other investors do the same, while the crises of the 1980s were mainly due to repayment difficulties.

Current Account Adjustment

Crises are different but the costs are similar

- A sudden stop of capital inflows, i.e. the lack of foreign credit, forces a current account adjustment: the CA must immediately turn from a deficit into a surplus* (or be balanced):

$$\text{from } CA < 0 \text{ to } \rightarrow CA \geq 0.$$

- Since $CA = NX + NI + NT$, Net Exports, NX, must improve, that is:

$$CA \uparrow \cong NX \uparrow \rightarrow Y \downarrow + \text{Real Depreciation}$$

Adjustment requires **a contraction in demand/output** and **a real depreciation**. (Expenditure reduction and Expenditure switching)

In particular, total domestic demand, or **absorption** $A \equiv C + G + I$ must fall relative to output: $NX = Y - A$

Therefore, **sudden stops and, more generally, crises are very costly**.

* Note: In practice, a capital reversal is usually observed.

The cost of crises

Equilibrium argument: Net exports must increase

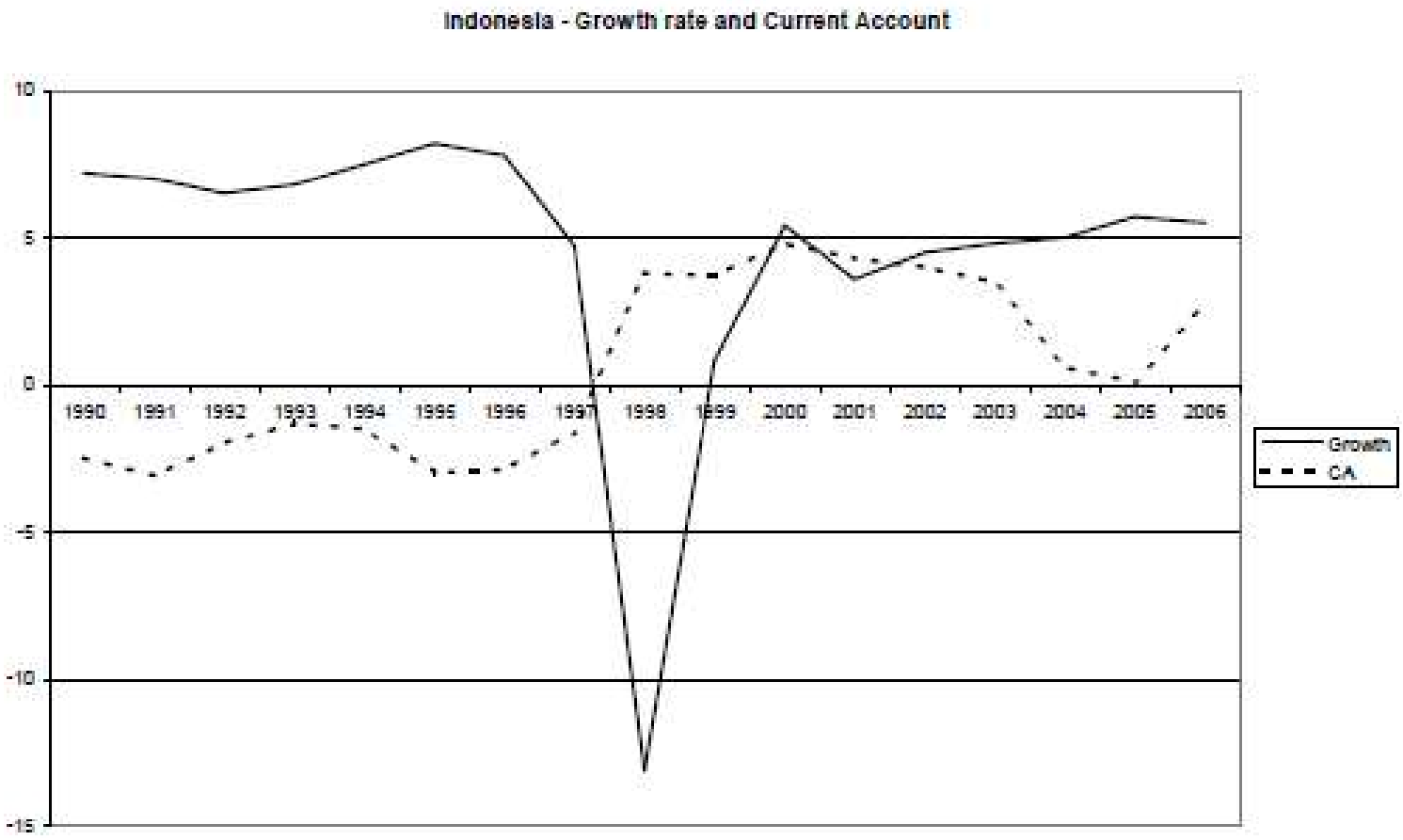
$$CA \uparrow \cong NX \uparrow \rightarrow Y \downarrow \; e \uparrow$$

which requires a fall in output and a real depreciation.

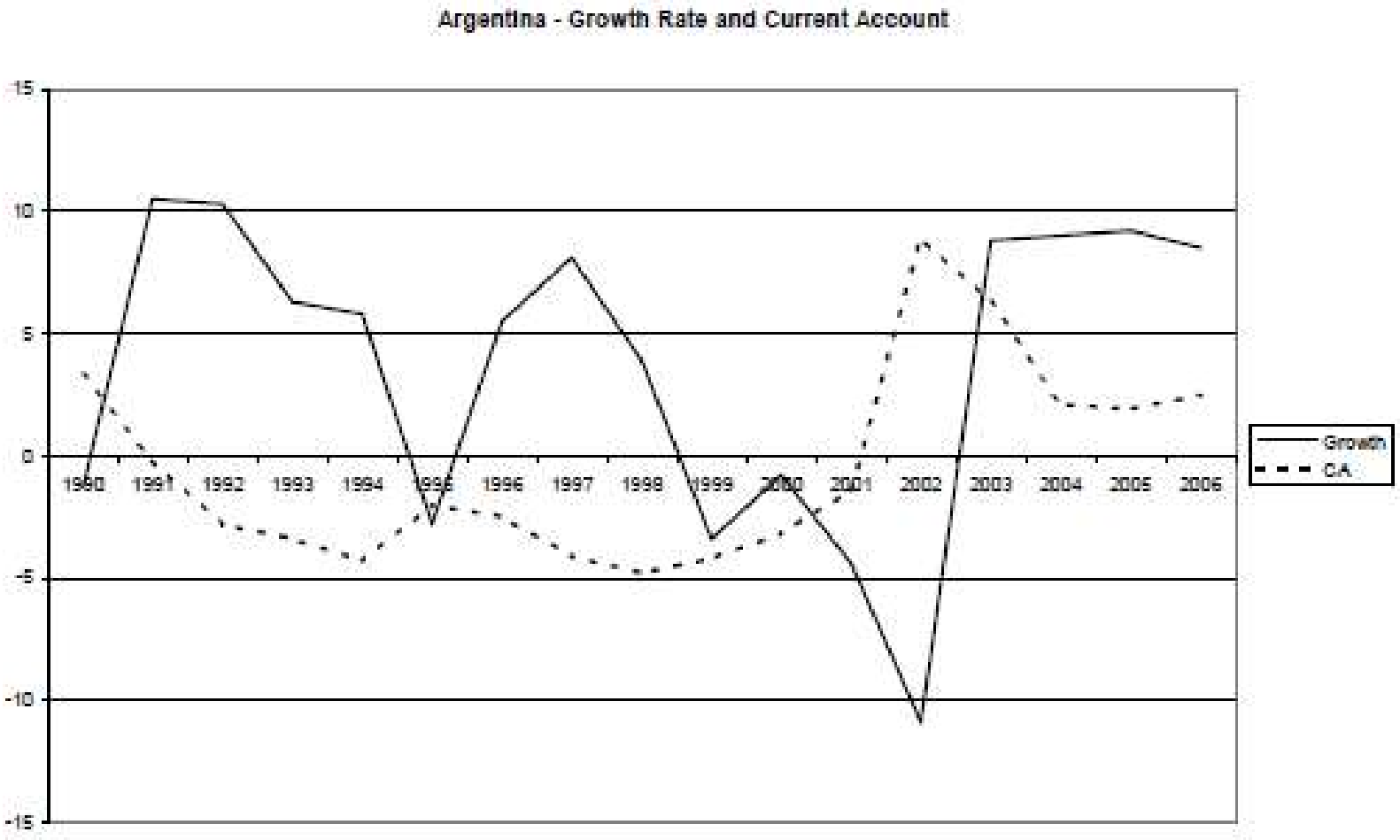
Narrative argument:

- The lack of foreign credit and the liquidation of foreign investments lead to a '**credit crunch**' and thus to high interest rates, contraction of investment and consumption, with firms and banks affected either directly or indirectly through the slowdown in economic activity.
- The capital outflow leads to an **exchange rate depreciation**.
- The credit crunch and the real depreciation may cause firms' and banks' failures, especially in the case they are indebted in foreign currency and firms operate in the non-tradable sector.

CA Reversal and Output Contraction Indonesia 1997-98

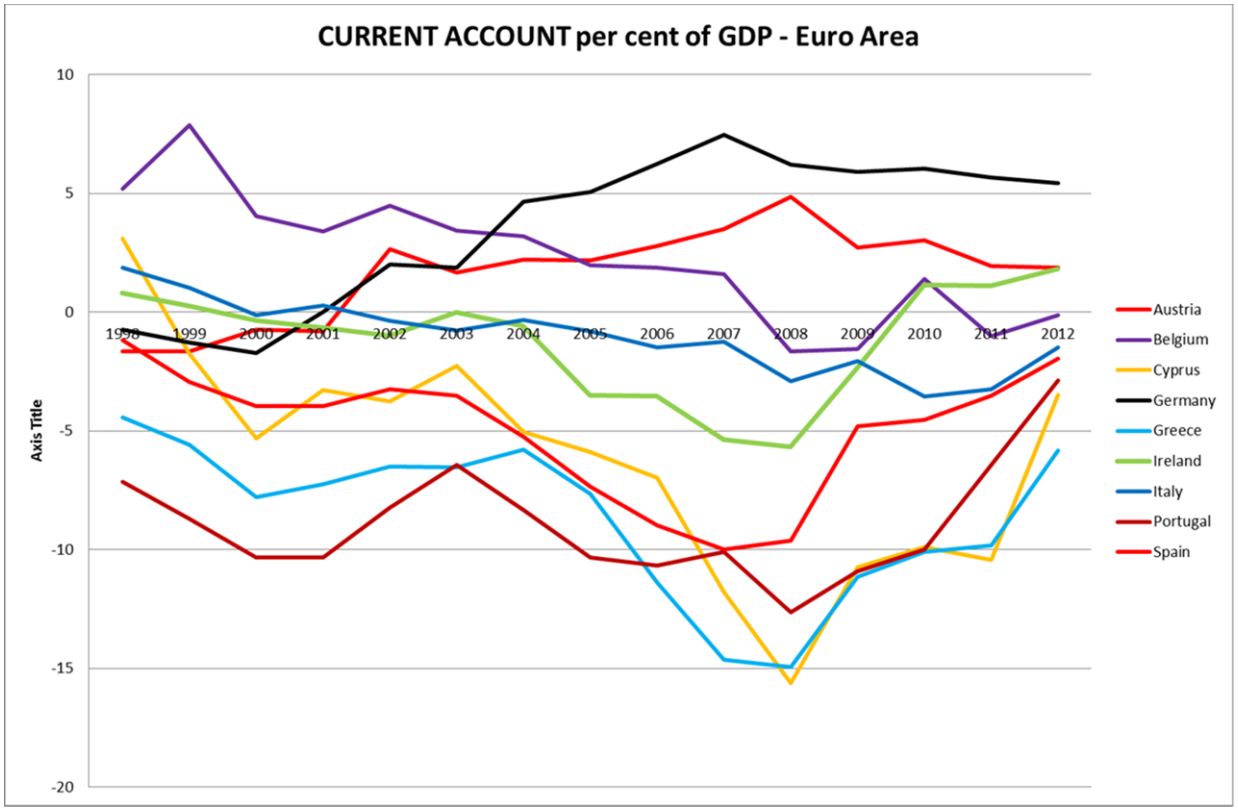


CA Reversal and Output Contraction Argentina 2001



CA Reversal and Output Contraction Thailand 1997-98

Current account reversal in the Euro Area following the Global financial crisis



Deficit countries were those most severely affected by the financial crisis when capital flows dried up and the asset-liquidation (deleveraging) process started

Crisis prevention

- Emerging and developing countries that are exposed to the risk of sudden stops and capital reversals can take various policy actions:
  - Re-introduce restrictions on capital movements;
  - Provide incentives for FDI over debt;
  - Develop domestic debt/bond markets to borrow in domestic currency;
  - **Accumulate liquid foreign reserve assets** (in dollars, yen, euro) at the Central Bank.

Foreign reserves as a self insurance

To cope with a sudden stop the Central Bank can sell its liquid reserve assets

- Consider **Foreign assets**: $A = A^P + R$

  where R are CB foreign reserve assets and A^P other foreign assets

- **The CA adjustment can be dampened by selling reserves, $\Delta R < 0$,** to make up for the lack of capital inflows, $\Delta L^* < 0$

$$\boldsymbol{CA}\ \textit{deficit} = \Delta L^* - \Delta A^{P*} - \Delta R$$

The deficit is financed by selling foreign reserves: $\Delta R < 0$

- This explains why:
  - Large amounts of reserves are lost during sudden stop episodes;
  - **Developing countries started accumulating reserves in the late 1990s**

If the CB pegs the exchange rate, the sudden stop is compounded by the speculative attack on foreign reserves, and we get a stop with currency crisis.

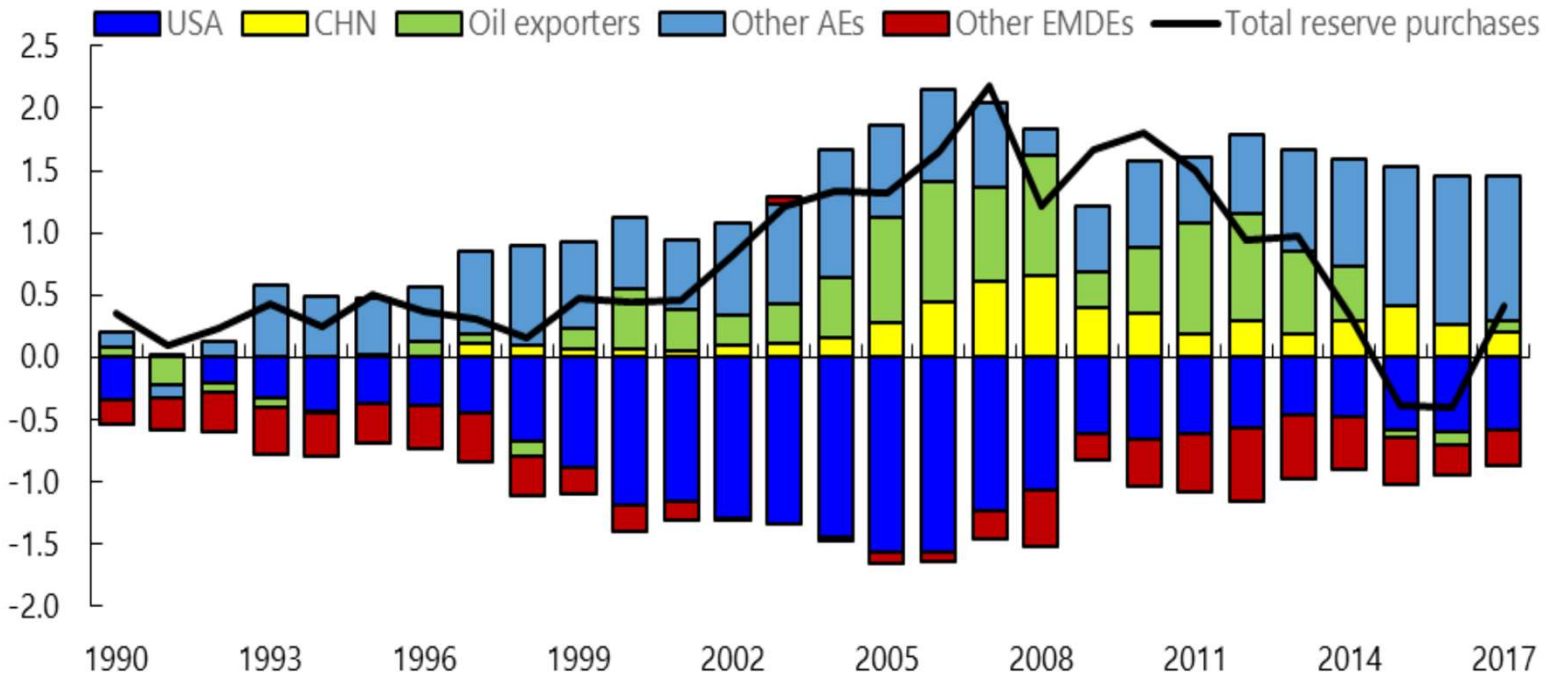
	Current Account Balance (% of GDP)	Real Foreign Reserves (% change)	Real Interest Rates (%)
Argentina-94	1.40	-40.95	20.36
Argentina-99	1.75	-14.17	0.97
Argentina-01	13.43	-48.61	48.05
Chile-98*	4.57	-22.30	24.15
Colombia-98	6.24	-18.29	36.28
Czech Republic-97	4.94	-33.44	13.97
Ecuador-99*	15.63	-72.90	10.37
Germany-93	-0.43	-43.03	1.05
Indonesia-97	7.41	-24.48	102.16
Japan-97	1.62	-10.68	3.88
Korea-97	17.15	-41.14	21.49
Mexico-94	5.25	-85.16	56.07
Peru-97*	0.58	-6.58	11.03
Philippines-97	6.85	-31.54	20.20
Portugal-92	1.19	-40.53	11.71
Spain-92	2.48	-44.12	3.69
Sweden-92	0.57	-35.52	68.79
Thailand-96	5.82	-37.22	17.34
Turkey-94	2.44	-53.06	132.08
Turkey-98	0.41	-10.94	23.31
Turkey-01	4.04	-34.89	209.02

Trough to Peak Differences in a 2-year window centered at the beginning of the sudden stop

Calvo, Izquierdo, Meja (2004)

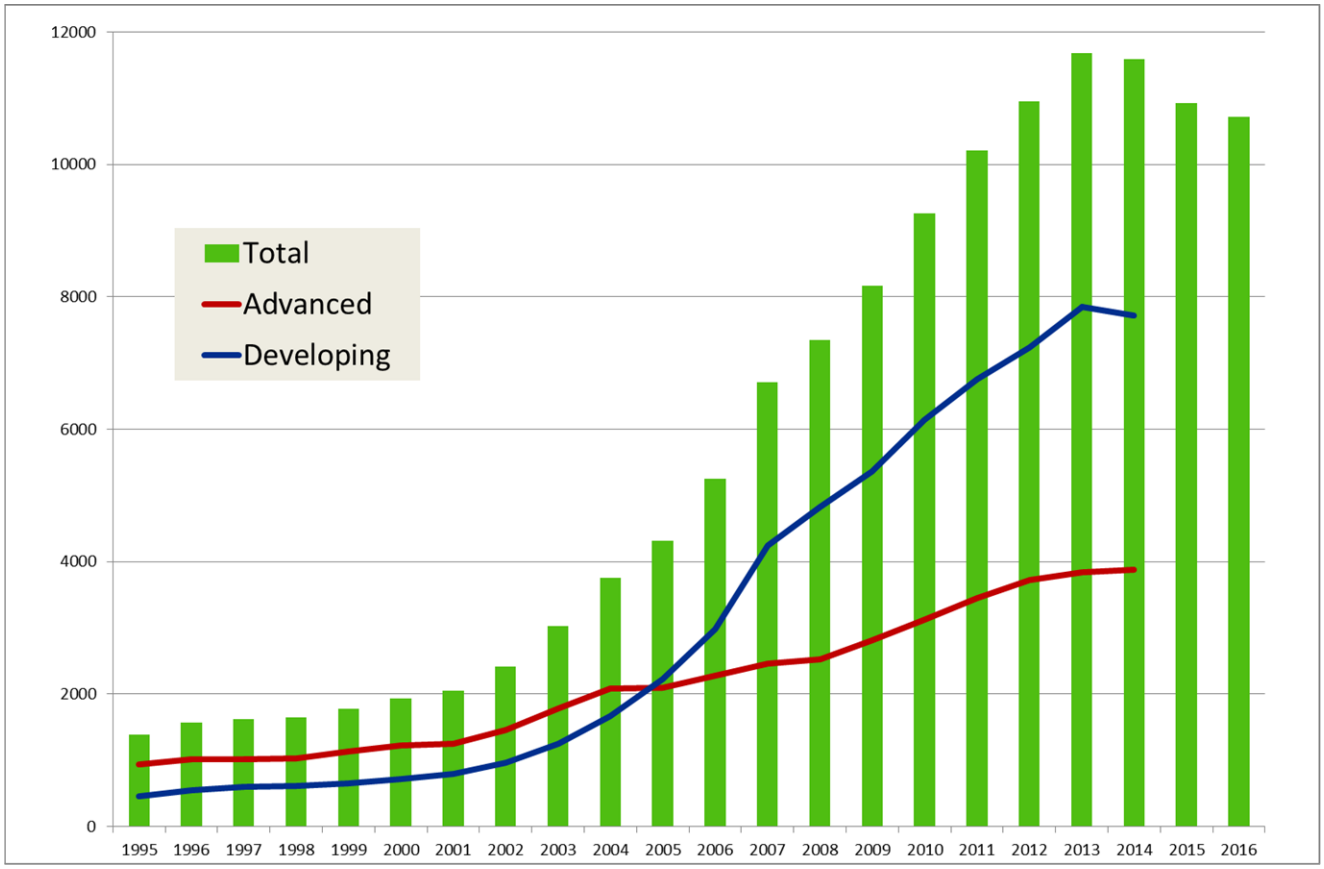
Account surpluses are highly aligned with reserve assets purchases until 2007

CA blances and reserve purchases 1990-2017 - percent of world GDP



Source: World Economic Outlook.

Foreign reserves, world total in US $ billion Advanced and Developing countries, 1995–2016



Reserves by country	
April 2016	US$ billion
China	3,520
Japan	1,321
Euro Area	820
Switzerland	661
Saudi Arabia	581
Russia	407
Hong Kong	380
Rep Korea	372
India	366
Brazil	362

Source: IMF COFER

The cost of insurance

- The insurance strategy to avoid crises by:
  - Attracting FDI rather than borrowing with debt;
  - Accumulating foreign exchange reserves

  is very costly:
- The returns on FDI, i.e. profits, are usually much higher than the return on bonds.
- Foreign reserves in liquid US Treasury bills and bonds yield a very low return while the same funds could be invested in assets with much higher returns.

Countries accumulating reserves pay an insurance premium

Sudden stop and real depreciation

Why do Sudden Stops lead to large real exchange-rate depreciations?

- For instance, in the Argentina 2001 crisis*, the nominal exchange rate went from 1 peso per dollar to 3.5 pesos per dollar in February 2002;

  a devaluation of 111% $= \widehat{S_t} = \frac{S_t - S_{t-1}}{0.5(S_t + S_{t-1})}$ (1)

- In 2002, as the domestic price of importables, $P_M = SP_M^*$, increased, domestic inflation reached 41%, and **the real exchange rate strongly depreciated**: $\hat{e} = \hat{S} + \pi^* - \pi = 111 + 2 - 41 = 72\%$ (2)

*In December 2001 nobody was willing to lend to Argentina anymore, including the IMF, Argentina was forced to abandon the Convertibility Plan; ie the one-Peso-one-Dollar fixed exchange-rate parity, and defaulted. The Plan had been adopted back in 1991 to stop inflation.

The relative price of non-tradables

- To gain insight in the Argentine 72% real depreciation, consider the price level $P = P_N^{\alpha} P_T^{1-\alpha}$ where P_T and P_N are the prices of tradable and non-tradable goods and $\boldsymbol{\alpha}$ is the weight (share) of non-tradables. Assuming the same specification for the US price level P^*, we can write:

$$e = \frac{SP^*}{P} = \frac{SP_N^{*\alpha} P_T^{*1-\alpha}}{P_N^{\alpha} P_T^{1-\alpha}} = \frac{SP_T^*(P_N^*/P_T^*)^{\alpha}}{P_T(P_N/P_T)^{\alpha}} = \frac{(P_N^*/P_T^*)^{\alpha}}{(P_N/P_T)^{\alpha}} \qquad (3)$$

where the last equality comes from the Law of One Price for tradables

Taking log, $ln(e) = \alpha\, ln(P_N^*/P_T^*) - \alpha\, ln(P_N/P_T)$ and first differencing

- $$\hat{e} = 72 = \alpha(\widehat{P_N^*/P_T^*}) - \alpha(\widehat{P_N/P_T}) = 0 - \alpha(\widehat{P_N/P_T}) \qquad (4)$$

- As the US relative prices did not change, **the Argentine real depreciation reflects a dramatic fall in the relative price of non-tradables.**
  Example: In case $\alpha = 0.5$ the relative price must fall by 144% which would require the price of non-tradable to fell by 33% becausee the price of tradables increased by 111%.

Sudden stop and the change in relative price

Why does a SS cause such a fall in the relative price of non-tradables?

- The lack of credit and the capital outflow lead to a sharp contraction in absorption. Both the demand for tradables and nontradables fall.
- At given relative prices, P_N/P_T, the market for tradables is cleared by lower imports (recall that $NX < 0$ must turn into $NX \geq 0$)
- But, with constant P_N/P_T **the market for nontradables would not clear**: there would be more supply of non-tradables than demand.
- **The price of non-tradables must fall relative to that of tradables** for firms to shift production from the non-tradable to the tradable sector.
- **As P_N/P_T falls the real exchange rate depreciates**. The adjustment mainly comes from the nominal depreciation that increases the domestic price of tradables (the LOP holds) but also from a fall in P_N.

Note that the re-allocation of resources from one sector to the other takes time and workers in the non-tradable sector experience high unemployment.

The TNT Model

TNT two sector model

- For simplicity, assume $CA = NX$; that is NI=0 and NT=0

Equilibrium in the market for goods and services implies:

- $Y = Z + NX$ (1)

  where $Z \equiv C + I + G$ is domestic demand or absorption

Note: Y, Z, NX are in real terms of tradable goods. In Nominal terms:

- $P_T Y = P_T Q_T + P_N Q_N = P_T Z_T + P_N Z_N + P_T NX$ (2)

Divide by P_T, define $P_N/P_T \equiv p$ and solve for NX

- $NX = Q_T - Z_T + pQ_N - pZ_N$ (3)

In equilibrium the market for non-tradable must clear:

- $Q_N = Z_N$ while $NX = Q_T - Z_T \neq 0$ (4)

Disequilibrium and relative prices

Then, start from an equilibrium in which $Q_N = Z_N$ and $NX < 0$

- $NX = Q_T - Z_T + p(Q_N - Z_N) < 0$ (5)

Suppose **the sudden stop forces a fall in aggregate demand $Z \downarrow$** so that net exports improve:

- $\uparrow NX = Q_T - Z_T \downarrow + pQ_N - pZ_N \downarrow$ (6)

This cannot be an equilibrium because now: $Q_N > Z_N$

Equilibrium can be restored only if the production of non-tradables decreases and that of tradables increases:

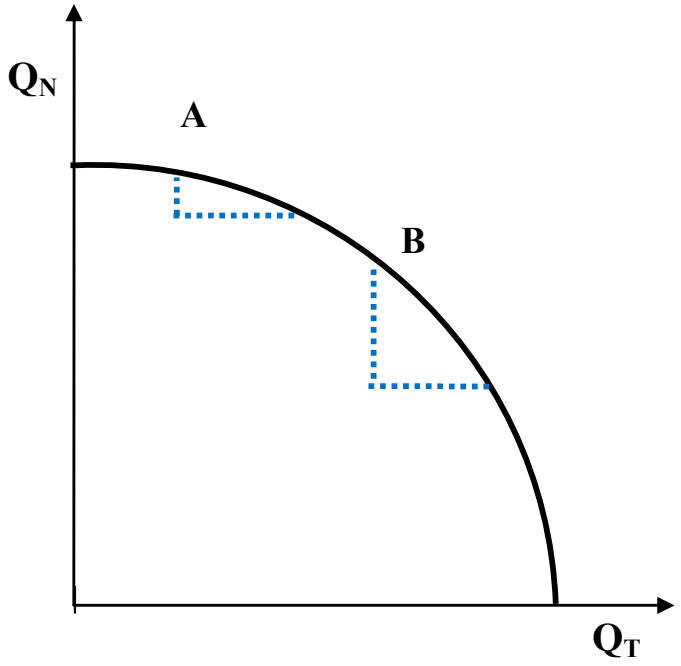
- $Q_T \uparrow$ and $Q_N \downarrow$ Need a change in relative prices $(P_N/P_T) \downarrow$ a real depreciation to reduce the supply of non-tradable goods (and increase their demand).

The fall in Z_T and the increase in Z_N due to the substitution effect also help to restore the equilibrium.

The production possibility frontier

The production possibilities of an economy are described by the PPF

The allocation of given resources, eg labor, between the two sectors determines the combination of tradables and non-tradables.



To increase Q_T we must reduce Q_N

The simplest model is

$Q_T = F_T(L_T)$ and $Q_N = F_N(L_N)$

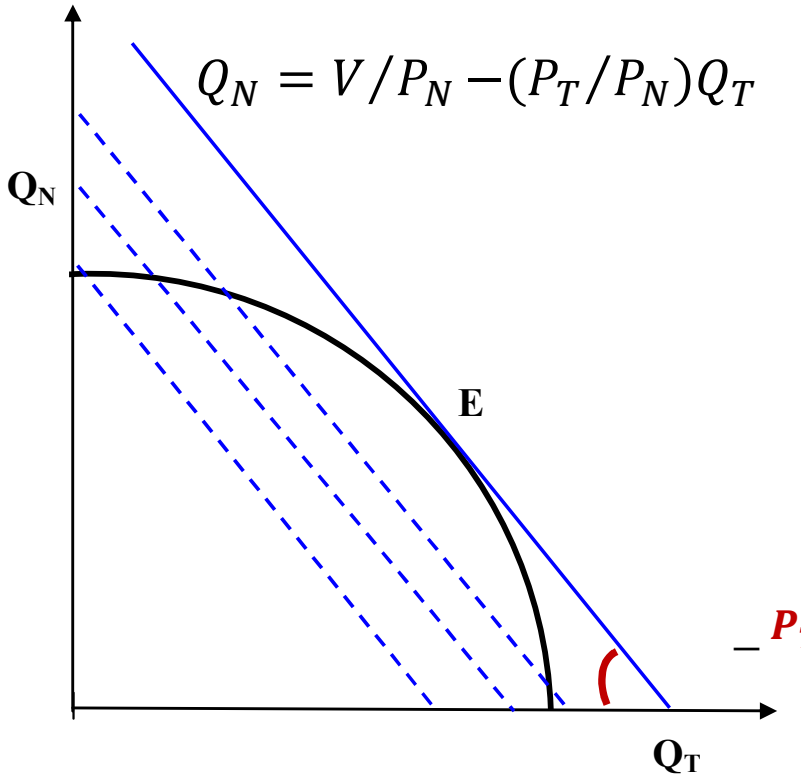
with $L = L_T + L_N$ and

decreasing marginal productivity of Labor in at least one sector. The latter implies that, to increase Q_T, we must give up increasing amounts of Q_N because labor becomes less and less productive in the T sector.

The slope is the marginal rate of transformation or the opportunity cost

Output Maximization

The combination of Q_T and Q_N that **maximizes the value of production**, $V = P_T Q_T + P_N Q_N$ is the combination on the highest possible isovalue line (the line with constant V)

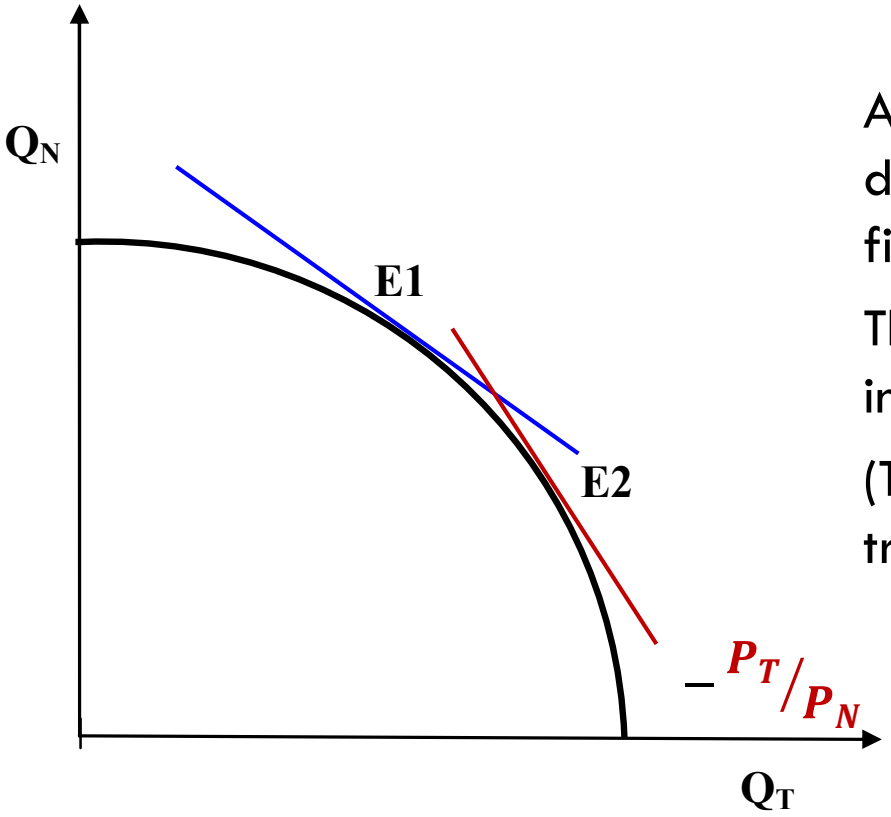


For any given P_T/P_N the highest V is where the isovalue is tangent to the PPF

A change in the relative prices

A decrease in the relative price of non-tradables $\frac{P_T}{P_N} \uparrow$

i.e. a real depreciation moves the economy from E1 to E2



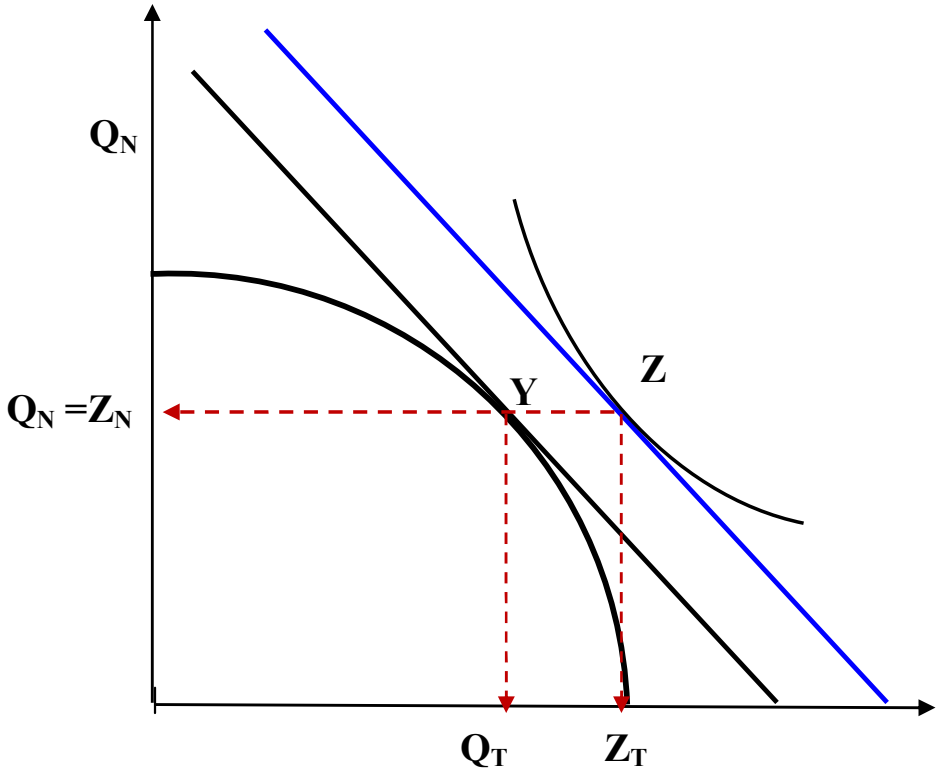
As the relative price of non-tradables decreases, it becomes profitable for firms to increase Q_T and decrease Q_N

The relative supply of tradables increases.

(The demand for labor increases in the tradable sector)

Domestic Demand

In a financially integrated economy Domestic demand (or Absorption), point Z, needs not be equal to output, point Y



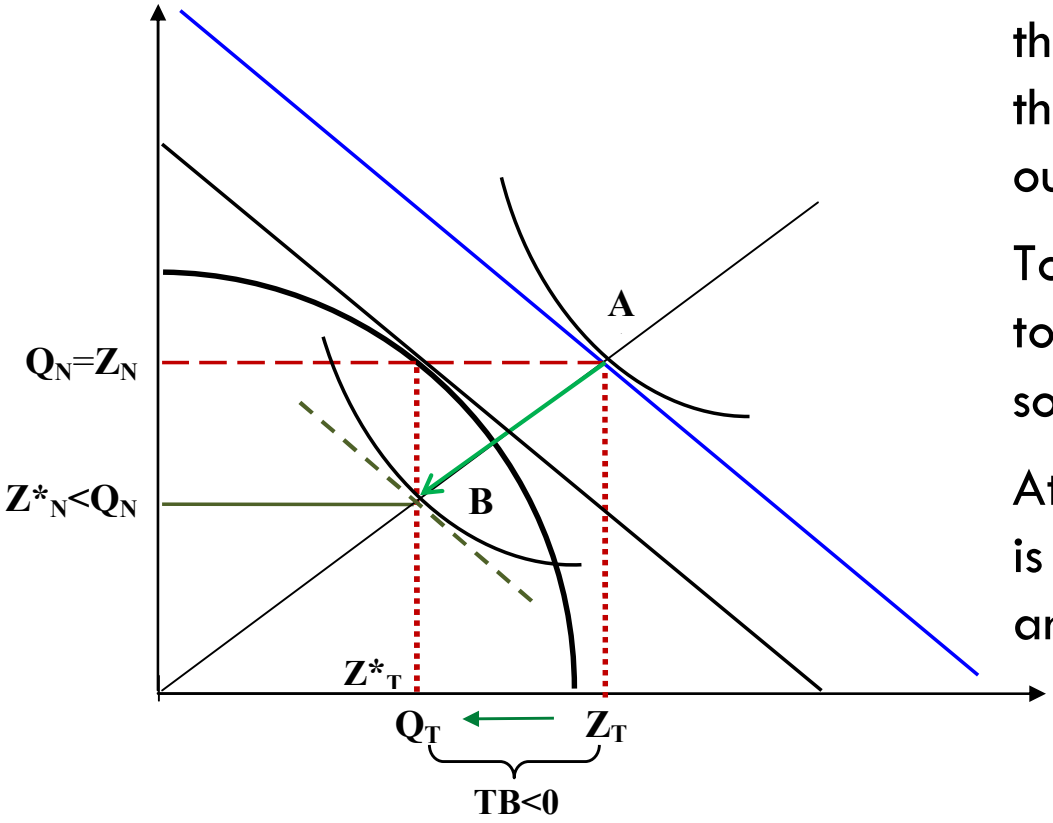
In the graph Domestic Demand Z (or Absorption) is greater than output Q.

The country is financing the excess demand by capital inflows from the rest of the world and $NX = Y - Z < 0$

Note that the slope of the isovalue and the slope of the budget available for Z are the same.

The impact effect of a sudden stop

The effect of a strong Demand contraction



In the initial equilibrium, at point A, there is a current account deficit and thus total demand Z is greater than output, and $NX = Q_T - Z_T < 0$.

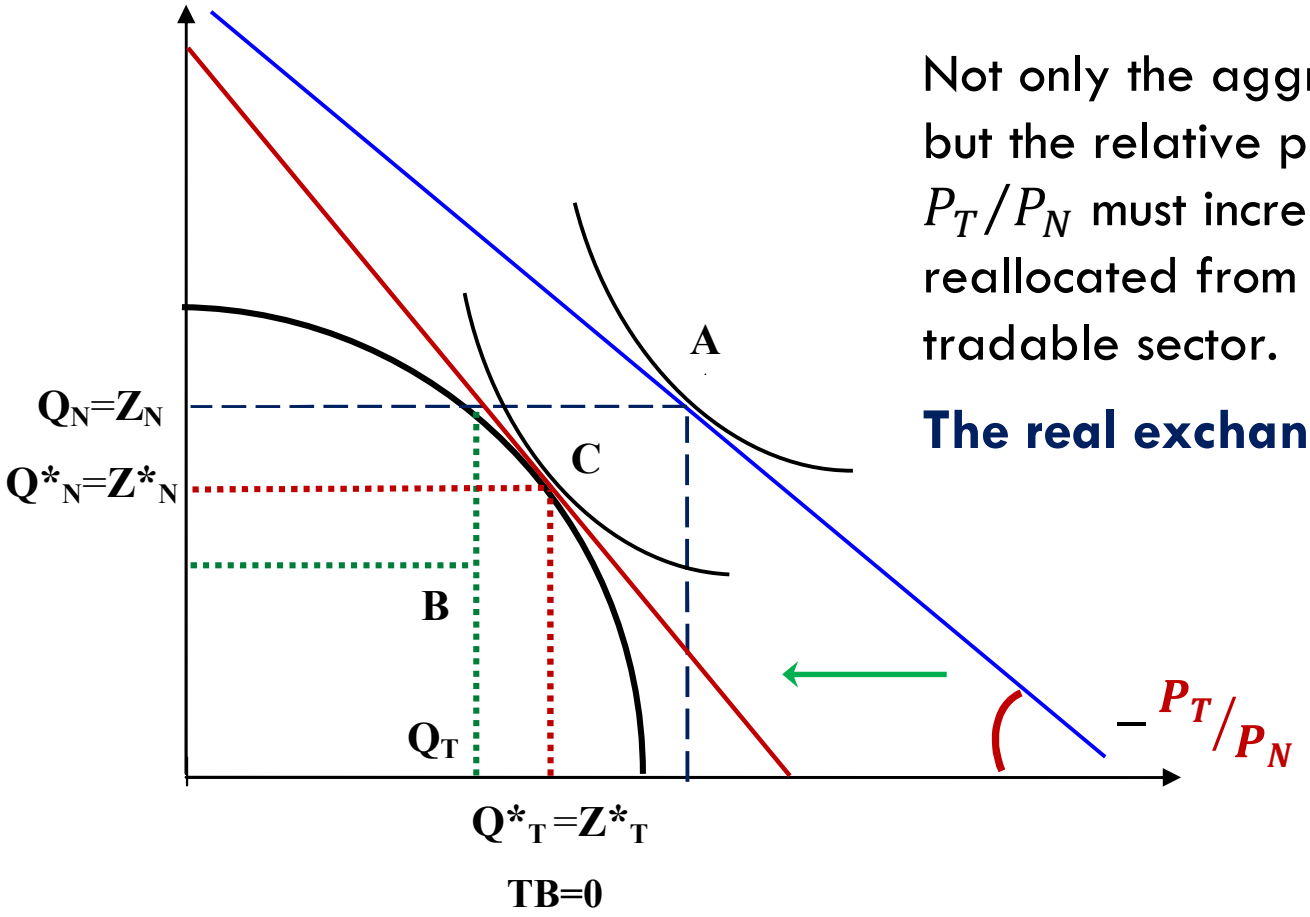
To achieve a zero trade balance, total demand must fall to point B so that $Z_T^* = Q_T$.

At point B, however, $Q_N > Z_N^*$, there is an excess supply of non-tradables and their relative price must fall;

- i.e. the real exchange rate must depreciate.

Adjustment in the real exchange rate

To have a balanced trade, $NX = 0$, and equilibrium in non-tradable sector we need both a demand contraction and a real depreciation

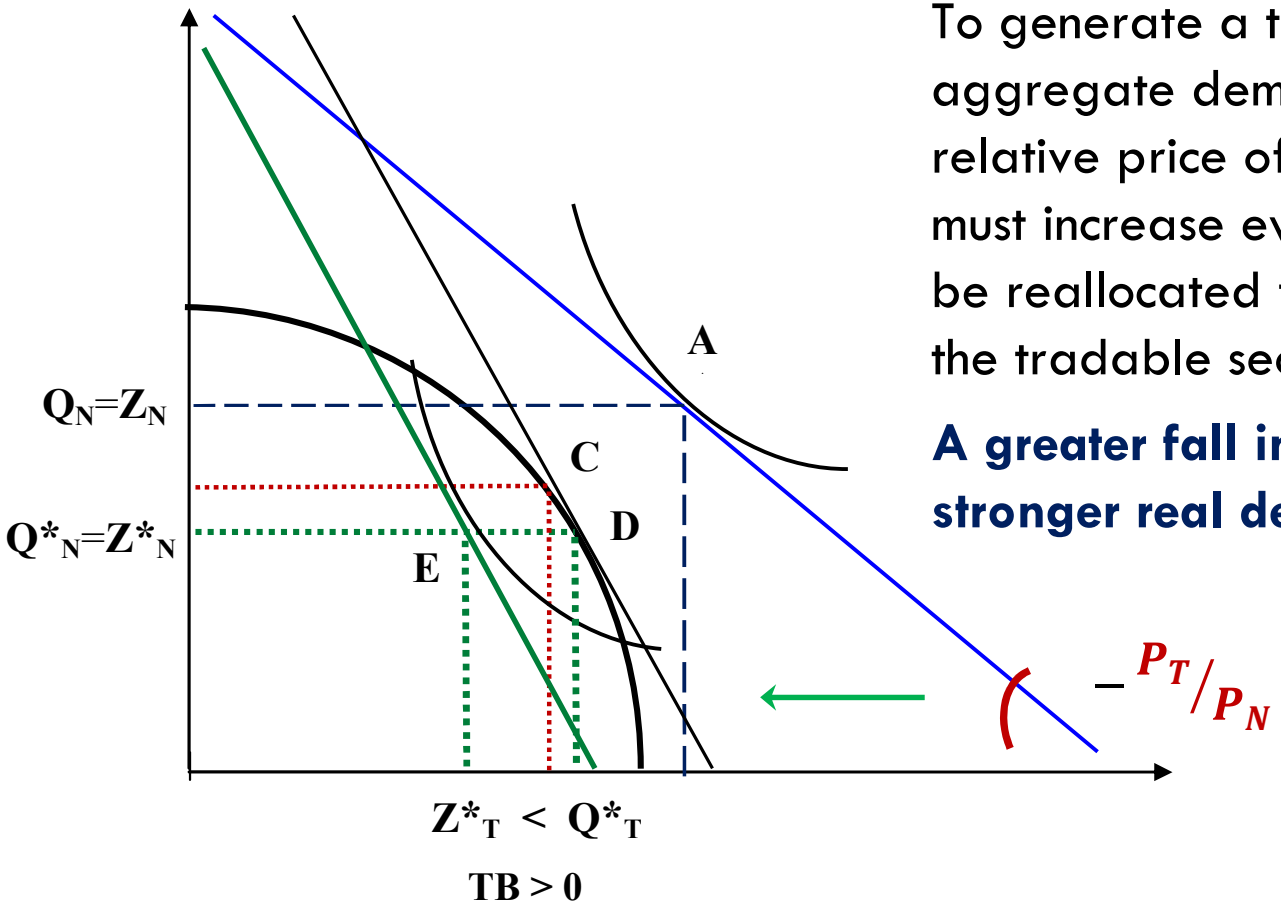


Not only the aggregate demand must fall but the relative price of tradable goods P_T/P_N must increase for resources to be reallocated from the non-tradable to the tradable sector.

The real exchange rate must depreciate

Adjustment to a capital reversal

A capital reversal implies $NX > 0$, and thus a stronger real depreciation and demand contraction



To generate a trade surplus the aggregate demand must fall and the relative price of tradable goods P_T/P_N must increase even more for resources to be reallocated from the non-tradable to the tradable sector.

A greater fall in Demand and a stronger real depreciation are needed

Output Contraction

- The graphical framework assumes full employment and cannot explain the obseved unemployment and contractions in GDP.
- GDP falls because of lower AD through traditional channels:
  - Lower foreign and domestic credit and higher interest rates.

The production possibility frontier also moves inward because:

- **Domestic liability dollarization (DLD) leads to bankruptcies of non-tradables producers** that borrowed in foreign currencies, (ie through balance sheet effects due to valuation changes).
- **Bank failures** originate from DLD directly or because of non-performing loans in the NT sector (and low capital ratios).
- Firm failures destroy physical and human capital.

Evidence by Calvo, Izquierdo, Mejia (2004)

- Evidence suggests that the probability of a Sudden Stop increases with:
  - The extent of Domestic Liability Dollarization (DLD);
  - The expected real depreciation (*estimated by the CA deficit relative to consumption of tradable $^{CAD}/_{Z_T}$ - ie how such consumption is leveraged);
  - The interaction between DLD and $^{CAD}/_{Z_T}$
- while it is not affected by:
  - The exchange rate regime;
  - Fiscal fundamentals.
- Does this lends support to the idea that sudden stops are self-fulling?

*Assuming that output in both sectors does not change on impact, and equilibrium in non-tradables holds, then all the CA adjustment is brought about by a contraction in the demand for tradables: $CAD = -\Delta Z_T$. The latter calls for a RER depreciation that depends on the elasticity γ of Z_T demand to RER:

- $\frac{\Delta Z_T}{Z_T} = -\gamma \frac{\Delta RER}{RER}$ $\qquad$ $\frac{\Delta RER}{RER} = -\frac{1}{\gamma}\frac{\Delta Z_T}{Z_T} = \frac{1}{\gamma}\frac{CAD}{Z_T}$

Panel PROBIT

All Countries – Dependent Variable: Sudden Stop Indicator

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CAD/Z_T	5.193	4.812	4.915	4.745	4.825	4.818	6.099
	(1.836)***	(1.834)***	(1.841)***	(1.842)***	(1.849)***	(1.848)***	(2.402)**
DLD	7.924	7.009	6.948	6.961	7.106	7.104	7.513
	(2.183)***	(2.255)***	(2.267)***	(2.275)***	(2.292)***	(2.290)***	(3.090)**
EM Dummy		0.460	0.463	0.473	0.444	0.443	0.174
		(0.403)	(0.405)	(0.396)	(0.398)	(0.398)	(0.586)
TOT Growth			-1.383	-1.369	-1.380	-1.371	-1.857
			(2.220)	(2.212)	(2.216)	(2.218)	(2.299)
Total Debt over Revenues				0.014	0.009	0.009	0.026
				(0.115)	(0.116)	(0.116)	(0.131)
Ex. Regime 3					0.028		
					(0.165)		
Ex. Regime 5						0.019	0.001
						(0.109)	(0.130)
Reserves over CAD							-0.003
							(0.006)
M2 over Reserves							-0.036
							(0.031)
Credit Growth							-1.919
							(1.341)
FDI/GDP							-1.372
							(9.096)
Public Balance/GDP							2.382
							(6.386)
Constant	-3.393	-3.560	-3.558	-3.563	-3.599	-3.610	-3.154
	(0.762)***	(0.790)***	(0.788)***	(0.812)***	(0.876)***	(0.896)***	(1.132)***
Observations	302	302	302	298	296	296	294