	Period		
Region	1980-1996	1997-2006	2007-2012
United States	-0.44	-1.17	-0.86
Japan	0.32	0.36	0.26
European Union	-0.10	0.04	-0.07
Oil producers	-0.06	0.28	0.57
China	0.01	0.15	0.49
Emerging Asia ex-China	-0.01	0.19	0.26
Latin American and Caribbean	-0.13	-0.10	-0.07
Rest of the World	-0.08	-0.02	-0.14

FIG. 2.65 – Current Account Balances, fraction of world GDP. Notes : Oil producers consists of Canada, Norway, Mexico, Russia, Venezuela, Saudi Arabia, Iran, Kuweit, Libya, Oman and Bahrein. Emerging Asia ex-China consists of Taiwan, Korea, Malaysia, Indonesia, Philippines, Singapore and Thailand. Source : Gourinchas and Rey (2014) External Adjustment, Global Imbalances, Valuation Effects. Handbook of International Economics, vol IV.

2.6.4 US Current Account Deficit over 1997-2006 and Global Imbalances

After the Asian crisis, capital flows move in the opposite direction. Over the last twenty years capital has flown from South to North, and especially towards the United States, arguably among the most advanced economies in the world. The large current account deficits of the United States have started to expand after the Asian Crisis to reach 5.3% of US GDP in 2004, 5.8% in 2005 and about 6% in 2006. Figure 2.66 illustrates this pattern by reporting the current account balances of various groups of countries, as a fraction of world output between 1980 and 2012. Table 2.65 reports average ratios of current accounts to world output for three periods : between 1980 and 1996 (before the Asian financial crisis) ; from 1997 to 2006 (between the Asian and global financial crises) ; and since 2007. U.S. current account deficits have been financed by a broad array of creditors, mostly Japan in the 1980s and early 1990s, oil producing economies and emerging Asia since 1996, and especially China over the recent period. These massive net capital flows into the world's dominant capital market have been referred to as global imbalances.

Figure 2.67 reports the world real interest rate over the same period. We observe a dramatic decline in the world real interest rate, from 5-6% at the beginning of the 1980s, to -2% by the end of 2011. As Bernanke (2005) observed in his early and influential piece on the 'savings glut', any account for the pattern of global imbalances needs also to be consistent with the evidence on real interest rates.

Stylized Fact 1 (Global Imbalances) : The largest and arguably most advanced world economy, the United States, has been a net capital importer since 1982 and has been increasingly financed by fast growing emerging economies. The absolute value of world current account balances scaled by world GDP, the 'global imbalances', have been increasing starting in 1996 with a short dip at the time of the 2001-02 recession and a more sustained one since 2008. The emergence of these global imbalances coincides with a general decline in world real interest rates.

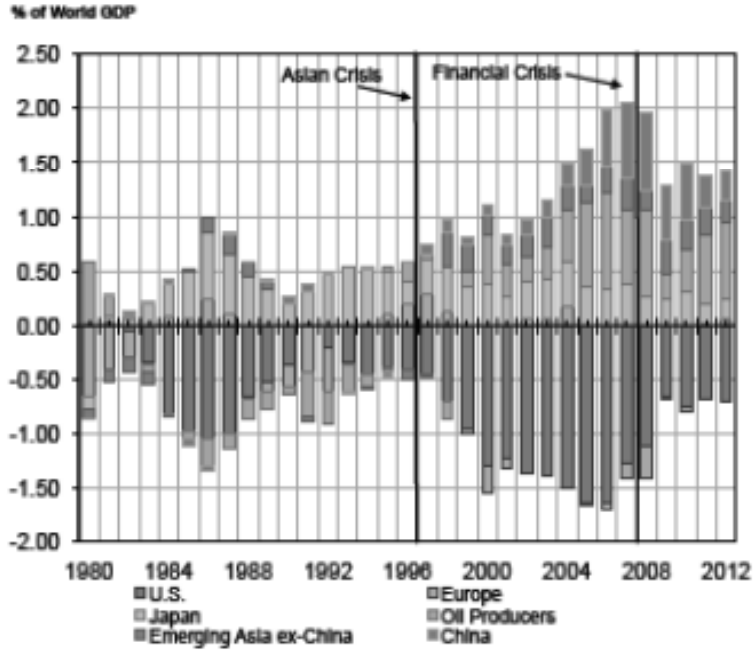


FIG. 2.66 – Global Imbalances : Current Accounts. Oil Producers : Bahrein, Canada, Kuweit, Iran, Lybia, Nigeria, Norway, Mexico, Oman, Russia, Venezuela, Saudi Arabia ; Emerging Asia ex-China : Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand. Europe : European Union. Source : Gourinchas and Rey (2014) External Adjustment, Global Imbalances, Valuation Effects, Handbook of International Economics, vol IV

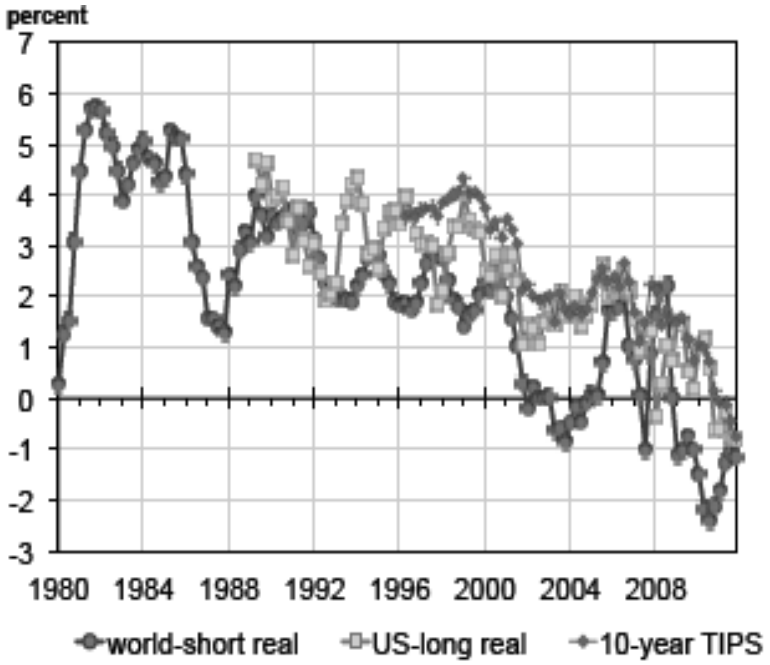


FIG. 2.67 – Global Imbalances : World Interest Rates. Notes : World-short real : ex-post 3-month real interest rate for the G-7 countries (GDP weighted). US-long real : 10 year yield on U.S. Treasuries minus 10-year expected inflation. 10-year TIPS : yield on inflation indexed 10-year Treasuries. Source : Gourinchas and Rey (2014) External Adjustment, Global Imbalances, Valuation Effects, Handbook of International Economics, vol IV

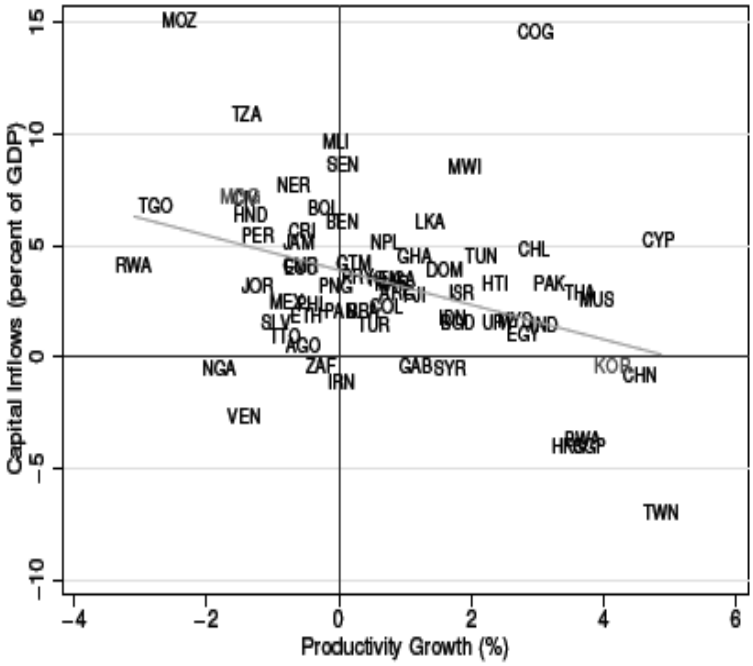


FIG. 2.68 – Average productivity growth and capital in flows between 1980 and 2000. Source : Gourinchas and Rey (2014) External Adjustment, Global Imbalances, Valuation Effects, Handbook of International Economics, vol IV

The starting point of the explanation of 'global imbalances' put forward by Caballero, Farhi, Gourinchas (2008) is the depressed autarky interest rates in emerging economies relative to advanced ones which reflects the fact that the financial system in emerging countries is under-developed and less sophisticated which in turn has depressed the issue of securities (because, for example, lenders require more collateral in exchange of loanable funds). The fall in the return on capital can be explained by depressed financial markets conditions in Asian emerging countries following the collapse in the Japanese asset bubble in the early 1990s and in the South-Asian asset market in the middle of the 1990s. Caballero, Farhi, Gourinchas (2008) argue that financial frictions increase in emerging economies as the Asian crisis has revealed that many loans made by banks and non-banks were of low quality, financing investment of dubious profitability. The most prominent example was South Korea. In Korea the financial system was in a severe crisis because of excessive lending to large traded-sector conglomerates with low profitability, as illustrated by Corsetti, Pesenti, and Roubini (1999). As shown by Antràs and Caballero (2009) who consider a two sector model where one sector produces complex goods (this sector faces financial constraints as rentiers have some difficulties to evaluate the quality of the investment project) and one sector which produces simple goods, financial frictions result in a lower return on capital because too much capital is allocated to the unconstrained 'traditional' sector. This observation can be formalized as follows :

$$(1-\tau)\ .\alpha\ .\frac{Y}{K}=r,\quad \text{or}\quad \frac{K}{Y}=\frac{\delta}{r}, \tag{2.74}$$

where $Y=K^{\alpha}\ .(\xi\ .N)^{1-\alpha}$, $0<\delta=\alpha\ .(1-\tau)<1$ is a measure of financial frictions. The social (or desirable) return is $\alpha\ .\frac{Y}{K}$ while the private return is lower at $(1-\tau)\ .\alpha\ .\frac{Y}{K}$; τ denotes a wedge between social and private returns of capital : this wedge is a shorthand for all the distortions that potentially affect the return to capital : credit market imperfections (for example if the banking system is not competitive, credits may be allocated to less efficient

firms due to the existence of public guaranteed loans), bribery and corruption. Using the Euler theorem which implies that $Y = r\ .K + Z$, substituting (2.74) gives labor income

$$Z = Y - r\ .K = (1-\delta)\ .Y > (1-\alpha)\,. \tag{2.75}$$

Eq. (3.160) shows that the economy is more labor intensive due to capital market imperfections.

Moreover, capital market frictions also affect savings. Because capital is less rewarded, workers get a larger fraction which in turn raises savings. To see it, the accumulation of financial wealth W is equal to interest receipts plus labor income $(1-\delta)\ .Y_t$ less consumption C_t which is a fraction $\rho+\theta$ of total wealth (θ is the probability of death which makes individuals more impatient) :

$$\dot{W}_t = r\ .W_t + (1-\delta)\ .Y_t - (\rho+\theta)\ .W_t. \tag{2.76}$$

Note that in a model with overlapping generations, consumption is equal to the annuity of total wealth defined as the sum of financial wealth plus the present discounted value of non financial wealth (labor income) ; for simplicity, we assume all non financial income at time t is received by the newborn generation so that the present discounted value of labor income tends toward zero. Hence, consumption is only a fraction $\rho+\theta$ of W_t.

In autarchy, financial wealth consists only of claims on capital stock :

$$W_t = K_t. \tag{2.77}$$

Additionally, in the long-run, the interest rate is fixed at r_{ss}. The demand for capital (2.74) implies that GDP, Y_t, must rise at the same speed as the capital stock, K_t, i.e.,

$$\frac{\dot{Y}_t}{Y_t} = \frac{\dot{K}_t}{K_t}. \tag{2.78}$$

Applying logarithm and differentiating the production function and substituting (2.78) implies that the capital stock rises at the same speed as labor-augmenting productivity :

$$\frac{\dot{K}_t}{K_t} = \frac{\dot{\xi}_t}{\xi_t} = g. \tag{2.79}$$

Because $W_t = K_t$ (see (2.77)), both variables increase at the same rate, i.e.,

$$\frac{\dot{W}_t}{W_t} = \frac{\dot{K}_t}{K_t} = \frac{\dot{\xi}_t}{\xi_t} = g. \tag{2.80}$$

Dividing equation(2.76) by Y_t and using the fact that the financial wealth rises at rate $\frac{\dot{W}}{W} = g$ (the same rate of capital along a balanced growth path), we have :

$$\frac{\dot{W}_t}{Y_t} = g\ .\frac{W_t}{Y_t} = r\ .\frac{W_t}{Y_t} + (1-\delta) - (\rho+\theta)\ .\frac{W_t}{Y_t}. \tag{2.81}$$

Solving, we find that savings is increasing with the interest rate :

$$\frac{W_t}{Y_t} = \frac{1-\delta}{g+\rho+\theta-r}. \tag{2.82}$$

A higher interest rate increases the supply of loanable funds since wealth accumulates at a higher rate. If δ falls, labor income rises which in turns shifts the savings schedule to the

right. Equating (2.74) with (2.82), we find that the equilibrium interest rate is decreasing with δ :

$$r_{ss}^{a} = \delta \,.\, (g + \rho + \theta)\,. \tag{2.83}$$

Note that K/Y is unaffected by δ ; to see it, plug the equilibrium interest rate into the private return of capital $\delta \,.\frac{Y}{K} = \delta \,.\, (g + \rho + \theta)$ which reduces to $\frac{K}{Y} = \frac{1}{g+\rho+\theta}$.

In summary, capital market frictions affect both the demand (investment) and the supply (savings) of loanable funds. First, capital market imperfections lower the return on domestic capital since $\delta < \alpha$. Second, because capitalists obtain a smaller share of value added, workers get a larger fraction which in turn raises savings. At the same time, there has been a large increase in savings for other reasons : the increased savings and reserve accumulation in emerging economies following the East Asian financial crisis of 1997-1998 ; the need for precautionary saving due to a poorly developed security social system ; the sharp increases in oil prices and the corresponding swing toward (basculement vers) current account surpluses of oil exporting economies.

We now assume that the economy opens its capital account. The difference between W_t and K_t represents the net foreign asset position of the country, B. Combining (2.82) with (2.74), we can express the net foreign asset position as a function of the autarky and world interest rates,

$$\begin{aligned}
\frac{B_t}{Y_t} &= \frac{W_t - K_t}{Y_t}, \\
&= \frac{1-\delta}{g+\rho+\theta-r} - \frac{\delta}{r}, \\
&= \frac{(1-\delta)\ .\delta\ .r - \delta\,.\,(r_{ss}^{a} - \delta\ .r)}{(r_{ss}^{a} - \delta\ .r)\ .r}, \\
&= \frac{\delta\,.\,(r - r_{ss}^{a})}{(r_{ss}^{a} - \delta\ .r)\ .r},
\end{aligned} \tag{2.84}$$

where we used the fact that $g + \rho + \theta = \frac{r_{ss}^{a}}{\delta}$. This expression makes clear that the net foreign asset position is positive (resp. negative) depending on whether the world interest rate is higher (resp. lower) than the autarky interest rate. From the previous discussion, we infer that it is now possible for capital to flow out of emerging countries, provided that they have a sufficiently low autarky interest rate, i.e. a sufficiently low supply of stores of value.

Asymptotic Metzler Diagram

The vertical axis in Figure 3.36 reports the real interest rate while the horizontal axis reports either the long run domestic financial wealth W or the value of domestic assets K, scaled by output Y. By construction, the difference between domestic financial wealth and the value of domestic assets equals the country's long run net foreign asset position : $B = W - K$. From the previous discussion, the value of domestic assets decreases with the real interest rate, while the value of domestic wealth increases with the real interest rate. Financial autarky corresponds to the situation where $W = K$. This pins down the autarky real interest rate r_{ss}^{a}. When $r > r_{ss}^{a}$, the small open economy runs an asymptotic current account surplus and is a net foreign creditor. Conversely, when $r < r_{ss}^{a}$ the country runs an asymptotic current account deficit and is a net foreign borrower.

Consider now a world economy composed of two countries, a and b. The two countries are identical, except in terms of their level of financial development, captured by δ. Assume

that $\delta^a > \delta^b$. It follows that country a will have a higher autarky interest rate than country b. In a world economy consisting of two countries a and b, the sum must equal the sum of investment :

$$\begin{aligned} & \frac{W^a}{Y^a}\ .\omega^a + \frac{W^b}{Y^b}\ .\omega^b = \frac{K^a}{Y^a}\ .\omega^a + \frac{K^b}{Y^b}\ .\omega^b, \\ & \frac{(1-\delta^a)\ .\omega^a}{g+\rho+\theta-r^w} + \frac{\left(1-\delta^b\right)\ .\omega^b}{g+\rho+\theta-r^w} \\ = \quad & \frac{\delta^a}{r^w}\ .\omega^a + \frac{\delta^b}{r^w}\ .\omega^b, \end{aligned}$$

where we denote by $\omega^a = \frac{Y^a}{Y^a+Y^b}$ the share of country a in global output ; solving yields the steady state world interest rate r_w which is a weighted average of the autarky interest rate in both countries :

$$r^w = \omega^a\ .r_{ss}^{a,a} + (1-\omega_{ss})\ .r_{ss}^{a,b} = \bar{\delta}\ .(g+\rho+\theta)\,. \tag{2.85}$$

Since $r_{ss}^{a,b} < r^w < r_{ss}^{a,a}$, following a financial liberalization, capital will flow from b to a, and a will run an asymptotic negative net foreign asset position.

According to the model, a simultaneous decline in world interest rates and the emergence of global imbalances (stylized fact 1) can be the result of the integration of countries with low financial development (low δ) into the world economy (e.g. China after 1980), or the decline in the market perception financial development in some countries (e.g. emerging Asia after the Asian financial crisis of 1997). We can think of a variety of reasons why countries may be unable to pledge a high share of future output. Government, managers or insiders can dilute and divert a substantial share of profits. The parameter δ can thus capture a number of capital market frictions, from explicit taxation, lack of enforcement of property rights, corruption or rent-seeking etc... Many of these features tend to be associated with developing economies, as measured by indicators of social infrastructure.

The combined effect of a lower amount of investment and the rise in savings has lowered significantly the autarchy interest rates in emerging economies relative to those in advanced ones. As the result, the excess of savings over investment lowers the world interest rate, stimulate investment in the US and the supply of assets. In conclusion, global imbalances can be explained by financial frictions in emerging economies. The US current account deficit has been amplified by the trade balance deficit due to an increase in U.S. demand for foreign goods and US rapid growth during this period.

2.6.5 Allocation Puzzle

According to the neoclassical model, emerging countries are poorer than industrialized countries because capital per worker is much lower. This in turn would imply that the marginal product of capital should be larger than that in industrialized countries. As a result, standard theory predicts that capital flows should flow from rich to emerging countries. Moreover, as will be shown later in Chapter 5, countries where productivity growth is larger than that in the rest of the world should receive larger capital inflows. The reason is that higher technology growth raises the marginal product of capital and thus investment opportunities. By increasing the domestic interest rate, it induces capital inflows.

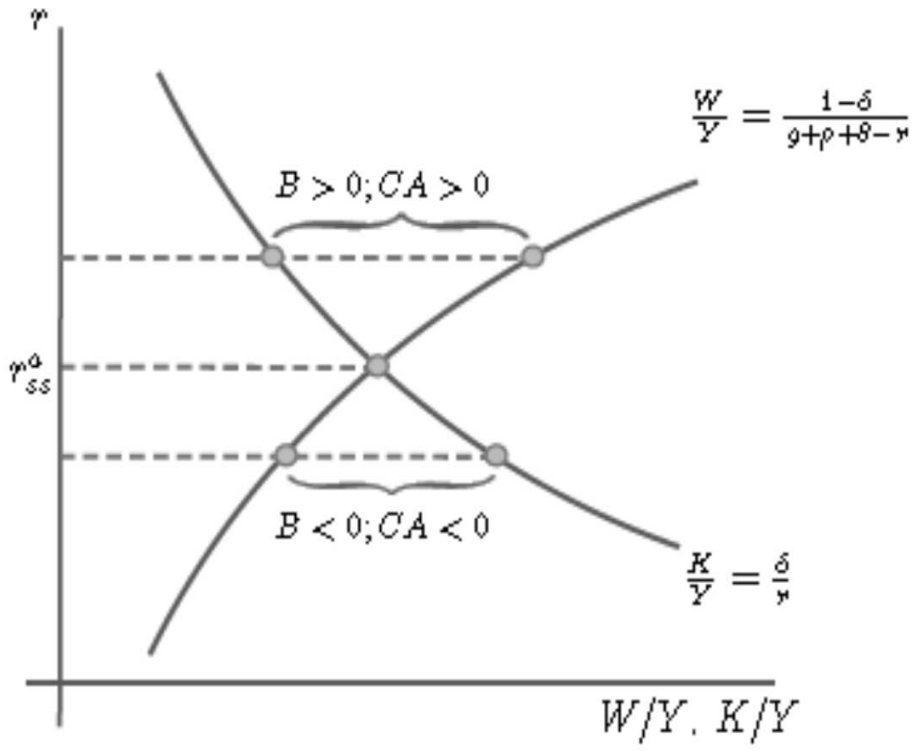


FIG. 2.69 – The Metzler Diagram - Source : Gourinchas and Rey (2014) External Adjustment, Global Imbalances, Valuation Effects. Handbook of International Economics, vol IV.

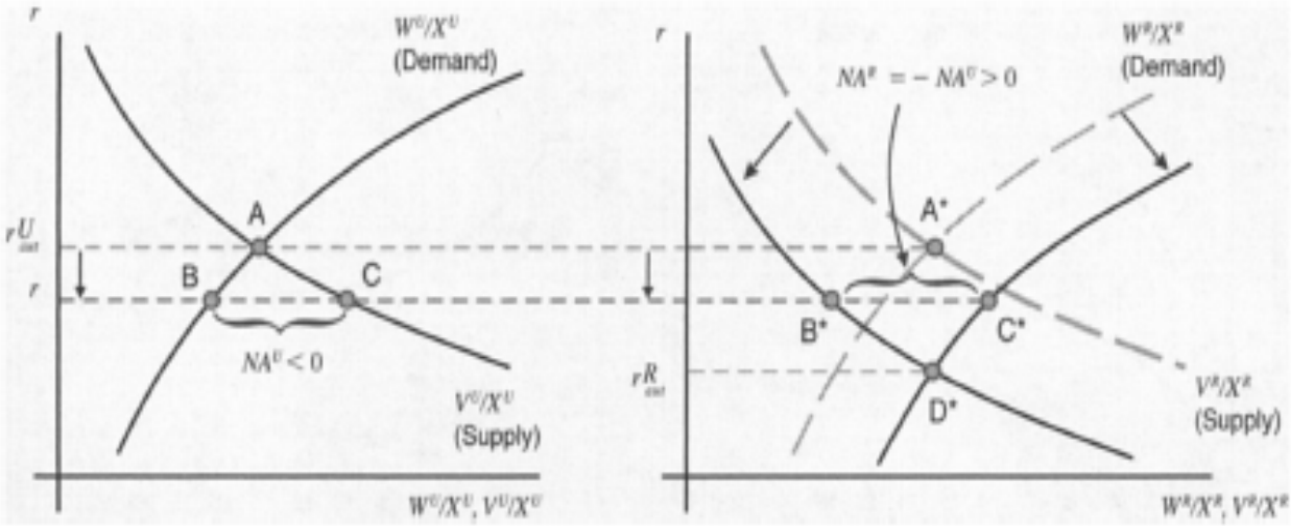


FIG. 2.70 – The Metzler Diagram for a Permanent Drop in δ - Source : Caballero, Farhi, et Gourinchas (2008) An equilibrium model of global imbalances and low interest rates. *American Economic Review*, 98(1), pp. 358-393

However, evidence enter in contradiction with the basic theory First, as displayed in Figure 2.67, capital flows from emerging to rich countries. Second, the pattern of total net capital inflows to developing countries also contradict the theory. Figure 2.68, reproduced from Gourinchas and Jeanne (2013), plots average productivity growth between 1980 and 2000 (horizontal axis) against the average net capital inflows relative to GDP for 68 developing countries over the period 1980-2000.[12] Although the variables are averaged over two decades, there is substantial cross-country variation both in the direction and in the volume of net capital inflows, with some countries receiving more than 10% of their GDP in capital inflows on average (Mozambique, Tanzania), whereas others export about 7% of their GDP in capital outflows (Taiwan). According to the theory, the relationship should be strongly positive. Instead, the Figure 2.68 exhibits a strong negative correlation, which the authors label the 'allocation puzzle'. To illustrate with two countries that are typical of this relationship (i.e. close to the regression line), Korea, a development success story with an average TFP growth of 4.1% per year and an average annual investment rate of 34% between 1980 and 2000, received almost no net capital inflows, whereas Madagascar, whose TFP fell by 1.5% a year and average annual investment rate barely reached 3%, received 7% of its GDP in capital inflows each year, on average.

Stylized Fact 2 (Allocation Puzzle) : Aggregate net capital in flows tend to be negatively correlated with productivity growth across developing countries.

Table 2.71 presents estimates for the productivity catch-up parameters (2.86) and capital flows for the whole sample as well as regional and income groups. The productivity catch-up term, π is positive when domestic productivity grows faster than the world productivity frontier :

$$\pi_t \equiv \left(\frac{g}{g^\star}\right)^t - 1, \tag{2.86}$$

where $g^t = \frac{A_t}{A_0}$ and $(g^\star)^t = \frac{A_t^\star}{A_0^\star}$, with g and $g^\star$ corresponding to domestic productivity and world productivity frontier growth. If $g > g^\star$, then the country catches-up the world productivity frontier which corresponds to US TFP growth between 1980 and 2000 (which is set to $g^\star = 1.017$, thus implying that the US TFP rises by 1.7% per year).

The estimates of π reported in column (1) show that there is no overall productivity catch-up with advanced countries : π is slightly negative on average. Thus we should not expect a lot of capital to flow from advanced to developing countries. Yet, closer inspection reveals an interesting geographical pattern. There was a sizeable productivity catch-up in Asia ($\pi = 0.19$), while Latin America and Africa fell behind ($\pi = -0.24$ and $\pi = -0.19$ respectively). So while we should not expect substantial capital inflows into developing countries as a whole, we should expect international capital to flow out of Africa and Latin America, and into Asia. However, as illustrated in Figure 2.68, this does not seem to be the case in the data : actual capital flows decrease with income per capita, from 56 percent of output for low income countries to -58 percent for high-income non-OECD countries.

What can explain this puzzling allocation of capital flows across developing countries ? Either savings or investment. If countries with higher productivity export capital, it means

[12] Net capital inflows are measured as the ratio of a country's current account deficit over its GDP, averaged over the period 1980-2000 : $\frac{1}{T} \cdot \sum_{t=1}^{T} \frac{CA_t}{Y_t}$

	(1) Catch-up π	(2) Private flows $\Delta D^{priv}/Y_0$	(3) Public flows $\Delta D^{pub}/Y_0$	(4) Obs.
Non-OECD countries	−0.10	31.44	4.76	62
By income:				
Low income	−0.22	27.73	28.32	24
Lower middle income	−0.15	29.01	11.50	21
Upper middle income	−0.06	30.12	−17.19	13
High income (non-OECD)	0.54	70.69	−100.58	4
By region:				
Africa	−0.17	31.80	8.48	27
Latin-America	−0.24	27.33	9.56	20
Asia	0.19	36.26	−8.32	15
China and India	0.53	4.76	−1.55	2
All but China and India	−0.12	32.33	4.97	60
All but Africa	−0.04	31.16	1.90	35

$\Delta D^{priv}/Y_0$ the private flows and $\Delta D^{pub}/Y_0$ the public flows. Group averages.

FIG. 2.71 – Productivity catch-up and capital inflows between 1980 and 2000 - Source : Gourinchas and Jeanne (2013) Capital Flows to Developing Countries : The Allocation Puzzle. *Review of Economic Studies*

that savings is higher than investment due to financial frictions reducing investment or savings subsidies.

Table 2.72 reports information on the investment rate, the capital wedge, and the decomposition of the observed investment rate into three components : i) the convergence component which corresponds to investment at time $t = 0$ that is required to put capital at its equilibrium level, ii) the second component reflects the additional investment required by the productivity catch-up, and iii) the trend component corresponds to the investment required to offset capital depreciation, adjusted for productivity and population growth. To see it formally, let us recall that investment replaces obsolete capital and brings capital toward its optimal level :

$$\begin{aligned} I_t &= K_{t+1} - K_t + \delta_k \,.K_t, \\ &= (1+n+a)\,.K_t - K_t + \delta_k \,.K_t, \\ &= (\delta_k + n + a)\,.K_t, \end{aligned} \tag{2.87}$$

where we used the fact that $\hat{k}_{t+1} = \hat{k}_t = \hat{k}_{ss}$ which implies :

$$\begin{aligned} K_{t+1} &= \frac{N_{t+1}}{N_t}.\frac{A_{t+1}}{A_t}\,.K_t, \\ &= (1+n)\,.(1+a)\,.K_t, \\ &\simeq (1+n+a)\,.K_t, \end{aligned} \tag{2.88}$$

where we assume that $n\,.a \simeq 0$. According to (2.87), the capital stock builds up in order to replace obsolete capital and to provide new effective workers with capital goods. Dividing (2.87) by Y gives :

$$\frac{I_t}{Y_t} = i_t = (\delta_k + n + a)\,.\frac{\hat{k}_{ss}}{\hat{y}_{ss}}, \tag{2.89}$$

where $Y_t = N_t \,.A_t \,.\hat{y}_{ss}$ and $\hat{k}_{ss}$ is determined by (2.93) ; note the domestic technical change is averaged over T years, i.e., $a = \frac{1}{T}\sum_{t=0}^{T-1} a_{t+1}$; adding and subtracting $a^\star$, the investment rate can be rewritten as follows :

$$\begin{aligned} \frac{I_t}{Y_t} &= i_t = (\delta_k + n + a^\star) \,.\frac{\hat{k}_{ss}}{\hat{y}_{ss}}, \\ &+ (a - a^\star) \,.\frac{\hat{k}_{ss}}{\hat{y}_{ss}}. \end{aligned} \tag{2.90}$$

Additionally, at time $t = 0$, the country must bring initial capital per effective worker $\hat{k}_0$ to its long-run level $\hat{k}_{ss}$:

$$\begin{aligned} \frac{I_t}{Y_t} &= i_t = (\delta_k + n + a^\star) \,.\frac{\hat{k}_{ss}}{\hat{y}_{ss}}, \\ &+ (a - a^\star) \,.\frac{\hat{k}_{ss}}{\hat{y}_{ss}} \qquad (2.91) \\ &+ \frac{1}{T}\left(\frac{\hat{k}_{ss} - \hat{k}_0}{\hat{y}_{ss}}\right). \qquad (2.92) \end{aligned}$$

Finally, at time $t = 0$, the country must also invest to bring the initial capital stock per effective worker at its initial long-run equilibrium.

Optimal investment requires that the marginal return to capital equals the world interest rate :

$$(1 - \tau)\left(\alpha \,.\hat{k}^{\alpha-1} - \delta_k\right) = r. \tag{2.93}$$

This equality pins down the stock of capital per efficient units at :

$$\hat{k} = \left(\frac{\alpha}{\frac{r}{1-\tau} + \delta_k}\right)^{\frac{1}{1-\alpha}}, \tag{2.94}$$

which in turn determines output per worker :

$$\hat{y} = \left(\hat{k}\right)^{\alpha} = \left(\frac{\alpha}{\frac{r}{1-\tau} + \delta_k}\right)^{\frac{\alpha}{1-\alpha}}, \tag{2.95}$$

According to (2.94), the capital per effective worker is a decreasing function of the world interest rate and the capital wedge. The authors set the capital wedge to match the countries' investment rates. Because all parameters in the RHS of eq. (2.94) are constants, the capital stock per effective worker is constant $\hat{k} = \hat{k}_{ss}$; hence the capital stcok grows at the same rate of population n plus productivity a ; in the long-run, when the productivity catch up ceases, we have $a = a^\star$; as a result, the capital stock grows at the following rate :

$$\frac{dK}{K} = \frac{dN}{N} + \frac{dA}{A} = n + a^\star. \tag{2.96}$$

Table 2.72 merits several comments. First, as is well known, investment rates vary widely across regions. They also vary with income levels, increasing from 8.5% for low-income countries to 28.5% for high-income non-OECD countries. Table 2.72 indicates that most of the variation in the investment rate is accounted for by the trend component, which itself is strongly correlated with the capital wedge τ_k (reported in Column (5)). To a first order of approximation, countries with a high investment rate are those that maintain a high capital-to-output ratio because of a low distortion on capital accumulation. The estimated capital

wedge (Column (5)) varies between 51.4% for Uganda and -2.5% for Singapore, with an average of 11.5%. It is negatively correlated with both the level of economic development and the productivity catch-up parameter - consistent with the idea that economic development is associated with better institutions and lower distortions on capital accumulation. The negative correlation between the capital wedge and the productivity catch-up magnifies the positive correlation between the productivity catch-up and capital inflows predicted by the model - which tends, if anything, to aggravate the allocation puzzle.

Gourinchas and Jeanne (2013) proposes a wedge savings as a solution to the allocation puzzle : fast growing countries have larger saving rates and experience greater capital outflows while running high current account surplus. In terms of consumption choices, a savings wedge denoted by τ_S lowers the relative price of present consumption :

$$\frac{C_{t+1}}{C_t} \,.(1+\rho) = (1-\tau_S) \,.(1+r)\,.$$

Table 2.73 shows the decomposition of the observed levels of capital flows into four terms : i) the first term reflects the impact of initial debt. In the absence of productivity catch-up the economy follows a balanced growth path in which external debt remains a constant fraction of output. The cumulated debt inflows that are required to keep the debt-to-output ratio constant are equal to $\Delta D^t/Y_0$ and increase with the net foreign asset position-to-output ratio when trend growth is positive ($a^\star+n>0$). We call this term the trend term. The second term, $\Delta D^c/Y_0$, results from the initial level of capital scarcity. Under financial integration, and in the absence of financial frictions or adjustment cost of capital, the country instantly borrows and invests the amount $\hat{k}_{ss} - \hat{k}_0$. We call this term the convergence term. The third and fourth terms reflect the impact of the productivity catch-up, as captured by the investment term $\Delta D^i/Y_0$ and the savings term $\Delta D^s/Y_0$. To see this, note that in the long-run, the capital per effective worker $\hat{k}_{ss}$ must stay constant. When there is a productivity catchup, investment rises above the trend because the capital per worker increases $k_{ss} = A\,.\hat{k}_{ss}$. As a result, investment increases by an amount $(a-a^\star)\;.\hat{k}_{ss}$. Moreover, faster relative productivity growth implies higher future income, leading to an increase in consumption and a decrease in savings. Since current income is unchanged, the representative domestic consumer borrows on the international markets. To conclude, productivity catch-up leads to capital inflows due to higher investment (compared with that without productivity catch-up) and lower savings.

Table 2.73 merits several comments. First, we observe that the saving wedge needed to account for aggregate saving ranges from 2.11% for low income countries to -3.43% for high income countries with an average of 1%. This may seem relatively small but the cumulative impact on initial consumption of such annual wedges applied for twenty years is large. Second, the pattern of saving wedges across countries is far from random. We observe a strong negative correlation between the saving wedge and productivity catch-up : countries whose productivity catches up ($\pi>0$) are also countries that 'subsidize' saving ($\tau_s<0$) while countries that fall behind ($\pi<0$) are countries that 'tax' saving ($\tau_s>0$). In conclusion, the saving wedge is essential to account for the observed pattern of net capital flows across developing countries. The wedge analysis indicates that Asia subsidizes saving ($\tau_s = 1.14\%$) whereas Latin America and Africa tax savings similarly ($\tau_s = 1.83\%$ and $\tau_s = 1.79\%$, respectively). Similarly, the saving wedge decreases with the level of development.

Having established that the allocation puzzle is a saving puzzle, Gourinchas and Jeanne (2013) now offer a different cut of the data. The authors split net capital flows into net

Decomposition of average investment rates between 1980 and 2000

Average investment rate (percent of output)	(1) Total i_k	(2) Convergence	(3) Productivity	(4) Trend	(5) Capital wedge τ_k	(6) Obs.
Non-OECD countries	13.52	0.11	−0.92	14.33	11.54	68
By income level:						
Low income	8.49	−0.21	−1.56	10.26	18.92	26
Lower middle income	14.06	0.29	−1.64	15.42	8.84	23
Upper middle income	15.69	0.40	−1.35	16.64	6.13	13
High income (non-OECD)	28.52	0.17	5.54	22.82	1.55	6
By region:						
Africa	10.26	−0.74	−1.18	12.19	16.05	31
Latin-America	13.40	0.39	−2.67	15.69	8.50	20
Asia	19.59	1.32	1.62	16.65	6.88	17
China and India	15.76	0.40	3.02	12.34	10.35	2
All but China and India	13.45	0.10	−1.04	14.39	11.57	66
All but Africa	16.25	0.82	−0.70	16.13	7.76	37

Convergence: $(\tilde{k}^* - \tilde{k}_0)/(T\tilde{y}_0)$; Productivity: $\pi\tilde{k}^{*(1-\alpha)}g^*n/T$; Trend: $\tilde{k}^{*(1-\alpha)}(g^*n+\delta-1)$. Percent of GDP. Group averages.

FIG. 2.72 – Decomposition of average investment rates between 1980 and 2000 - Source : Gourinchas and Jeanne (2013) Capital Flows to Developing Countries : The Allocation Puzzle. *Review of Economic Studies*

Capital flows (percent)	(1) Observed $\Delta D/Y_0$	(2) Convergence $\Delta D^c/Y_0$	(3) Investment $\Delta D^i/Y_0$	(4) Saving $\Delta D^s/Y_0$	(5) Trend $\Delta D^t/Y_0$	(6) Wedge τ_s	(7) Obs.
Non-OECD countries	31.49	5.95	−28.18	21.97	31.75	1.07	68
By income:							
Low income	56.49	−14.55	−49.76	85.39	35.42	2.11	26
Lower middle income	37.02	17.38	−62.62	47.96	34.30	1.28	23
Upper middle income	12.94	22.85	−40.99	−15.93	47.00	0.68	13
High income (non-OECD)	−57.85	14.37	225.12	−270.35	−26.98	−3.43	6
By region:							
Africa	39.09	−31.64	−41.53	78.20	34.06	1.79	31
Latin-America	36.89	20.96	−100.07	62.09	53.92	1.83	20
Asia	11.28	56.84	80.74	−127.75	1.44	−1.14	17
China and India	3.21	11.39	141.57	−132.15	−17.60	−2.53	2
All but China and India	32.35	5.79	−33.32	26.64	33.24	1.18	66
All but Africa	25.12	37.45	−16.99	−25.14	29.81	0.47	37

$\Delta D/Y_0$ is the observed ratio. See the Supplementary Appendix for definition of the various components. Saving wedge τ_s calibrated to equate observed and predicted capital inflows. Group averages.

FIG. 2.73 – Decomposition of cumulated capital inflows relative to initial output between 1980 and 2000 - Source : Gourinchas and Jeanne (2013) Capital Flows to Developing Countries : The Allocation Puzzle. *Review of Economic Studies*

private and public capital flows. They define net public capital inflows as the change in public and publicly guaranteed debt minus the change in international reserves. Private net capital inflows are then constructed as total net inflows minus net public inflows. Columns (2) and (3) of Table 2.71 report measured average private and public flows. Denoting by D the net external debt in US dollar and by Y GDP, the volume of capital inflows between 1980 and 2000 in terms of initial GDP is constructed as the change in the net external debt (in % of initial GDP) :

$$\frac{\Delta D}{Y_0} = \frac{D_{2000} - D_{1980}}{Y_{1980}}. \tag{2.97}$$

The net private capital flows ΔD^{priv} are constructed as the difference between net capital flows ΔD minus the net public flows ΔD^{pub} :

$$\frac{\Delta D^{priv}}{Y_0} = \frac{\Delta D - \Delta D^{pub}}{Y_0}. \tag{2.98}$$

At first glance, there is more support for the standard model when looking at private flows. Net private capital flows are now positively correlated with income per capita and productivity catch-up. High-income non-OECD economies received 71% of private capital inflows, while low-income countries only received 28%. As Column (3) shows, the behavior of public flows is strikingly at odds with that of private flows, and almost always larger in magnitude. The negative correlation between productivity catch-up and net capital flows is clearly present for public capital flows.

Table 2.74 regresses public and private net capital inflows onto a theoretically motivated set of regressors (see chapter 5 : productivity catch-up, initial capital abundance, initial debt, population growth, and financial openness (interacted with productivity catch-up). The predictions of the model are as follows : net capital inflows are increasing in the productivity catch-up parameter (π), decreasing in the initial level of capital (k_0), increasing in population growth (n),[13] and, when trend growth is positive ($n + a^\star > 0$), increasing in the initial level of debt ($d_0 = \frac{D_0}{Y_0}$).[14] Estimates summarized in Table 2.74 corroborate the predictions of the neoclassical model when the dependent variable is 'private net capital inflows', except for the initial abundance of capital since the coefficient is positive instead of negative. As shown in column 1, estimates suggest that productivity catch-up is strongly negatively correlated with public net capital flows (Column 1). In addition, public inflows decrease with capital abundance, population growth, and financial openness. Column 2 of Table 2.74 indicates that more open economies experience also larger public capital outflows, and more so as when the catching up term π is higher.

Since public capital inflows play such an important role in total inflows, the authors examine separately the two components of public flows : public and publicly guaranteed debt and the international reserves accumulation. The results indicate unambiguously that the accumulation of international reserves plays a major role in the allocation puzzle. The

[13] Faster rate of population growth increases investment as a larger workforce increases the marginal return to capital, increasing autarky rates. However, faster population growth also increases the fraction of young (savers) relative to old (dissavers), increasing aggregate saving and reducing the autarky rate. It seems that the former effect is captured by private capital inflows while the latter effect is captured by net public capital outflows.

[14] The latter prediction captures the fact that a country with high trend growth will experience capital inflows in order to keep D/Y constant otherwise, D/Y would fall if the rate at which the country experiences capital inflows is lower than the trend growth.

regression coefficients for total public flows (Column 2) and for international reserves (Column 6) are quite similar.

Why do countries that grow more also accumulate more reserves, and why is this reserve accumulation not offset by capital inflows to the private sector ? The accumulation of international reserves, is often justified as self-insurance against the aggregate risk of a crisis. Emerging countries such as China which experience a rapid and large expansion of their traded sector tend to resist the real appreciation of their currency through various policies, most notably the accumulation of foreign assets by the public sector combined with restrictions on capital inflows : as the country liberalizes its capital account, it raises its precautionary saving (captures by the variable 'Openness') and this effect rises with the productivity catch-up term (π) which raises the size of the traded sector.

The allocation puzzle, thus, would come from the fact that developing countries with higher growth in the tradable sector would tend to have higher trade surpluses and so (as a matter of accounting) larger net capital outflows. Korinek and Servèn (2011) show that a government accumulates foreign reserves by providing loans to foreigners to purchase a quantity V of tradable goods. The government revenue necessary to finance these loans is raised via lump-sum taxation, i.e., a fraction v of domestic tradable production so that $V = v \ .Y^T$. Because the country accumulates foreign claims, it runs a current account surplus ; because by granting loans to foreigners, the country withdraws a portion v of Y^T, it depreciates the real exchange rate by making tradable goods in the economy scarcer, i.e., it increase the price of tradables relative to non tradables (undervaluation of the real exchange rate).

The explanation provided by Jeanne (2012) is similar but the mechanism is a bit more subtle. The author assumes that traded output endowment rises other time. In a neoclassical model without capital controls, the anticipation of higher future tradable income leads to a trade balance deficit as consumption of tradable goods exceeds the endowment. The reason is that in the neoclassical model, the real permanent income, which can be viewed as the average income over time, determines consumption. In fast growing countries, future income is larger than current income. Hence, in the short-run, because consumption is set to the average income, the country borrows abroad to smooth consumption over time. In contrast, the government may force the private sector to buy domestic public debt and use the proceeds to buy foreign assets. By closing the capital account, the domestic sector cannot sell the public debt to foreigners or cannot borrow from the rest of world. The real-world analog of the government in the model is the Chinese government plus the Chinese banking sector, including the central bank. Leaving the central bank aside, most of the banking sector is composed of four large banks that are owned or controlled by the government. The banking sector issues deposits that are held by the domestic real sector and uses them to buy foreign assets and finance loans to the real sector. The banking sector's foreign assets can be interpreted as international reserves.

2.6.6 The Growth of Cross-Border Gross Positions

Another key stylized fact since the 1990s has been the massive increase in gross capital flows. As shown in Figure 2.75, capital controls were taken down (countries can experience

Variable: $\Delta D^k/Y_0$	(1) Public flows	(2) Public flows	(3) Private flows	(4) Private flows	(5) PPG debt	(6) Reserves
	(Std. Err.)	(Std. Err.)	(Std. Err.)	(Std. Err.)	(Std. Err.)	(Std. Err.)
Productivity catch-up (π)	−0.843***	−1.182***	0.319**	0.428**	−0.037	−1.145***
	(0.185)	(0.219)	(0.158)	(0.177)	(0.097)	(0.149)
Initial capital abundance (k_0/y_0)	−0.177*	−0.112	0.080	0.059	−0.085*	−0.027
	(0.103)	(0.093)	(0.088)	(0.089)	(0.049)	(0.075)
Initial debt (d_0/y_0)	−0.001	−0.002	0.002	0.003	0.001	−0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Population growth (n)	−0.208**	−0.148*	0.091	0.072	0.070*	−0.218***
	(0.087)	(0.078)	(0.074)	(0.075)	(0.041)	(0.063)
Openness (Chinn–Ito)	−0.155**	−0.131**	0.006	−0.002	0.030	−0.161***
	(0.060)	(0.054)	(0.051)	(0.051)	(0.028)	(0.043)
Openness $\times\pi$		−0.693***		0.222	−0.025	−0.491***
		(0.174)		(0.166)	(0.091)	(0.140)
Intercept	0.668	0.504	−0.040	0.119	0.208	0.298
	(0.270)	(0.244)	(0.231)	(0.230)	(0.124)	(0.196)
Number of observations	62	62	62	62	62	62
Adjusted-R^2	0.369	0.501	0.056	0.069	0.107	0.392

*, **, and *** significant at 10, 5, and 1% respectively.

FIG. 2.74 – Estimation results : regression of observed public and private capital flows on initial conditions (capital, debt), productivity catch-up, and the Chinn and Ito (2008) index of capital account openness - Source : Gourinchas and Jeanne (2013) Capital Flows to Developing Countries : The Allocation Puzzle. *Review of Economic Studies*

large capital inflows), as financial regulation and transaction costs decreased, the gross external asset positions of countries underwent a remarkable surge. For example, while the French financial system was highly centralized through the Encadrement du Crédit, in the fall of 1984, the socialist government announced a drastic reversal of policy. The goal was to transform the financial system into a decentralized credit market, whereby interest rates would be used to match the supply and demand of capital for each type of project. First, starting in 1985, most subsidized loans were eliminated. Second, the 'encadrement du crédit' was abolished in 1985, allowing capital flows in the economy to be determined by market forces. In particular, between 1985 and 1987, credit growth limits were gradually removed. Third, a number of banks were privatized over the 1986 to 1988 period (about 10% of the banks and 20% of the banking assets). Moreover, at the end of the eighties (in 1989), France abolished exchange controls. Finally, the capital controls were abolished in 1989.[15]

[15]Le système de parités fixes entre membres de l'Union Européenne (1974-1979 : serpent monétaire européen puis 1979-1993 : système monétaire européen puis 1993-1999 : système de parités fixes) a conduit la France a adopté le système d'encadrement du crédit qui consistait à contrôler étroitement le taux de croissance de la masse monétaire. Parallèlement à la fixation de la croissance des crédits qu'un établissement crédit pouvait octroyer en France, il s'est développé un système d'octroi de prêts bonifiés (cad des prêts accordés à des taux inférieurs à ceux du marché) et ces prêts n'étaient pas limités. Mais ces prêts étaient accordés par l'Etat, ou plutôt le réseau des banques de dépôt affiliées au Trésor français. Après mai 1981, lors de l'accès au pouvoir du gouvernement socialiste, le secteur bancaire a été davantage nationalisé en 1982, les grandes banques ayant déjà été nationalisées après la seconde guerre mondiale. L'octroi de prêts bonifiés s'est développé encore davantage au début des années 1980. L'objectif du Trésor français était de préserver l'emploi à tout prix et donc d'empêcher la faillite des firmes, même si lorsqu'elles étaient peu performantes. Les banques accumulaient donc dans leurs bilans un montant important de créances douteuses (crédits accordés à des firmes non rentables qui risquaient de n'être jamais remboursés). Entre 1974 et 1985, l'allocation du capital n'était pas le résultat de décisions décentralisées sur le marché et les taux d'intérêt n'étaient pas déterminés par le libre jeu de la demande et de l'offre ; l'allocation du capital entre les firmes était en grande partie régulée. Le problème de

Scandinavian countries experienced a serious economic crisis at the beginning of the nineties, in particular due to this financial deregulation process. For example, in the eighties, Swedish banks can borrow in foreign currencies at low rates and lend in home currency at higher rates. The impact of the deregulation was immediately apparent. The rate of increase of new lending from financial institutions, which varied between 11 and 17 per cent per year during the first half of the 1980s, jumped to 20 per cent in 1986. Over the 5-year period, 1986-90, lending increased by 136 per cent (73 per cent in real terms). Deregulation also opened up new opportunities for competition over market shares. As a result, overall outstanding loans (encours de crédits) increase disproportionately at 136% between 1986 and 1990, housing loans represent 150% of GDP in 1990 with a share of non performing loans of 12% (in % of GDP).

At the beginning of the 21st century, some small open economies invested abroad and/or owed to foreigners several times their level of annual output. The example, of Iceland, which in 2007 owned about 524% of its annual GDP in external assets while owing foreigners 636% of its annual GDP is particularly striking but not isolated : for instance, in 2010, the gross external assets of the UK were 488% and 507% of annual output respectively.

In pioneering work, Lane and Milesi-Ferretti (2001) and Lane and Milesi-Ferretti (2007) constructed an annual panel of cross border assets and liabilities for a large number of countries. A simple and widely used measure of de facto financial integration is the sum of cross-border financial claims (A) and liabilities (L), scaled by annual GDP : $(A+L)/Y$. Using the latest update of the Lane and Milesi-Ferretti (2007) dataset with data up to 2010, Figure 2.76 reports the sum of gross external assets and liabilities, scaled by world GDP for the G7 economies as well as for four large and fast growing emerging economies - the so-called BRICs (Brazil, Russia, India, China)-. The magnitude of financial globalization for G-7 economies increased sharply from 75% of world output in 1990s to 210% at its peak in 2007. For the BRIC economies, it increased tenfold, from 2% in 1990 to 20% in 2010. Financial integration has therefore been a general phenomenon. But unlike trade globalization, which was mostly driven by emerging markets, financial integration has been more pronounced so far for advanced economies.

Stylized Fact 3 (Increase in cross-border gross flows and positions) : Cross-border gross asset and liability positions have massively increased since the 1980s and especially in the 1990s and 2000s. This increase has been particularly pronounced for advanced economies.

Furthermore, the type of cross border positions taken by different economies, i.e. the composition of the balance sheets, is very heterogeneous across countries. While it is relatively common to find that risky assets (portfolio equity or FDI investments) account on average for a large share of the asset side of the balance sheet of advanced economies (49% for the United States, 50% for Canada, 26% for the UK, 31% for France), emerging markets' external portfolios have a lower weight on risky assets (India 5%, Indonesia 5%, Russia 18%, China 9% , Brazil 21%), as these economies tend to invest in safer securities such as government bonds. Interestingly, and in particular since the 1990s, the BRICs (Brazil, Russia, India, China) have taken increasingly net short positions in risky assets (vendeurs d'actifs risqués) while

cette régulation est qu'en réservant une part substantielle des financements à la survie des firmes existantes peu rentables, moins de financements pouvaient être accordés aux entrants potentiels ce qui rendaient le marché des produits moins concurrentiel.

the G7 economies, which often double up as important financial centers (the US, the UK, large euro area countries) are increasingly long in risky assets (acheteurs d'actifs risqués). Figure 2.77 reports the net risky position of these two groups of countries as fraction of the groups' annual GDP :

$$\frac{\Delta\left(A^{RISK}-L^{RISK}\right)}{Y^{G7}}.$$

Starting in the 1990s, the expansion of the external balance sheet of countries has been accompanied by a marked heterogeneity in their structure across countries, with advanced economies increasingly investing more in risky assets.

Stylized Fact 4 (Heterogeneity in Gross Flows and Positions) : The asset composition of the external balance sheet of countries is heterogeneous with advanced economies tending to be long in risky assets and emerging markets short in risky assets.

Starting in the 1990s, advanced economies have increasingly invested more in risky assets while emerging economies invest more in risk-free (safe) assets. Gourinchas and Jeanne (2013) provide an explanation of this empirical fact along with the allocation puzzle. While the neoclassical model predicts that net capital inflows should be positively correlated with aggregate productivity, the authors find the opposite. The explanation they provide relies upon the saving wedge (a subsidy for saving in Asian countries) which can be explained by the accumulation of international reserves after the 1997 crisis. Differentiating between the private capital flows (capital flows toward firms defined as the difference between total capital flows and public capital flows) and the public capital flows (defined as flows that go to or emanate from the public sector), the authors' empirical findings suggest that net private capital inflows rise with aggregate productivity across countries while net public capital inflows decrease with aggregate productivity. In fact, countries with higher productivity such as Asian countries have a larger traded sector by restricting capital inflows and accumulating international reserves which lead to an undervaluation of the RER (that stimulates the size of the traded sector by raising the relative price of tradables relative to non tradables). Larger trade surpluses imply larger capital outflows.

The trade surplus oriented policies by emerging countries affect the composition of their cross border positions. Let us take the example of China described by Jeanne (2012). As shown in Figure 2.78, which reports the breakdown of Chinese foreign assets and liabilities at the end of 2010, most of the foreign liabilities are accounted for by FDI and most of the foreign assets take the form of foreign exchange reserves. This composition is the result of important restrictions of the capital account in China. On the side of inflows, foreign direct investment (FDI) is largely liberalized and even encouraged in some cases through tax incentives but other inflows are constrained. The access of foreign investors to Chinese financial assets is severely limited. For equity, two types of shares are traded in the Shanghai and Shengzhen stock markets, 'A shares' that can be owned only by domestic investors and 'B shares' that can be purchased by foreigners. The value of B shares has never exceeded 3 percent of total stock market capitalization since 2000.[16] Capital outflows are restricted too. The shares of

[16]Foreign investors can invest in financial assets other than B shares through the Qualified Foreign Institutional Investor (QFII) program. This program allows about 100 selected foreign institutional investors to invest in a limited range of Chinese domestic financial assets. The overall quota allocated to this program has remained small and the range of investable assets limited. Foreign investors cannot otherwise invest in domestic debt securities or hold bank deposits.

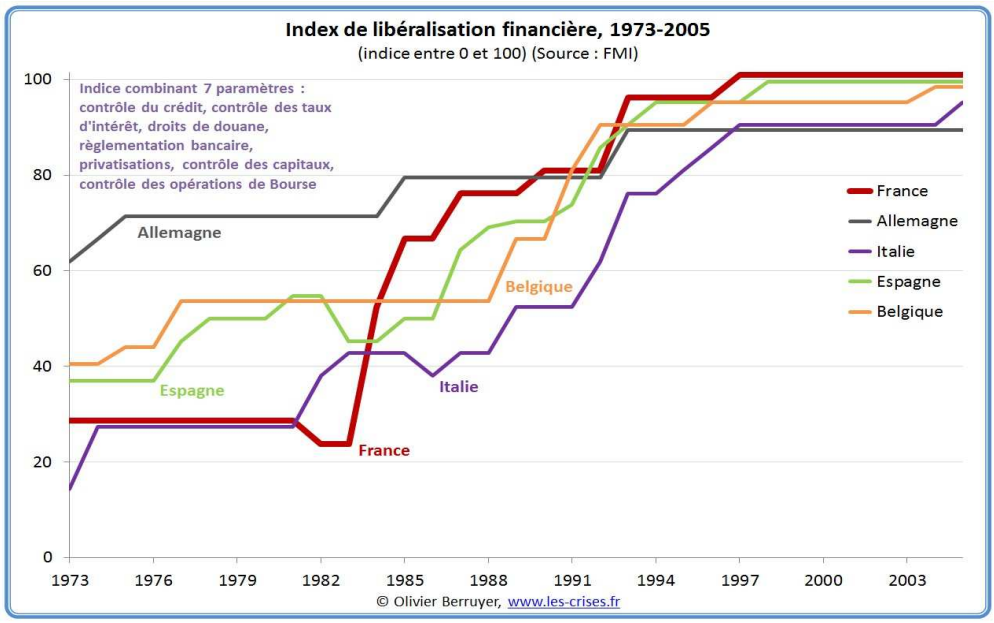


FIG. 2.75 – Financial Deregulation Index in Five European Countries. Source : IMF

outward direct investment and purchases of foreign equities represent a small fraction of total assets compared with the share of international reserves that exceeds 70% of total assets.

A first explanation of the large share of portfolio equity or FDI investments held by advanced countries is the increasing fragmentation of the production chain by multinational firms (with headquarters located in industrialized countries). A second explanation is related to financial integration. As mentioned in the introduction, Obstfeld (1994) shows that financial integration and the resulting international portfolio diversification opportunities encourages global shift from (relatively) low-return, low-risk investments into high-return, and riskier investments. Because advanced economies experienced over the last twenty years a larger increase in cross border positions, the incentives to diversify their portfolios by holding a larger share of riskier assets have been stronger.

2.7 Valuation Changes and Net International Investment Position

By the middle of 2000s, there was a concern regarding the ability of the United States to improve its net foreign asset position as external indebtedness amounts to about 20% of GDP. According to the conventional wisdom, a net debtor position will induce a dollar depreciation which in turn will raise net exports and thus will improve the net foreign asset position through a 'trade channel'.[17] Gourinchas and Rey (2007) argue that a dollar depreciation will also improve the net foreign asset position by raising the return on foreign assets. Suppose that the US holds one bond denominated in euro. When the dollar depreciates, the amount in dollar you obtain is larger because the euro appreciates against the dollar. The contribution of Gourinchas and Rey is to break down the change in the net foreign asset position in a

[17] A similar explanation can be provided by using a model with tradables and non tradables. country's wealth is relatively lower than that of other countries. Hence, the country consumes less of tradable and non tradable goods. The lower consumption of tradables produces an excess supply in the non traded good market which reduces the relative price of non tradables and thus depreciates the real exchange rate.

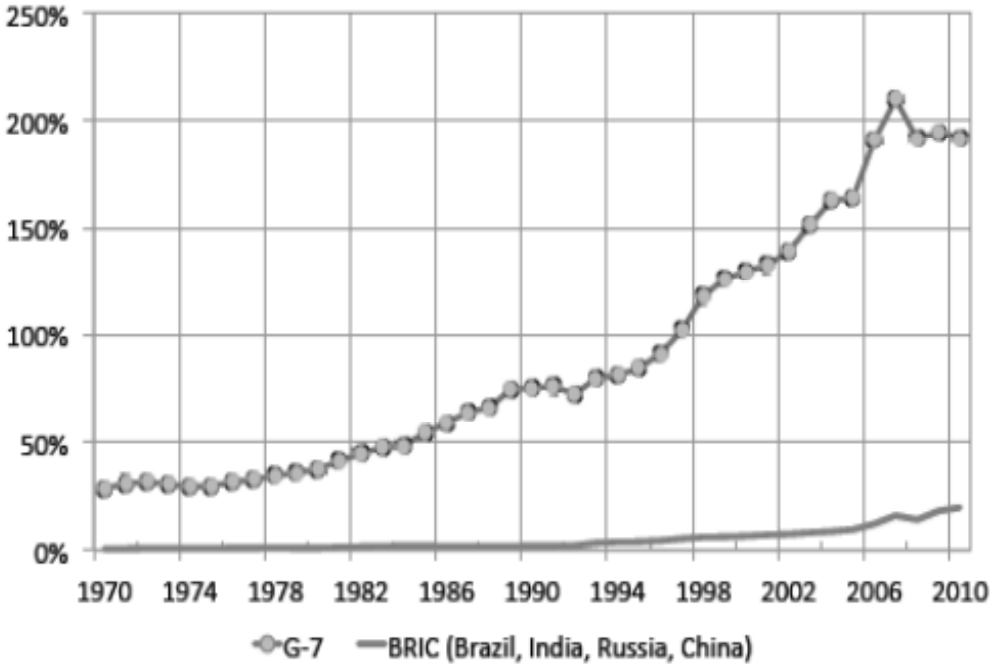


Fig. 2.76 – G-7 and BRIC Cross Border Assets and Liabilities (% of world GDP) - Source : Gourinchas and Rey (2014) External Adjustment, Global Imbalances, Valuation Effects. Handbook of International Economics, vol IV.

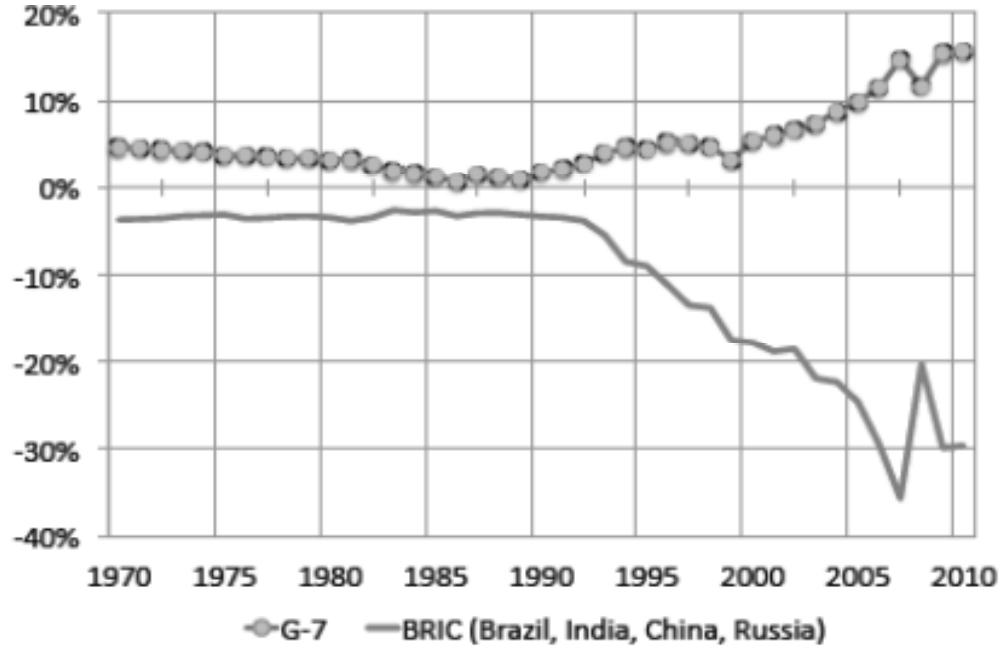


Fig. 2.77 – Net Risky Position. percent of GDP. Source : Gourinchas and Rey (2014) External Adjustment, Global Imbalances, Valuation Effects. Handbook of International Economics, vol IV.

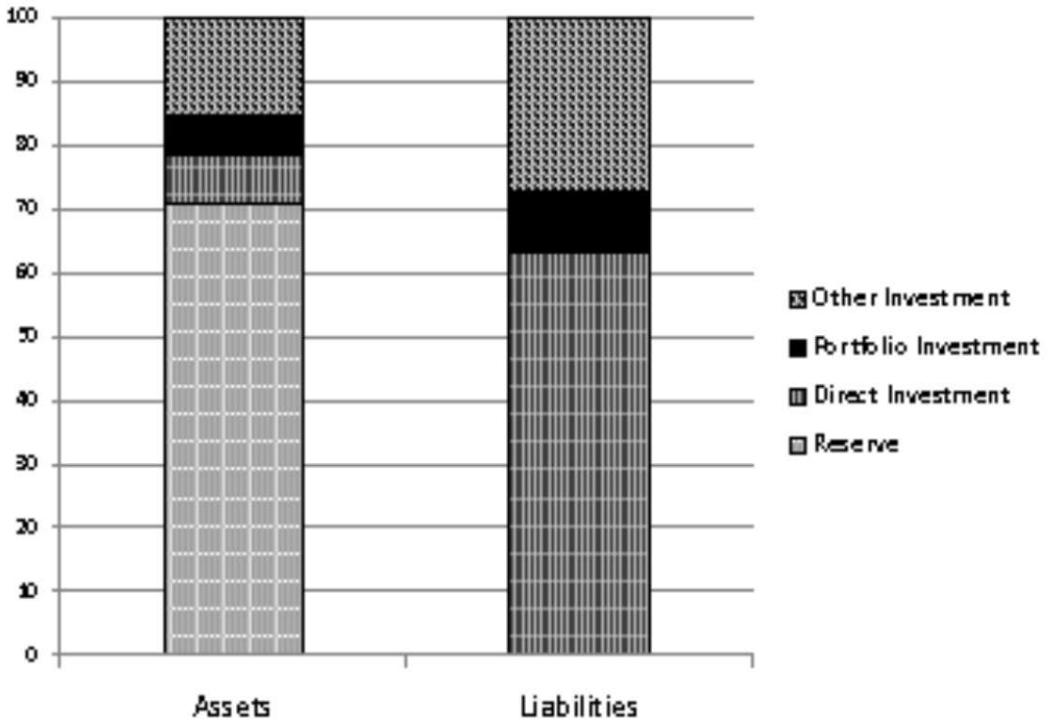


FIG. 2.78 – Composition of Chinese foreign assets and liabilities (percent, 2010) - Source : Jeanne, Olivier (2012) Capital Account Policies and the Real Exchange Rate. NBER International Seminar on Macroeconomics 2012 : Volume 9.

valuation channel and a trade channel. The idea is simple : a net debtor country needs must run a trade surplus at some date in the future. To do so, the exchange rate must depreciate. The exchange rate depreciation has also an impact on the interest receipts from foreign assets holding : according to the interest rate parity condition, an exchange rate depreciation raises the value in dollar of the foreign investment because the foreign currency appreciates against the dollar. The authors find that this channel accounts for 25%-30% of the change in the net foreign asset position.

2.7.1 A first look at the valuation effect

The net international investment position can change for two reasons. One is deficits or surpluses in the current account, which imply, respectively, net international sales or purchases of assets. The other source of changes in the NIIP is changes in the price of the financial assets that compose the country's international asset and liability positions.

We have :

$$\Delta \text{NIIP} = \text{CA} + \text{valuation changes.}$$

where the symbol Δ denotes change. In the absence of valuation changes, the level of the current account must equal the change in the net international investment position. More precisely, let us begin by writing down the external budget constraint of a country and deriving some implications for the process of international adjustment. Define $NA_t = A_t - L_t$ as the net foreign asset position (at market value) of a country at the end of period t, where A_t and L_t denote respectively gross external assets and liabilities. The change in net foreign

asset position from one period to the next is given by the following accumulation equation :

$$NA_t - NA_{t-1} = (R_t - 1)\ .NA_{t-1} + TB_t,$$

where $TB_t = EX_t - IM_t$ denotes the balance on goods and services, and R_t represents the gross portfolio return on the net foreign portfolio between the end of period $t-1$ and the end of period t. Adding and subtracting the net investment income balance NII_t (including net unilateral transfers during period t), we can write :

$$\begin{aligned} NA_t - NA_{t-1} &= [(R_t - 1)\ .NA_{t-1} - NII_t] + CA_t, \\ &= VA_t + CA_t, \end{aligned}$$

using the definition of the current account as the sum of the trade balance TB_t and the net factor payment : $CA_t = TB_t + NII_t$. The change in the net foreign position equals the current account, CA_t, plus the valuation adjustment VA_t. This valuation adjustment equals the capital gain on the net foreign asset portfolio i.e. the net return $(R_t - 1)$ minus income, dividends and earnings distributed. Traditionally, this valuation term has been omitted and the net external position of a country has been calculated as the cumulated sum of past current accounts. This is in keeping with the National Income and Product Accounts (NIPA) and the Balance of Payments methodology that focuses on produced transactions and ignores capital gains and losses. In other words, while the current account registers only flows, the NIIP considers both flows and stocks and thus accounts for changes in the value of assets and liabilities triggered by changes in asset prices and exchange rate movements as well.

Valuation changes have been an important source of movements in the NIIP of the United States, especially in the past two decades. Take a look at Figure 2.79. It plots changes in the U.S. net international investment position as a fraction of GDP, $\Delta\frac{NIIP}{GDP}$, against the U.S. current account balance as a fraction of GDP, $\frac{CA}{GDP}$. There are 36 observations, one for each year for the period 1977 and 2012. The Figure also displays with a solid line the 45-degree line. Observations for the pair ($\frac{CA}{GDP}$,$\Delta\frac{NIIP}{GDP}$) located below the 45-degree line correspond to years in which valuation changes were negative and observations located above the 45-degree line correspond to years in which valuation changes were positive. The Figure shows that positive valuation changes have been observed more frequently than negative valuation changes. Of particular interest is the period leading to the great recession of 2008. The period 2002-2007 exhibited the largest current account deficits since 1976. In each of these years, the current account deficit exceeded 4 percent of GDP, with a cumulative deficit of 3.9 trillion dollars, or 32 percent of GDP. Nevertheless, the net international investment position actually increased by 0.08 trillion dollars (i.e., about 0.6% of US GDP). So in the period 2002-2007 there is a huge discrepancy of almost 4 trillion dollars between the accumulated current account balances and the change in the NIIP. This discrepancy is due to increases in the market value of U.S. owned foreign assets relative to foreign-owned U.S. assets. Without this lucky strike (coup de chance), the U.S. net foreign asset position in 2007 would have been an external debt of about 43 percent of GDP instead of the actual 13 percent.

Another way to visualize the importance of valuation changes, is to compare the actual NIIP with the one that would have obtained in the absence of any valuation changes. Formally, the change in the net international investment position $NA_T - NA_0$ between time T and $t = 0$, is equal to the cumulated change in $NIIP_t$, i.e., $\sum_{t=1}^{T} NA_t$, which is equal to the cumulated current account balances plus cumulated valuation effects, i.e., $\sum_{t=1}^{T} CA_t + \sum_{t=1}^{T} VA_t$. Hence,

the 'true' value of the $NIIP$ at time T is given by :

$$NA_T = NA_0 + \sum_{t=1}^{T} CA_t + \sum_{t=1}^{T} VA_t.$$

Figure 2.80 plots the NIIP and the hypothetical NIIP that would have occurred if no valuation changes had taken place since 1976. The hypothetical NIIP with no valuation changes for a given year is computed as the sum of the NIIP for 1976 and the cumulative sum of current account balances from 1977 until the year in question. It is clear from the graph that valuation changes became a predominant determinant of the NIIP around 2002.

What then caused the large change in the value of assets in favor of the United States over the period 2002 and 2007 ? Milesi-Ferretti, of the International Monetary Fund, decomposes this valuation change. Because valuation changes were positive during the period 2002-2007, U.S.-owned assets abroad, which are mostly denominated in foreign currency, must have increased in value by much more than foreign-owned U.S. assets, which are mostly denominated in U.S. dollars. The factors behind these asymmetric changes in value are twofold :

- First, the U.S. dollar depreciated relative to other currencies by about 20 percent in real terms. A depreciation of the U.S. dollar increases the dollar value of foreign-currency denominated U.S.-owned assets, while leaving unchanged the dollar value of dollar denominated foreign-owned assets, thereby strengthening the U.S. NIIP.
- Second, the stock markets in foreign countries significantly outperformed the U.S. stock market. Specifically, a dollar invested in foreign stock markets in 2002 returned 2.90 dollars by the end of 2007. By contrast, a dollar invested in the U.S. market in 2002, yielded only 1.90 dollars at the end of 2007. These gains in foreign equity resulted in an increase in the net equity position of the U.S. from an insignificant level in 2002 of below 0.04 trillion dollar to 3 trillion dollar by 2007.

The large valuation changes observed in the period 2002-2007, which allowed the United States to run unprecedented current account deficits without a concomitant deterioration of its net international investment position, came to an abrupt end in 2008. Look at the dot corresponding to 2008 in Figure 2.79. Notice that it is significantly below the 45-degree line, which indicates that in the year the NIIP of the United States suffered a large valuation loss. The source of this drop in value was primarily the stock market. In 2008 stock markets around the world plummeted. Because the net equity position of the U.S. had gotten so large by the beginning of 2008 the decline in stock prices outside of the U.S. inflicted large losses on the value of the U.S. equity portfolio.

2.7.2 The Source of a Positive Net Income Balance

While capital gains and the US exchange rate depreciation have improved the net international investment position, the US also have a positive net income balance which partially offsets the large trade balance deficit.

We have documented that for the past quarter century, the United States has had a negative net international investment position ($NIIP < 0$). This means that the United States has been a net debtor to the rest of the world. One would therefore expect that during this period the U.S. paid more interest and dividends to the rest of the world than it received. In other words, we would expect that the net investment income component of the current

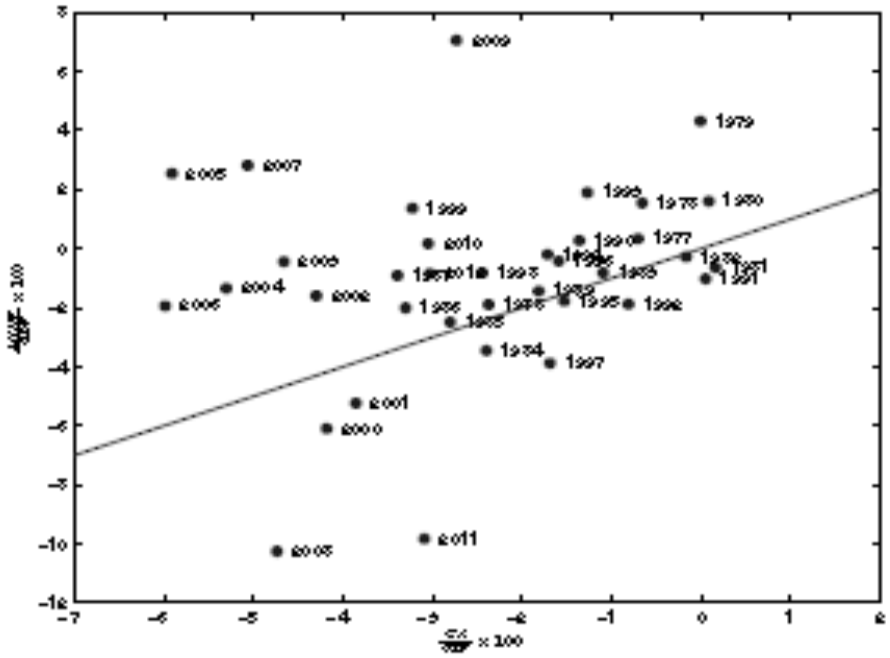
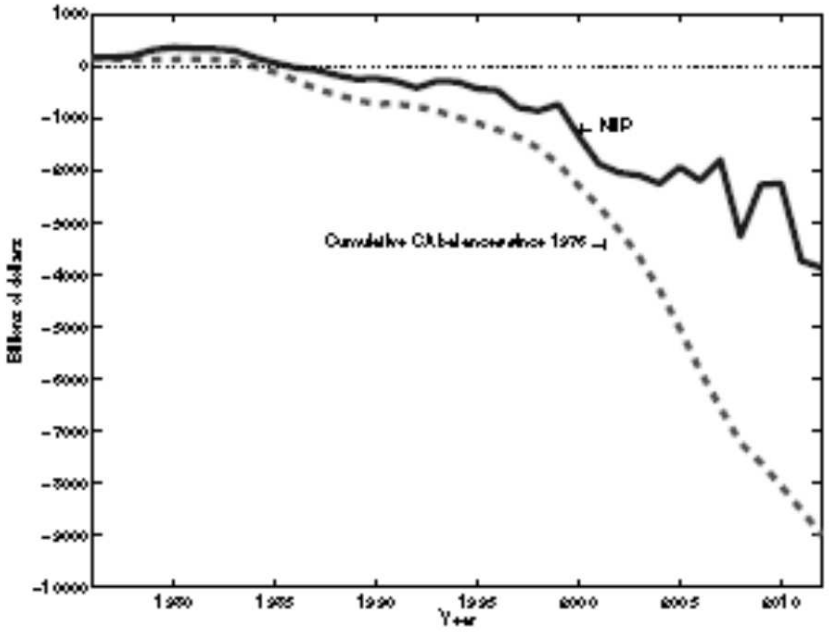


FIG. 2.79 – The U.S. CA and Changes in the NIIP : 1977-2012. Source : BEA, taken from Schmitt-Grohé and Uribe (2014) International Macroeconomics



Note: the actual NIIP data are from the Bureau of Economic Analysis. The hypothetical NIIP with no valuation changes for a given year is computed as the sum of the NIIP for 1976 and the cumulative sum of current account balances from 1977 until the year in question.

FIG. 2.80 – The U.S. NIIP and the Hypothetical NIIP with No Valuation Changes Since 1976. Source : BEA, taken from Schmitt-Grohé and Uribe (2014) International Macroeconomics

account be negative ($NII < 0$). Let r the interest rate on net foreign assets ; then the net investment income component of the current account is equal to the product between the interest rate and net investment income position $NIIP$:

$$\text{NII} = r \text{ .NIIP.} \tag{2.99}$$

This is, however, not observed in the data. Take a look at Figure 2.81. It shows net investment income and the net international investment position since 1976. NII is positive throughout the sample, whereas NIIP has been negative since 1986. How could it be that a debtor country, instead of having to make payments on its debt, receives income on it ?

An explanation for the paradoxical combination of positive NII and negative NIIP is the United States earns a higher interest rate on its foreign asset holdings than foreigners earn on their U.S. asset holdings. The rationale behind this explanation is the observation that the U.S. international assets and liabilities are composed of different types of financial instruments. Specifically, the data show that foreign investors typically hold low-risk U.S. assets, such as Treasury Bills. These assets carry a low interest rate. At the same time, American investors tend to purchase more risky foreign assets, such as foreign stocks, which earn relatively high returns.

How big does the spread between the interest rate on U.S.-owned foreign assets and the interest rate on foreign-owned U.S. assets have to be to explain the paradox ? Let A denote the U.S. gross foreign asset position and L the U.S. gross foreign liability position. Further, let r^A denote the interest rate on A and r^L the interest rate on L. Then, we have that :

$$\text{NII} = r^A \times A - r^L \times L. \tag{2.100}$$

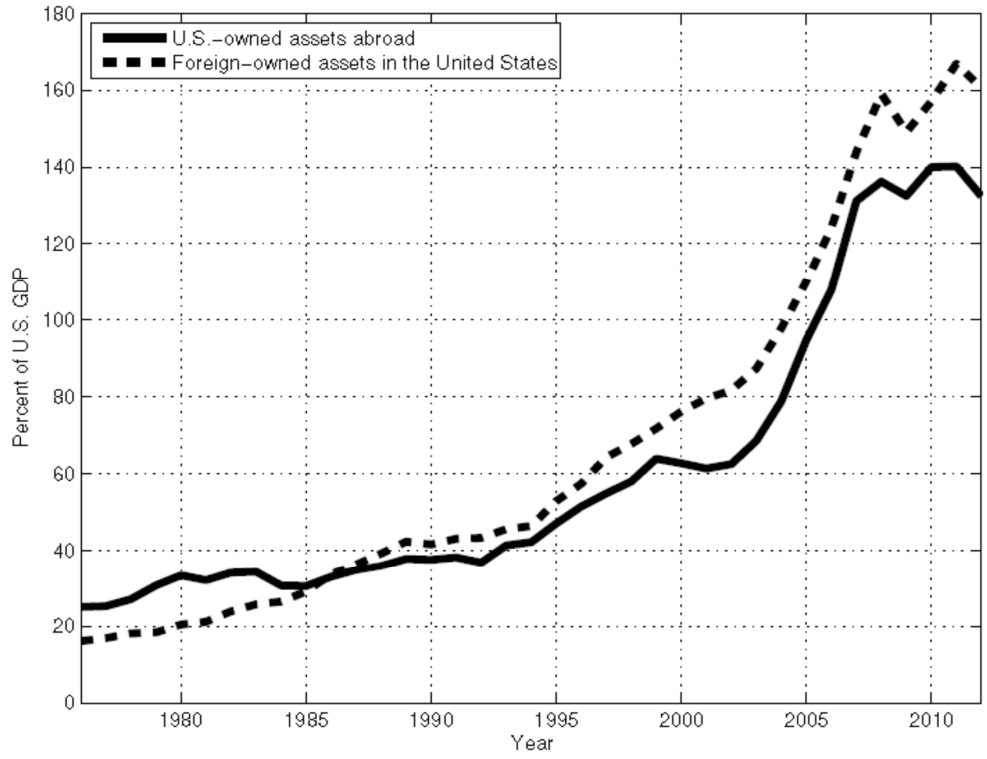
How big does the spread $r^A - r^L$ have to be to explained the observed values of NII, A, and L ? We have data on the size of NII, A and L. Figure 2.81 shows the behavior of NII and figure 2.82 displays assets A_t/GDP_t and liabilities L_t/GDP_t as a share of GDP, and in the United States for the period 1976 to 2012. The U.S. gross asset positions have grown very large since the 1990s from about 40 percent of GDP to more than 160 percent of GDP in the case of L_t and 140 percent of GDP in the case of A_t. At the same time, the net international investment position has fallen over this period from about -5 percent of GDP (1990) to -25 percent of GDP (2012). Suppose we set r^L equal to the return on one-year U.S. Treasury securities. For example, in 2010, the U.S. gross foreign asset position (A) was 20.3 trillion dollars, whereas its gross foreign liability position (L) was 22.8 trillion dollars. The U.S. net investment income (NII) in that year was 191 billion and the rate on one-year Treasury securities was 0.32 percent. Then using the above expression, and measuring all amounts in trillons of dollars, we have that r^A is the solution to :

$$0.191 = r^A \times 20.3 - 0.0032 \times 22.8,$$

which yields a return on US-owned foreign assets of $r^A = 1.3\%$. That is, we need an interest rate spread of 1 percentage point to explain the paradox. This figure seems empirically plausible.

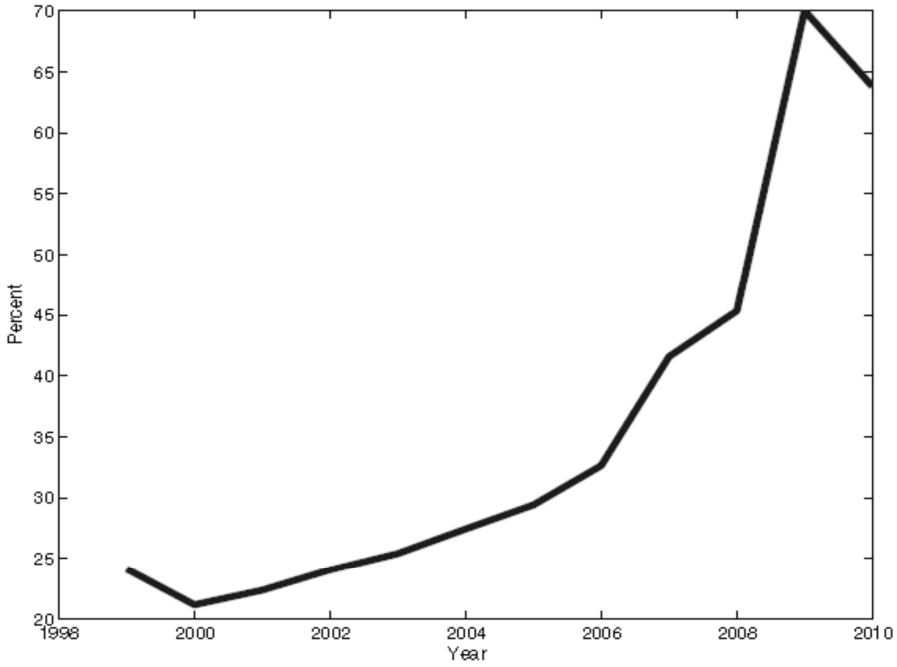
Data Source: http://www.bea.gov

FIG. 2.81 – Net Investment Income (NII) (solid line above the X-axis) and the Net International Investment Position (NIIP) (solid line below the X-axis) (United States 1976-2012). Source : BEA, taken from Schmitt-Grohé and Uribe (2014) International Macroeconomics



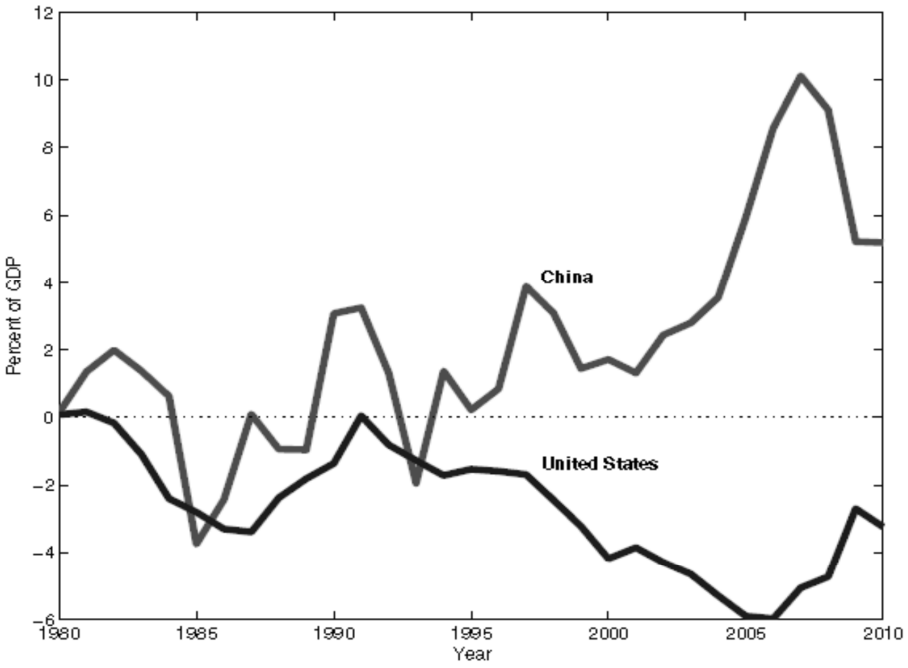
Data Source: http://www.bea.gov.

FIG. 2.82 – U.S.-Owned Assets Abroad (A) and Foreign-Owned Assets in the U.S. (L). Source : BEA, taken from Schmitt-Grohé and Uribe (2014) International Macroeconomics



Source: `http://www.bea.gov`. Note: The U.S. current account deficit with China is expressed as a fraction of the total U.S. current account deficit.

FIG. 2.83 – The U.S. Current Account Deficit With China. Source : BEA, taken from Schmitt-Grohé and Uribe (2014) International Macroeconomics



Source: `http://www.bea.gov`. Note: The current accounts of China and the United States are expressed as fractions of their respective GDPs.

FIG. 2.84 – The Current Accounts of China and the United States. Source : BEA, taken from Schmitt-Grohé and Uribe (2014) International Macroeconomics

2.7.3 The Importance of Valuations for the Net International Investment Position

So far, we have presented the discrepancy between the NIIP and the cumulated current account deficits only for the USA. At the same time, other industrialized and emerging countries have accumulated large portfolios of foreign assets and external debt. These capital flows imply potentially important wealth transfers across countries when asset prices and exchange rate fluctuates. In turn, these capital gains and losses are bound to affect the external asset positions of countries. To illustrate, Figures 2.85-2.86 compare the Lane and Milesi-Ferretti (2007)'s measure of a country's net external position with a measure obtained simply by cumulating current account balances for a group of advanced economies (Figure 2.85) and a group of emerging ones (Figure 2.86). Since the current account does not - by definition - incorporate fluctuations in the value of existing assets and liabilities, the two measures differ from one another in theory by the cumulated value of capital gains and losses on the country's external position. As Figure 2.85a shows for the United States, simply cumulating the balance on the US current account since 1970 would lead to a severe underestimate of the US external position, by about 36% of US GDP in 2010. A contrario, this suggests that the US has enjoyed important net capital gains on its net external asset positions over this period. These valuation effects are economically quite sizable : they represent the equivalent of an additional surplus of the US current account of about 2% of output, for every year between 1970 and 2010. Figures 2.85(b)-2.85(d) show smaller cumulated valuation gains for the other advanced economies we consider. Figure 2.86 shows that the BRIC economies tended to experience significant cumulated valuation losses since 2000, between 10% of output for China and 40% for Russia. The reason is that emerging countries tend to own disproportionately more safe assets with very low capital gains and to own liabilities like FDI with large capital gains. Moreover, other the period 2000-2010, the dollar has depreciated which in turn led negative valuation effects for the countries with dollar denominated assets.

Figures 2.85-2.86 illustrate the asymmetry between the US (large positive valuation gains) and emerging economies (large valuation losses). By contrast, Figures 2.85(b)-2.85(d) show that cumulated current accounts provide a roughly accurate guide to the low frequency movements in the net external position of other advanced economies, although the valuation component can be large in any given year.

Table 2.87 documents the average magnitude of absolute valuation effects (as a percentage of GDP), as well as the average of the absolute value of current accounts of a number of countries over four periods. For most countries, including emerging economies, the importance of valuation effects has been increasing over time. For economies very open to cross border investments, such as Ireland, the average valuation change per annum reaches more than 13% of GDP in the most recent period (it reaches 11.8% for Switzerland). The absolute value of current accounts has also increased over these four periods for all the countries considered. Except for Germany, Japan and to a lesser extent China, the average magnitude of the current accounts, though rising over time, tend to be dominated by the average magnitude of valuation effects.

Stylized Fact 5 (The growing importance of valuation effects) : Valuation effects, which are capital gains and losses on gross external assets and liabilities, account for an important

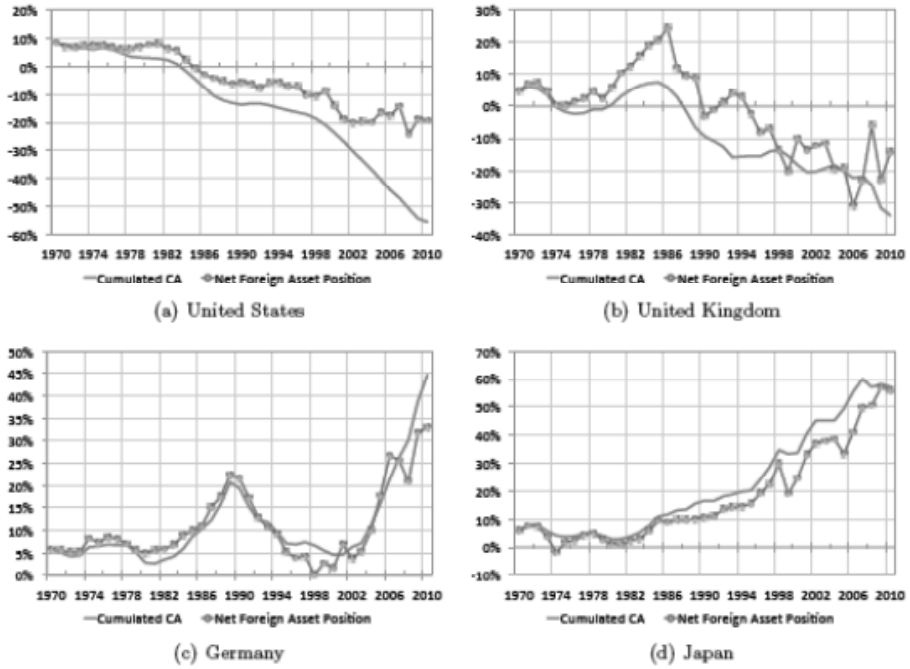


FIG. 2.85 – Cumulated Current Account and Net Foreign Asset Position, US, UK, Germany and Japan, 1970-2010. Percent of GDP. Source : Gourinchas and Rey (2014) External Adjustment, Global Imbalances, Valuation Effects. Handbook of International Economics, vol IV.

and increasing part of the dynamics of the net foreign asset positions of countries. For the U.S., valuation effects have tended to be positive and economically large.

2.7.4 Who lends ?

The large observed U.S. current account deficits must be matched by current account surpluses of other countries with the United States. Over the past decade, an increasing fraction of the U.S. current account deficit is accounted for by current account deficits with China. Figure 2.83 displays the U.S. current account with China as a fraction of the total U.S. current account balance. This ratio was about 20 percent in 1999 and has been increasing steadily, reaching a peak of 70 percent in 2009.

The expanding commercial relation between the United States and China has reached a magnitude such that the respective total current accounts are beginning to mirror each other. This phenomenon is evident from Figure 2.84 which displays the current account balances of the United States and China as fractions of their respective GDPs. Since the mid 1990s, the U.S. widening current account deficits have coincided with a growing path of Chinese current account surpluses. Notice that the great recession of 2008-2009 was associated with a significant improvement in the U.S. current account and an equally important contraction in the Chinese current account surplus.

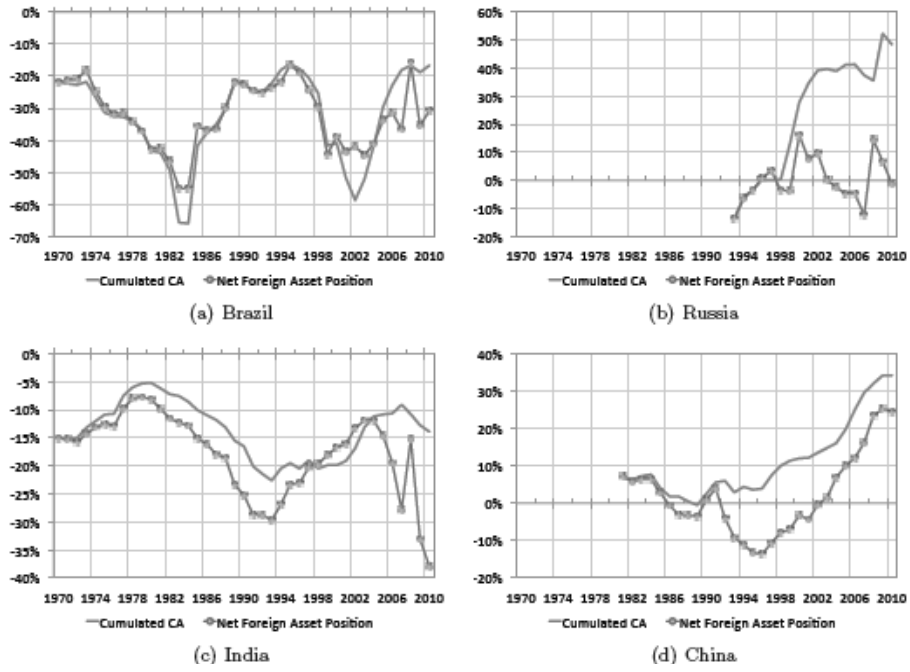


FIG. 2.86 – Cumulated Current Account and Net Foreign Asset Position, Brazil, Russia, India and China, 1970-2010. Percent of GDP. percent of GDP. Source : Gourinchas and Rey (2014) External Adjustment, Global Imbalances, Valuation Effects. Handbook of International Economics, vol IV.

Period	US	UK	Ireland	Germany	Japan	Brazil	Russia	China	India	Switzerland
					—valuations—					
1971-1980	0.84%	1.29%	3.12%	0.67%	1.3%	0.97%	N/A	0.00%	0.44%	10.74%
1981-1990	0.93%	3.59%	3.73%	0.75%	0.83%	2.02%	N/A	1.47%	0.98%	9.76%
1991-2000	1.79%	4.71%	18.67%	1.42%	2.03%	2.11%	4.26%	2.95%	1.16%	9.39%
2001-2010	4.75%	7.57%	13.29%	3.91%	2.67%	8.38%	13.71%	2.22%	6.08%	11.84%
					—current accounts—					
1971-1980	0.40%	1.16%	5.75%	1.00%	1.15%	5.74%	N/A	0.00%	0.82%	2.16%
1981-1990	1.95%	2.16%	4.23%	2.71%	2.32%	2.32%	N/A	1.52%	1.68%	3.72%
1991-2000	2.12%	2.21%	0.48%	1.48%	2.26%	2.05%	9.02%	1.94%	1.13%	8.55%
2001-2010	4.56%	2.24%	2.37%	4.50%	3.39%	1.67%	7.94%	5.43%	1.41%	10.96%

The table reports the average valuation and current account components, as a share of GDP, for each sub period, where the average valuation and current account components are defined as $VA = 1/T \sum_t \left| \frac{NA_t - NA_{t-1} - CA_t}{GDP_t} \right|$ and $CA = 1/T \sum_t \left| \frac{CA_t}{GDP_t} \right|$.

FIG. 2.87 – Valuations and Current Accounts, (average p.a., % GDP). Source : Gourinchas and Rey (2014) External Adjustment, Global Imbalances, Valuation Effects. Handbook of International Economics, vol IV.