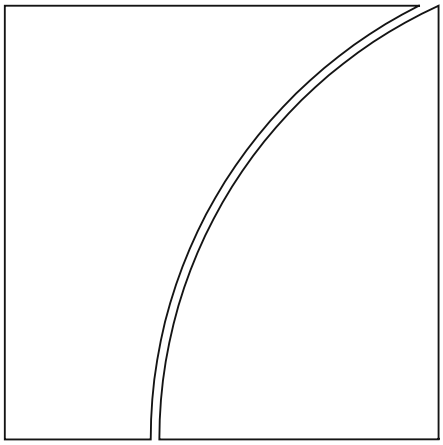

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Capital flows and the current account: Taking financing (more) seriously*

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Abstract

This paper questions the appropriateness of popular analytical frameworks that focus on current accounts or net capital flows as a basis for assessing the pattern of cross-border capital flows, the degree of financial integration and the vulnerability of countries to financial crises. In the process, it revisits the Lucas paradox, the Feldstein-Horioka puzzle and the notion of sudden stops. It argues that, in a world of huge and free capital flows, the centrality of current accounts in international finance, and hence in academic and policy debates, should be reconsidered.

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Introduction

Attention to *gross* flows in international finance has been gaining ground, especially post-crisis (eg Shin (2012), Obstfeld (2012, 2015), Rey (2013)). Yet the centrality of current accounts, and corresponding *net* flows, remains deeply entrenched and shapes both academic and policy debates. In fact, sometimes the terms "current accounts" and "capital flows" are used interchangeably. Current accounts, for instance, are used to identify the sources and destinations of cross-border finance, and hence the global pattern of capital flows, to gauge the degree of financial market integration, and to assess a country's vulnerability to "sudden stops" (Calvo (1998)) in external funding. This centrality runs so deep that in policy circles "global imbalances" are often treated as synonymous with "current account imbalances" (G20 (2011)).

The issues raised are far from purely semantic: they shape one's diagnosis of the ills of the international monetary and financial system and, hence, of possible remedies (Borio (2014), Borio et al (2014b)). For instance, in a previous paper (Borio and Disyatat (2011)), we have critiqued the view that large current account surpluses, and the corresponding "excess saving", have been at the root of the Great Financial Crisis by inducing very low interest rates and loose global financial conditions and by fuelling credit booms in current account deficit countries – the "saving glut" hypothesis advanced by Bernanke (2005). One essential element of our critique is that, contrary to a common view, current account patterns are largely silent about the role a country plays in international borrowing, lending and financial intermediation – aspects that must be at the core of the understanding of *any* financial crisis.[1]

In this paper, we take that analysis further in two respects. First, we make the arguments more precise by developing a very simple, highly stylised general equilibrium model. The aim is to clarify further the basic analytics and draw out the underlying reasoning in a tractable framework. Second, we broaden the scope of the critique. In particular, we apply the underlying framework to the interpretation of two of the most enduring puzzles in international finance – the Lucas paradox (Lucas (1990)) and the Feldstein-Horioka puzzle (Feldstein and Horioka (1980)). We argue that once one acknowledges the limitations of current accounts in providing a full picture of cross-border capital flows, it is not puzzling, or necessarily sub-optimal, to see developing economies run account surpluses (the Lucas paradox) and it is inappropriate, as many others have already noted, to assess the degree of financial integration from the size and persistence of current accounts (the Feldstein-Horioka puzzle).

The common thread in our analysis is the distinction between *saving* and *financing* (Borio and Disyatat (2011)). Saving, a national accounts concept, is simply income (output) not consumed; *financing*, a cash flow concept, is access to purchasing power in the form of

[1] The second analytical element of the critique is that saving and investment balances – what current accounts reflect – at best help determine the natural, or equilibrium, interest rate and not the market interest rate. And it is hard to think of the interest rates prevailing before the crisis as fully "equilibrium" ones if they are simultaneously regarded as a factor contributing to the crisis. On this, see also Borio and Disyatat (2014).

an accepted settlement medium (money), including through borrowing. Investment, and expenditures more generally, require financing, not saving. And financing is a gross, not a net, concept: financing is necessary for all sorts of purchases, well beyond those associated with income flows, including those of existing financial and real assets.

Put differently, there is a corresponding distinction between a *resource* and a *financing* constraint. Saving alleviates an economy's *resource constraint*: if people did not abstain from consuming, they would not release real resources that could be used to invest; cash flows alleviate an economy's *financing constraint*: in their absence, no spending could take place. This applies both domestically – to a closed economy – and across borders. And it is what makes it misleading to think of the current account – the gap between domestic saving and investment – as telling whether a country is lending (if in surplus) or borrowing (if in deficit). The current account is simply telling us whether a country is, on net, releasing resources to the rest of the world (if in surplus) or drawing on it for those resources (if in deficit). But the corresponding expenditures could be financed *entirely* at home or abroad, *regardless* of the current account position.

This distinction is precisely what is lost in the prevailing analytical frameworks, which have tended to treat money and finance as veils of little or no consequence. A profoundly influential example is the so-called intertemporal approach to the current account. This sees the current account as the outcome of households' consumption-smoothing decisions and hence as *the* vehicle for lending and borrowing (eg Obstfeld and Rogoff (1995, 1996)). In its simplest form, and because of its focus, the approach has no room for the distinction between net and gross flows. And even when it does make the distinction, it tends to see the capital account as a means of diversifying portfolio risks, rather than as facilitating financing. In the process, most prevailing models also overlook the role of banks in endogenously creating purchasing power and hence financing, which would make the distinction between saving and financing even clearer.

To be sure, none of this is the models' fault: they were specifically designed to focus on intertemporal decisions in the simplest possible way. Even so, their clean conceptual intuition has been applied to settings for which it is ill-suited. Put differently, our analysis can be read as a cautionary tale: the way we talk about identities and our models can inadvertently shape in unhelpful ways the inferences we draw from them. In this sense, our paper is both about rhetoric and substance.

Seen through our lens, the apparent paradoxes and puzzles highlighted above lose force. Even if poor countries finance *all* of their investments from abroad, with high potential returns attracting foreign investment, they may still run current account surpluses – there is no obvious Lucas paradox. Similarly, even if a country is fully financially integrated with the rest of the world, its current account may be balanced; or even if it has a large position, it may rely on tight capital controls, with little correlation between domestic saving and investment – there is no Feldstein-Horioka puzzle. The conundrums are such only because the lens is too narrow, forcing equivalences where they need not exist. And, as we will show, they appear so deceptively compelling owing to another intellectual pitfall: the tendency to extrapolate inferences from a two-country to a multi-country world – something which is, or at least should be, well known but is often overlooked.

Our analysis has broader implications, sometimes already recognised but, in our view, still underappreciated. We note two of them in particular. The first has to do with the assessment of financial vulnerabilities and external adjustment mechanisms. Once the focus shifts away from the sustainability of current accounts, it makes sense to zero in on the sustainability of financial exposures, and hence on how external positions link up with a country's overall balance sheet. Indeed, while sudden stops have often been analysed through a current account lens, they are gross, not net, financing events, very much like bank runs. The second has to do with the global configuration of current accounts. Once the focus is broadened beyond intertemporal consumption-smoothing decisions, there is greater room for global trade and production structures in helping to explain that configuration. This would encompass aspects prominent in traditional trade theory, such as relative factor endowments and factor intensities and hence a country's position in global production networks.

To be clear, we do believe that current accounts matter greatly. If very large and persistent, they do provide information about long-term sustainability, they do raise the costs of financial crises, and they do pose the risk of trade protectionism. But current accounts have been asked to tell us more than they can about several key macroeconomic magnitudes – about the volume and direction of capital flows; about how economic activity is financed; about the role countries play in financial intermediation, lending and borrowing; and about the risks of financial instability and the mechanisms involved. In part, this stems from too literal an interpretation of conceptual frameworks not intended to address these issues. More importantly still, this has often led the policy debate astray. And this is just one of the broader set of limitations of prevailing conceptual frameworks used to analyse the global financial system (Avdjiev et al (2015)).

The rest of the paper is organised as follows. Section I briefly recalls the strength of the current account tradition in international finance, illustrates it with the more formal intertemporal approach to the current account, and summarises the treatment of the Lucas and Feldstein-Horioka conundrums in the literature. Section II develops our critique with the help of simple models. Section III examines critically the prominence that current accounts still have in academic and policy discussions of financial vulnerabilities and crises. A box explores the implications of the analysis for the determination of the configuration of global current account balances.

I. Capital flow puzzles and paradoxes

A current account focus

The focus on current accounts and their reflexive association with capital flows has a very long tradition. It goes back to at least David Hume's view of the gold specie standard, in which current account balances were seen as the source of cross-border gold flows (Hume (1898)). It is through this lens that the economic havoc in the interwar years is seen in terms of the transfer problem, linked with war reparations (Keynes (1929a,b) and Ohlin (1929a,b)). It is the perspective that highlights a systematic contractionary bias in the global economy because deficit (borrowing) countries are forced to retrench when surplus (creditor) ones are

no longer willing to lend to them (Keynes (1941)). It reappears in the view that traces the 1970s woes and Latin American crisis to the recycling of oil exporters' surpluses (Lomax (1986), Congdon (1988)). And, more recently, it has re-emerged in the argument that a saving glut, reflected in large Asian current account surpluses, was at the root of the Great Financial Crisis (Bernanke (2005, 2009), Krugman (2009), King (2010)).[2]

Through this lens, current accounts are seen as both a gauge of *how much* financing an economy obtains from abroad and of the *direction* of that financing, with surplus countries lending to deficit ones. The corresponding statements have become so familiar that they are rarely questioned. Here are just a few. Prasad et al (2006) see the current account as a "measure of total external capital financing available for investment in a country" (p 120) or as "the total amount of finance flowing in or out of a country" (p 129). Aizenman et al (2004) examine countries' "self-financing ratios" based on current accounts. And Gourinchas and Rey (2013) note that "[t]he 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" (p 5).

This pervasive, if not ubiquitous, perspective inspires the intertemporal equilibrium approach to the current account, most famously formalised in the 1990s by Obstfeld and Rogoff (1995, 1996) (Annex I). At the core of what has become the workhorse model in international finance is the decoupling of consumption and investment decisions in a given country. Households set their consumption to smooth it over time, ie to avoid volatility; investment takes place so as to maximise returns across countries, seeking the most productive opportunities. The current account permits the decoupling: if a country has a temporarily high income and/or few investment opportunities, it runs current account surpluses, and vice versa.

Annex I lays out the model's well known behavioural relationships; here all we need are the core *identities*. As always, the current account (CA) is equal to production (income), Y, minus domestic investment (I) and consumption (C); saving is defined as income not spent, and the current account is equal to the accumulation of financial claims ("bonds", ΔB, where Δ denotes change). In other words:

$$CA = Y - C - I = \Delta B \quad (1)$$

$$S = Y - C \quad (2)$$

$$CA = S - I = \Delta B \quad (3)$$

These are accounting identities that track resource flows and hence net wealth transfers across countries in a given period, with the difference, on net, taking the form of a financial claim on future output, ie a "bond". The identities are silent about the underlying financing of those resource flows. Thus, taking this as a basis for tracking cross-border borrowing and lending essentially assumes that the resource constraint coincides with the

[2] This line of reasoning echoes in studies that examine the relationship between housing booms and current account deficits. These studies implicitly view the deficits as increasing the availability of foreign funds to finance domestic borrowing (eg Sá et al (2011), Aizenman and Jinjarak (2008)). A popular variant of the "saving glut" view sees capital market "frictions" as an explanation for the observed pattern of global imbalances. Caballero et al (2008), for example, emphasise the role of "safe asset shortages" arising from financial underdevelopment in emerging economies: unable to generate sufficiently attractive assets to absorb domestic saving, these countries see their residents export their saving to advanced economies, generating current account surpluses.

financing constraint. Identity (3) then becomes the basis for the irresistible intuition that surplus countries lend to the rest of the world, while deficit countries borrow from it. And it is also the basis for the equally irresistible image that surplus countries lend to deficit ones. As we will see, neither statement is, in fact, correct once we allow for a distinction between saving and financing and we consider a multi-country world, respectively.

For the moment, however, it is useful to stick to the prevailing perspective for a bit longer. Consider, next, how it underpins the Lucas paradox and the Feldstein-Horioka puzzle. These are just the two most prominent of a number of empirical patterns that are hard to reconcile with this standard framework, given its intended focus. They have given rise to a huge literature in international finance (Gourinchas and Rey (2013)).

The Lucas paradox and the Feldstein-Horioka puzzle

The Lucas paradox highlights how the intertemporal model performs poorly in explaining the empirical *pattern* of net capital movements between developing and mature economies.

As noted, a country is expected to run a current account deficit if output is below its long-term ("permanent") level or investment exceeds its own long-term level. In this case, households need to draw on capital markets to avoid falling short of their desired long-run consumption path. This stylised configuration fits developing countries, where a relatively smaller capital stock should imply a higher marginal product of capital and where incomes are expected to rise more rapidly over time. These countries, therefore, should run current account deficits. This, in fact, tends not to be the case (eg Prasad et al (2006)). To put it in Lucas's (1980) terms, capital appears to flow "uphill", from less developed, poorer, capital-scarce economies to more developed, richer, capital-abundant ones.[3]

Explanations of the Lucas paradox have not questioned the saving-financing equivalence; rather, they have focused on the possibility that the true returns to capital in poor countries may not be as high as their low capital-to-labour ratio suggests. Several reasons have been proposed: institutions there may be weak (Alfaro et al (2008)); physical capital may be costly (Hsieh and Klenow (2007), Caselli and Feyrer (2007); governments may be more likely to default (Reinhart and Rogoff (2004)); and underdeveloped financial markets may not offer sufficiently attractive stores of value (Caballero et al (2008)) or insurance against idiosyncratic risk, boosting precautionary saving (Mendoza et al (2009)).

The Feldstein-Horioka puzzle highlights how current account balances tend to be much smaller and less variable than theory predicts.

In a seminal paper, Feldstein and Horioka (1980) studied the cross-country correlation between average saving $\left(S/Y\right)$ and investment $\left(I/Y\right)$ rates with the following regression:

$$\left(I/Y\right)_j = \gamma + \beta\left(S/Y\right)_j + \varepsilon_j. \qquad (4)$$

[3] The intertemporal approach also implies that countries with higher productivity *growth*, and thus a higher growth rate, should receive relatively more capital inflows (ie run larger current account surpluses) than the rest. This contradicts the empirical observation that, among developing economies, those with relatively *higher* productivity growth tend to have *larger* current account surpluses – the so-called "allocation puzzle" (Gourinchas and Jeanne (2013)).

For a sample of 16 OECD countries over 1960–74, they obtained an estimate of $\beta = 0.89$: saving and investment co-moved very closely. They interpreted this as evidence of sizeable "financial frictions" in international markets, inhibiting the free flow of capital across borders. Without such obstacles, investment and saving (consumption) should be decoupled, ie the coefficient should be much smaller than 1.[4]

Feldstein and Horioka's work has sparked a voluminous literature, updating their study and implementing various variations on the theme. The framework still forms the basis for research into capital market integration (eg Chang and Smith (2014), Bai and Zhang (2010)).

Rationalisations of the Feldstein-Horioka puzzle, again, have not questioned the saving-financing equivalence; rather, they have focused on the role of common shocks and general equilibrium effects. Obstfeld and Rogoff (1995) list a number of reasons why the empirical test is not robust, including the failure to control for shocks, such as temporary unexpected changes in productivity that would generate co-movements in saving and investment. Ventura (2003) has emphasised investment risk and adjustment costs, while Bai and Xiang (2010) have highlighted the role of financial frictions. Numerous studies have also raised data and estimation issues.[5] Perhaps closest to us is Golub (1990), who argued that the difference between gross and net capital flows undermines the Feldstein-Horioka framework.

II. Taking financing seriously

Lost in translation

What is lost in the translation from theory to empirical observation is that saving and financing are not equivalent – the resource and financing constraints differ. They are equivalent in the model, but not in general and, more to the point, in the real world. The question, therefore, may not be entirely correctly posed.

Consider first their equivalence in the model. The current account allows the economy to relax its *resource constraint* today, matched by changes in (net) claims abroad – identity (1) above. There are no gross capital flows because agents are assumed to be identical. Everyone either borrows or lends, but not both: all flows are unidirectional. Moreover, with internationally traded bonds being the *only* asset, a resource flow imbalance automatically implies changes in net debt claims. Thus, a current account imbalance is synonymous with foreign borrowing and lending: there is no distinction between the resource constraint and the *financing constraint*. Fundamentally, though, goods are

[4] This independence, however, need not hold in the presence of non-traded goods; see Obstfeld and Rogoff (1995). Also, Decressin and Disyatat (2008) show that, in this framework, the correlation depends on the share of agents in the economy who face borrowing constraints. In the extreme, when everybody is unable to borrow, saving equals investment and the current account is zero.

[5] See Apergis and Tsoumas (2009) for a survey.

exchanged for goods directly: "bonds" are simply claims on future goods. There is no monetary constraint requiring goods to be exchanged for money – the settlement medium.[6]

But saving and financing are not equivalent in general. In a monetary economy, the (real) resource constraint and the (monetary) cash flow constraint differ, because goods are not exchanged for goods, but for money or claims on it (credit). And so borrowing and lending are carried out not through the direct exchange of real resources, but of financial claims on those resources. The same is true for *any* acquisition of real and financial assets that do not give rise to income (output) flows, such as that of existing assets or intermediate goods and services, which are excluded from value added. And when financial exchanges cross the border, ie are between a resident and a non-resident, they give rise, *by construction*, to offsetting gross flows. In other words, on their own, financial trades (ie those unrelated to payments for goods and services, factor incomes or transfers) are a wash and cannot give rise to changes in net claims, ie in the current account.

This is the reason why current accounts are, in effect, silent about financing patterns. They reflect net wealth transfers, not financing flows. As such, they can tell us little about how much of the investment carried out in a given country is financed from abroad, let alone from which country – the basis for the Lucas paradox. And they contain no *direct* information about the degree of financial integration – the basis for the Feldstein-Horioka puzzle.

To be sure, in some instances the tight link between the finance and resource constraints presumed in standard models may not be too far off the mark. This would be the case, for instance, if the capital account was largely closed, so that the only cross-border exchanges reflected transactions in goods and services *and* those transactions had to be financed from home. Indeed, historically the theory first developed at a time of limited financial integration. But in today's increasingly financially integrated world, the assumption has become tenuous.[7]

In what follows, we develop this basic point with the help of a highly stylised model. We start with a closed economy, since the distinction between saving and financing and the resource and financing constraints is clearest there. We then consider a two-country model, as the basis for generalisations to a multi-country setting. Annex II lays out in detail the model in mathematical form, including its minimalistic behavioural relationships. These are needed to "close" it, but are not essential for our critique, which is based on identities combined with the explicit inclusion of the cash flow constraint.

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[6] Such interpretations are in large part based on the textbook loanable funds perspective of finance, couched purely in terms of saving and investment flows (eg Mankiw (2008)). As we discuss below, this is a very narrow and overly restrictive view of finance because it ignores the role of monetary credit. Lindner (2013) and Jakab and Kumhof (2015) elaborate on the distinction between saving and financing with respect to the loanable funds framework.

[7] The goal of the early models was to focus on intertemporal decisions in a one-asset framework, so that equilibrium in the asset markets could be safely ignored. Subsequent extensions to multiple assets have largely drawn on the insights of Tobin's (1969) portfolio equilibrium approach. That said, our main critique is not about neglecting stock equilibrium in a multiple-asset setting; rather, it is about neglecting the need to finance expenditures with cash flows.

The stylised model: a closed economy

The model has two key features. Together, they formalise the financing and resource constraints in a way that allows for a simple introduction of international trade once we later split the economy into two "countries".

First and foremost, to formalise the *financing constraint*, we assume that all transactions can be carried out only through the transfer of bank deposits. All economic activity requires financing expenditures through *cash flows*. This implements the financing constraint. In turn, banks issue deposits by extending credit. To highlight the role of the constraint, we require that production and investment are prefinanced through the extension of bank credit.

Second, to formalise the *resource constraint*, we allow for investment and, hence, by definition, saving.[8] We do so through a simple storage technology. Importantly, the firms that produce output and those that store it (invest) are distinct. This is the simplest way to introduce international trade once we open the economy up, ie by assuming that the two types of firm are located in different countries.

More specifically, we consider a two-period economy comprised of households, production firms, storage firms and banks. Output needs to be stored because we assume that households only want to consume in period 2. Production firms need to trade with storage firms because they do not have access to the storage technology. Thus, goods are traded among firms in period 1 and between firms and households in period 2. Households provide labour services to production firms in period 1.

A number of ancillary assumptions, of less interest here, help to close the model. Both banks and firms operate in perfectly competitive markets and maximise profits, which are therefore zero in equilibrium. The supply of labour is, in effect, given, and so is output: households consume all the income they receive. Prices adjust so as to equilibrate supply and demand for output. The interest rate (on deposits and loans) is given ("exogenous"). We rule out bankruptcy.

What matters most is the sequence of events and hence how incomes and cash flows as well as assets and liabilities evolve over time. Output is produced in the first period and consumed in the second: storage (investment) prevents it from perishing. Production firms need to prefinance output to pay for wages. They do so by borrowing from banks, which credit them with deposits. In period 1, these deposits are held by households (the wages paid out). In the same period, the storage firms purchase the output generated by product firms. In order to do so, in turn, they also borrow from banks. The banks issue the corresponding deposits, which are then held by the production firms once storage firms pay for the output. In the second period, households consume and all debts are repaid.

[8] To be clear: saving (investment) is not a necessary element of the resource constraint, since *all* expenditures have to be financed. But we need to introduce saving in order to highlight the distinction with financing.

The closed-economy resource constraint: output and expenditure flows Table 1

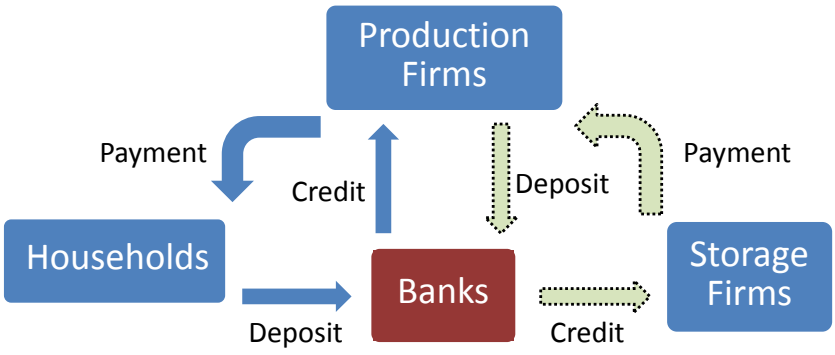
Period 1	Period 2
$S_1 = Y - C_1 = Y$	$S_2 = -C_2 = -Y$
$I_1 = Y$	$I_2 = -Y$
$CA_1 = S_1 - I_1 = 0$	$CA_2 = S_2 - I_2 = 0$

S_i, I_i, CA_i and C_i denote saving, investment, current account and consumption, respectively, in period i.

Table 1 summarises the evolution of the resource constraint, ie what happens to *real* output, saving and investment in the two periods. Since output is produced only in the first period, we drop the time subscript on Y. In period 1, output is fully stored and hence equal to investment while consumption is zero; by definition, saving is equal to investment and hence output. In period 2, the output stored from period 1 (wealth) is fully consumed; since no output is produced, saving is actually *negative* by the amount of consumption (dissaving). By definition, investment is also negative by the same amount – effectively a run-down of inventory.

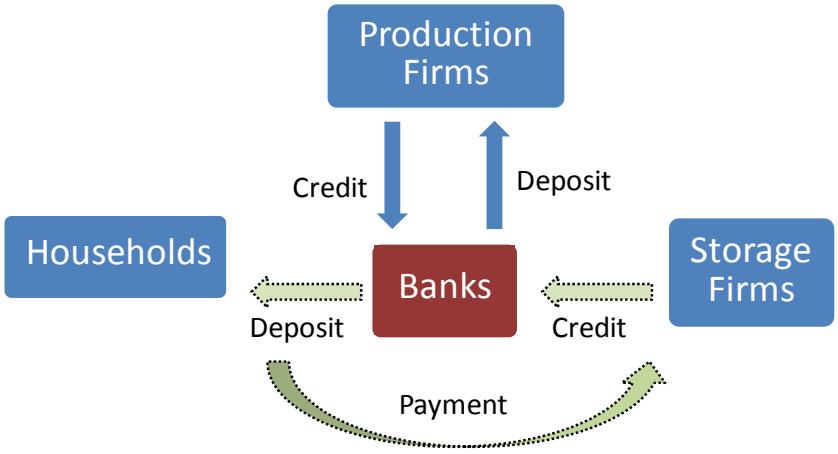
Figure 1 traces the financing flows, ie the *nominal* flows of funds that reflect what we call the financing constraint in period 1. The blue solid arrows trace how *production* is financed: banks grant loans to production firms, which use them to pay salaries to households, which in turn deposit the proceeds with banks. The light green dotted arrows trace how *investment* is financed: banks grant loans to storage firms, which use them to purchase goods from production firms, which in turn deposit the proceeds with banks. In the competitive equilibrium described in Annex II, the value of financial flows captured by each arrow will be equal to P_1Y, where P_1 is the period 1 price level.

Figure 1: Closed-economy financing constraint: period 1 financing flows



In period 2 (Figure 2), these flows are effectively reversed, as households use their deposits to buy the output from storage firms, which in turn use the proceeds to repay their loans from banks. Production firms repay their bank loans with deposits held over the period (we are assuming that bank loans cannot be repaid until period 2 so that production firms keep their sale proceeds in deposits over the period). In the process, the banks' balance sheet shrinks to zero, and so do those of all other agents.

Figure 2: Closed-economy financing constraint: period 2 financing flows



The model highlights two key points.

First, *there is a clear distinction between saving and financing*. In this economy, output, *Y*, is fully saved (invested) in the storage technology in the first period and consumed in the second. By construction, because the economy is closed, saving equals investment. In nominal terms, output, saving and investment in period 1 amount to P_1Y. By contrast, given the specific payment technology assumed, financing is *twice* the value of output in the first period: both production and storage firms need to prefinance, respectively, their production and purchases. This is illustrated in Figure 3 above, which shows banks' balance sheets at the end of period 1: the outstanding value of loans and deposits is twice the value of output. Similarly, financing is also twice output in the second period: households pay the storage firms, which in turn repay their debts, while production firms repay their debt with the deposits they have accumulated in the first period. Thus in each period, the flow of financing is twice the flow of saving. Correspondingly, gross financial assets are twice the value of output at the end of period 1, and zero at the end of period 2, when all debts are repaid.

Figure 3: End of period 1 bank balance sheets

Banks

Asset	Liability
Loans Production Firms P_1Y Storage Firms P_1Y	Deposits Production Firms P_1Y Households P_1Y

Second, *the only way to create deposits is by extending credit*. This is the well known feature of a monetary economy that is obscured in mainstream general equilibrium macroeconomic models. There, banks' task is simply to allocate pre-existing (and new) resources to alternative uses. By contrast, here banks create money – purchasing power – out

of thin air. And it is this that allows production and investment to take place.[9] Banks relieve financing constraints within an economy's available real resources, here given simply by the amount of employable labour (for simplicity, we assume no initial capital stock). It is bank loans that finance production and investment. And the saving flow occurs only once financing has been achieved.

While, of course, the model results in a specific relationship between the volume of assets and debt, production, and saving or investment, the points are quite general.

The equality between saving and investment is often interpreted as saving *financing* investment. But this is true only in the sense that non-consumption of goods in period 1 *makes room* for goods to be invested. This reflects the economy's *resource constraint*. The only way to save in a given period is to produce something that is not consumed – that is, to invest. Thus, investment is already in itself an act of saving. Rather, the constraint on expenditures in our monetary economy is not saving, but *financing*, through monetary payments, ie the transfer of bank deposits, which are in turn generated by extending loans. Without such financing, there would be no production at all.[10]

Crucially, the provision of financing *does not require someone to abstain from consuming*. It is purely a financial transaction and hence distinct from saving, which is simply a way of classifying and keeping track of real resource flows. The equality of saving and investment is an accounting identity that always holds ex post and reveals nothing about financing patterns. In ex post terms, being simply the *outcome* of expenditures, saving does not represent a constraint on how much agents are able to spend *ex ante*. If we step back from comparative statics and consider the underlying dynamics, it is only once expenditures take place that income and investment, and hence saving, are generated.

Put differently, in contrast to popular images, saving is not a "wall" that needs to be channelled into financial assets. Rather, it is the "hole" in aggregate demand (output/income not spent/purchased/consumed) that makes room for investment expenditure. It is part of the resource constraint and entirely unrelated to the financing constraint. Saving entails capital accumulation, not financing. Thus, typical statements such as "country X can sustain more public debt because its high saving rate boosts the demand for assets" are, strictly speaking, meaningless. They conflate saving and financing as well as the national account identity – a rendition of the resource constraint – with the cash flow identity – the financing constraint.[11]

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[9] Obviously, credit may also be granted by non-banks. For instance, this would occur in our simple model if workers received their wages only after production took place. They would be extending "trade credit" to firms. In effect, firms would be issuing IOUs to them, or claims on money. The more general point is that in a monetary economy all activity is underpinned by the exchange of goods and services for an exchange medium that provides purchasing power (money) or claims to it (credit). Our model should *not* be seen as imposing a cash-in-advance constraint, as deposits are created endogenously. Introducing a fixed stock of cash or central bank money and requiring that transfer of bank deposits be settled in cash would simply make the velocity of cash circulation a function of activity but do not constrain it. The same would be true if the stock of bank deposits was fixed and firms could credibly and elastically issue IOUs on the market directly: in this case, it would be the velocity of bank deposits that would change with no impact on economic activity.

[10] Of course, there is also a real constraint, ie the availability of labour, which is mobilised through the creation of the settlement medium (extension of credit).

[11] In our model, financing could be made arbitrarily large by assuming a more involved financing process. Thus, for a given saving rate, the outstanding stock of financial assets and liabilities could vary considerably in terms of

Moreover, *in a more realistic economy, the volume of (gross) financing is bound to be much large*r than in our simple model.[12] Financing will be needed not just to purchase output, but also to purchase intermediate goods and pre-existing (real and financial) assets as well as new financial ones and so on. The observed level of financial assets and debt at any given point in time need not bear a close relationship to output. Pinning that level down would require a richer model than the one we employ here – a model with a broader set of behavioural relationships. That said, regardless of complexity, the key point will survive: saving and financing are two very different concepts. We return to this issue later, when we consider how financial vulnerabilities can build up in an economy.

The stylised model: an open economy

It is now straightforward to extend the results to an open economy. The distinction between saving and financing allows us to decouple the analysis of the direction of trade flows from that of financing flows. Specifically, in our simple model *the location of firms and consumers determines the direction of trade; that of the banks determines the direction of financing flows*. The more general corollary is that there need be *no relationship between the current account position and the origin of the financing for investment (and production)*.

The open-economy resource constraint: output and expenditure flows — Table 2

	Country A	Country B
Period 1	$S_1^A = Y - C_1^A = Y$	$S_1^B = 0$
	$I_1^A = 0$	$I_1^B = Y$
	$CA_1^A = S_1^A - I_1^A = Y$	$CA_1^B = S_1^B - I_1^B = -Y$
Period 2	Country A	Country B
	$S_2^A = -C_2^A = -Y$	$S_2^B = 0$
	$I_2^A = 0$	$I_2^B = -Y$
	$CA_2^A = S_2^A - I_2^A = -Y$	$CA_2^B = S_2^B - I_2^B = Y$

S_i^j, I_i^j, CA_i^j and C_i^j denote saving, investment, current account and consumption, respectively, for country j in period i.

Because of this decoupling, it is instructive to consider the two aspects sequentially. For simplicity, we also assume that the two countries share the same currency. This assumption, however, in no way affects the result, as we show in detail in Annex III.

In order to determine the direction of trade, we simply assume that production firms and storage firms are located in different countries, A and B, respectively. For simplicity, we

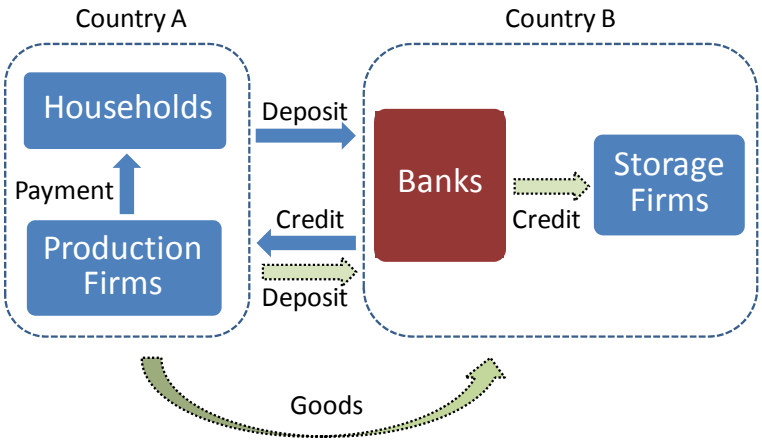
scale and complexity. The amount of assets that an economy sustains, therefore, depends on the financing model and is not pinned down by the saving rate.

[12] In Annex II, we describe an open economy version of the model with more elaborate financing patterns. In this case, the volume of financing is three times the value of output.

also assume that consumers (households) are located only in country A. In this case, country A runs a current account surplus in period 1, when it produces and exports the output to storage firms abroad, and an equivalent deficit in period 2, when households import to consume. Correspondingly, country B runs a deficit in period 1, when it invests (stores the output), and a surplus in period 2, when it sells it back. Table 2 shows the familiar national income identities and traces the behaviour of the current account in the two periods.

What about financing flows? Assume, first, that banks are all located in country B. If so, by construction, all the financing will come from there. In period 1, banks will finance production in country A *and* investment in country B, through their credit extension. Figure 4 provides a schematic of the flow of funds, with the solid blue arrows depicting flows related to goods production and the green dotted ones those to investment by storage firms. From the arrows crossing borders, country A's acquisition of *net* claims on B is evident (residents in A's claims on banks in B are twice the size of those of B's residents on firms in A).

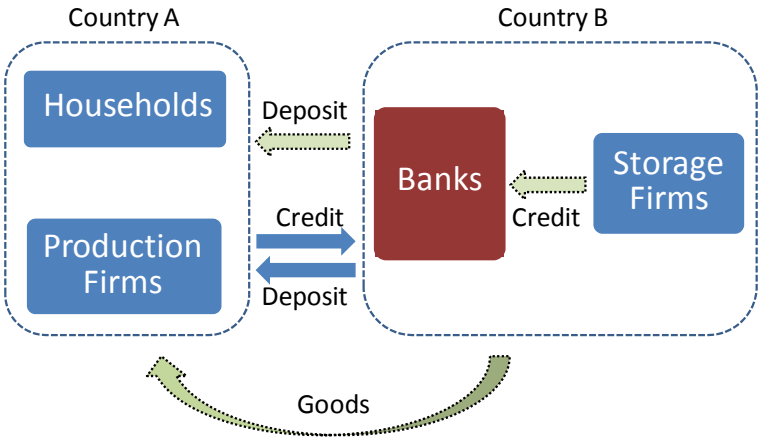
Figure 4: Period 1 flow of funds



In period 2, as before, debts are paid back and deposits run down, as households consume. Figure 5 captures the flow of funds. Again, the solid blue arrows represent flows linked to the repayment of production firms' financing while the dotted green arrows depict flows from the unwinding of storage firms' financing (households use deposits to pay storage firms which use the proceeds to repay banks). The unwinding of country A's net claims on B is evident: now, in flow terms, country B cancels its net liability against B.[13]

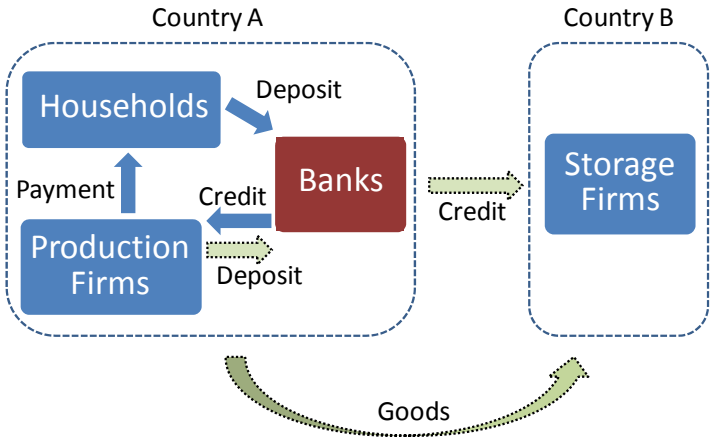
[13] One way to rationalise our setup is to view it as a simple depiction of global trade supply chain. Goods producers represent "upstream" production and storage firms "downstream" production. The assumed specialisation could reflect the relative comparative advantage of countries in the supply chain. Thus, one corollary of our setup is that the structure of international production matters for financing flows.

Figure 5: Period 2 flow of funds



Correspondingly, if we assume that all banks are located in country A, by construction all the financing comes from there. This has no implications whatsoever for the goods flows or national accounts: the configuration of current accounts is *exactly* the same. But the financing flows across countries are obviously very different. As illustrated in Figure 6, the period 1 financing flows for goods production are now entirely domestic within country A while storage firms require cross-border financing to purchase goods for investment. Fund flows reverse in period 2 (not shown). Of course, net flows have the same size and direction as before, but the composition changes. All that crosses the border is A's banks' credit to storage firms in B.

Figure 6: Period 1 flow of funds



The example above highlights the distinction between "capital flows" as conventionally defined and true *financing*. Consider period 1. Country A's current account surplus is typically taken to mean that "capital is flowing from A to B to finance investment there". But the current account just reflects the flow of goods from A to B, to be used for investment there. A's non-consumption of goods accommodates B's use of that good for investment. The current account is a description of the *resource constraint*. In fact, in the example of Figure 4, country B's investment is financed entirely domestically.

In canonical models, it is real resources that are borrowed and lent. A trade-off arises between consumption and investment because the economy's resource constraint dictates that goods that are consumed cannot be invested. Hence foreign saving augments domestic investment by expanding the economy's resource constraint. The resource constraint becomes synonymous with the financing constraint. But the resource constraint does not represent the true nature of finance in a monetary system, where borrowing and lending take place in terms of purchasing power – that is, of money. As shown, the financing source is tied to the location of banks *independently* of the direction of the flow of goods.

An additional, more incidental difference between our model and the canonical one is the main reason for having a non-zero trade balance. Here, cross-country net resource flow does not reflect intertemporal consumption smoothing but the combination of a specific production structure with the temporal separation between production and consumption. The financing patterns and corresponding changes in the various agents' balance sheets simply underpin these real transactions. And whereas the pattern of real transactions and that of net wealth transfers across countries are identical across examples, that of cross-border financing can vary substantially. Financing and intertemporal resource trade (net wealth transfers) are fundamentally distinct.

Of course, at all times the balance of payments identities must hold, and they do: *on a net basis*, the country running a current account surplus is accumulating (net) claims on the country running a deficit. *But the nature of those claims does depend on the underlying financing flows*. In our model, this is tied to the location of the bank.

To see what happens to the nature of the net claims more closely, let's distinguish between claims on banks (deposits) and claims on non-banks (debt). The latter item embodies credit risk associated with firms' activity. Assume, first, that banks are located in country A as in Figure 6. Then, in period 1, country B (in deficit) borrows from country A, as banks there extend credit to storage firms, which in turn run down the corresponding deposits to purchase goods from country A. On net, country B's residents (storage firms) have a *debt* versus A. But if the bank is located in B as in Figure 4, then storage firms' debt is being incurred domestically and the corresponding deposits are transferred to production firms in A in exchange for goods. On net, country B's liability vis-à-vis A is in the form of non-resident bank *deposits*. Thus the *nature* of net claims varies with financing patterns, irrespective of the level of net claims, with important implications for financial stability.

What would happen to cross-border flows if each set of firms borrowed *only* from domestic banks? Storage firms would then use deposits in country B to purchase goods. At the end of period 1, the production firms in country A would accumulate deposits in banks in country B. Thus, the deficit country (B) would accumulate debt in the form of non-resident deposits on the surplus country (A). In this simple example, *the increase in net and gross claims would be the same, in line with the traditional intuition*.

But this, of course, is a very special, unrealistic case. For instance, if production firms in country A decided to repatriate the funds, this would result in a grossing-up of bank assets and liabilities in country A: as banks in B would be short of deposits, those in A would receive additional ones and would need to lend them back to banks in B to clear the market. In other words, the international interbank market would channel the additional gross funds generated by the new lending from banks in A. Overall, there is a reshuffling of ownership

claims as well as an increase in credit risk exposures. Banks in A would take over from production firms the credit risk vis-à-vis banks in B, but production firms in A would not see their credit risk decline, as they would replace credit risk vis-à-vis banks in B with credit risk vis-à-vis domestic banks.

Two key insights follow from these simple examples.

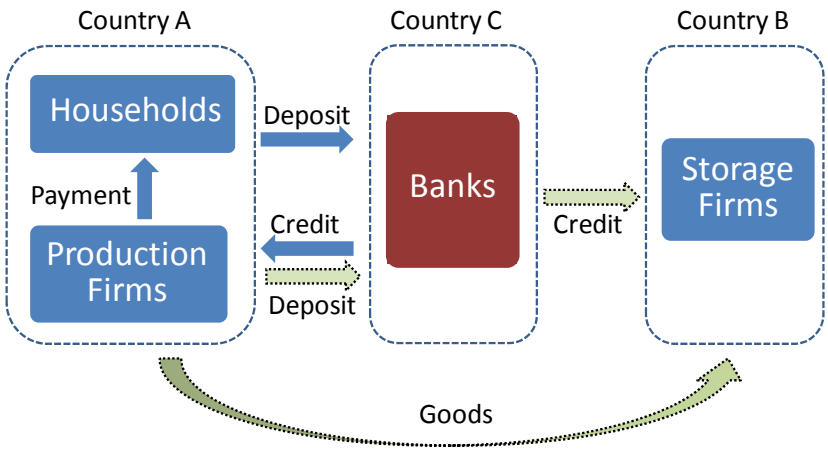
For one, *the direction of cross-border credit risk arising from consumption and investment expenditures is unrelated to the current account position: it depends only on the origin of the financing*. The credit risk associated with storage firms' investment expenditures that give rise to a current account deficit in country B is indeed borne by residents in country A if banks are located there. But if the bank is located in the deficit country B, the credit risk associated with investment is incurred by the domestic bank in B. Put differently, the irresistible image that surplus countries are creditors, exposed to credit risk of deficit countries, because these on net "borrow" from them, is fundamentally misleading. No such statement can be made unless we know who is financing whom.

In addition, *capital flows need not increase the volume of financing in a given economy*. In fact, most of them probably do not: they simply reshuffle the ownership of existing claims (eg deposits, or other assets, as the extended model with multiple currencies in Annex II illustrates). The volume of financing increases only when new financial claims are issued – in our model, bank credit is extended. Thus, care should be exercised when interpreting expressions such as "capital flows financed a credit boom in the country". In this case, much of the effect, in fact, is indirect – through the impact on asset prices that, in turn, encourages more financing.

Before we turn to the interpretation of the two famous puzzles, it is worth generalising the analysis to a multi-country world. Two observations deserve attention: the first relates to the financing constraint, the second to the resource constraint.

In a multi-country world, there is an even weaker link between current account positions and financing flows. Specifically, in a two-country world, at least bilateral *net* capital flows *must be* the mirror image of the current accounts, but this is *no longer true when more countries are involved*. For instance, financing may be provided from a third country *not involved in the underlying current account transactions at all*.

Figure 7: Multiple countries: period 1 financing flows



This is illustrated in Figure 7, where we simply assume that the bank is now located in a country C, which, by assumption, is not engaged in trade and thus has a current account balance of zero. By construction, all net positions of countries A and B will be vis-à-vis C. Thus, even though country A runs a current account surplus vis-à-vis B, A acquires net claims on C (bank deposits). Similarly, country B's current account deficit vis-à-vis A is matched by a net liability position vis-à-vis C (bank credit). Thus, contrary to standard interpretations, *even in net terms* capital is *not* flowing from A to B and B is *not* borrowing from A. Moreover, despite having a zero current account balance, country C has a negative net asset position vis-à-vis country A offset by positive net claims on B. Thus, the pattern of current account balances is silent about the corresponding bilateral pattern of (changes in) net financial claims (A and B vs C).

Equally, in a multi-country world, the pattern of current account balances also says little about bilateral balances among them. For instance, A may be in surplus, B in deficit and C in balance. And yet, A's surplus and B's deficit may be entirely vis-à-vis C, with A and B not even trading with each other. In this case, it makes no sense to say that country A transfers resources to country B. What is happening is that *at the global level* A's shortfall of expenditure over production "makes room for" B's excess.[14]

III. The paradoxes and puzzles revisited

Armed with this simple analytical framework, it is now possible to revisit the Lucas paradox and the Feldstein-Horioka puzzle. Consider each in turn.

Lucas paradox redux

We have seen that current account balances are, in general, silent about the pattern of financing. This goes to the heart of the Lucas paradox.

By itself, the observation that poor countries tend to run current account surpluses while rich ones run deficits says *nothing* about how much, if any, of the poorer countries' investment is financed from abroad. Nor does it point to the direction of financing flows between rich and poor countries. This can be seen on two levels.

First and foremost, the distinction between saving and financing invalidates inferences about the direction of financing based on current accounts *even in a simple two-country setting*. One needs to look at the pattern of bilateral *gross* funding flows. For instance, in the benchmark model outlined above (Table 2 and Figure 4), country B has a deficit in period 1 yet provides the financing that underpins production in country A and

[14] The United States, for instance, has large bilateral deficits vis-à-vis a whole range of countries, not just China or oil exporters. In fact, for much of the past decade the bilateral deficit vis-à-vis European countries has exceeded that vis-à-vis OPEC countries and has not been that much smaller than that vis-à-vis China. It is then arbitrary to identify the US *overall* deficit as coming from China's *overall* surplus. Likewise, China also runs large bilateral trade *deficits* vis-à-vis rich countries such as Korea and Australia even as it runs a large surplus vis-à-vis the United States. At the same time, China runs trade surpluses vis-à-vis emerging market countries such as India and Vietnam. Thus, it is not obvious that China's overall current account surplus can be seen to reflect a net transfer of resources to rich countries.

storage firms' imports of goods. If banks are located in country A, the financing patterns are reversed but current account positions remain the same. Moreover, as illustrated in a more developed version of the model in Annex III, in reality this financing could take a myriad of forms, including from non-banks (eg securities held by non-residents) or businesses (eg types of foreign direct investment (FDI)).

Second, moving from a two-country to a multi-country world undermines our straightforward intuition about *bilateral net* relations. Now, even in *net terms*, individual surplus countries need not accumulate claims on deficit countries. As noted in Figure 7, in the extreme case, *all* the financing could come from a third country, which does not trade with the first two – think of it as a pure financial hub. By construction, net positions would be accumulated vis-à-vis this third country. Thus, in practice, some poor countries may be incurring net liabilities vis-à-vis rich countries, as the theory implies, even as they acquire larger positive net claims on others, rich and poor alike. Likewise, some rich countries could be accumulating net claims on poor countries while incurring larger net liability positions vis-à-vis others.[15]

Finally, even if bilateral net positions do correspond to current account positions – and they need not – it does not follow that, in *aggregate*, surplus countries accumulate *net* claims on *deficit* ones. For example, assume that country A has a current account deficit with B; B a current account deficit with C; and B is in balance. In this case, A is in deficit and C in surplus. Assume further that bilateral net positions do correspond to current account positions, although, as discussed, they need not. Then country C, which has a surplus, is acquiring net claims on B, which is in balance, and which is in turn acquiring net claims on A, which is in deficit. Thus, there is no sense in which capital is flowing from C, in surplus, to A, in deficit.

Overall, the financing pattern underlying current account balances in a multi-country world can be drastically different and much more complex than that suggested by countries' overall current account positions. A first look at the empirical evidence confirms the validity of this analysis.

First, the size of gross capital flows dwarfs that of net (current account) flows, especially for advanced economies (Figure 8). This, by itself, casts doubt on a close correspondence, as it points to the myriad of possible financing flows.

Second, as discussed further below, FDI, which can be more closely linked to real investments, has tended to flow "downhill", from advanced economies to emerging market economies, not vice versa (eg Prasad et al (2006)). The same is true of bank flows, at least over the last decade.

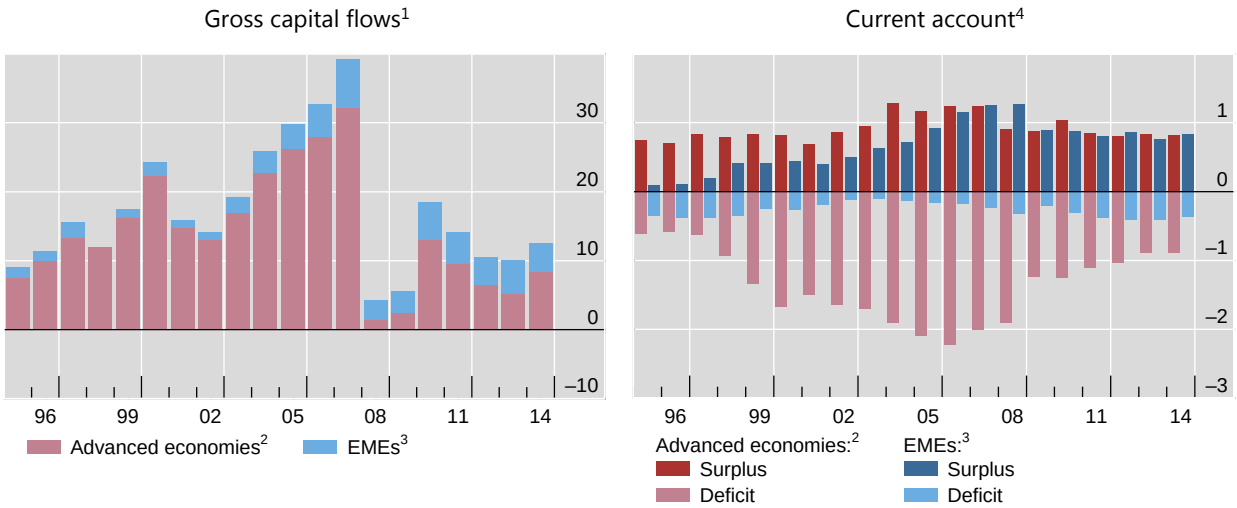
Third, studies indicate that net bilateral financial flows need not correspond to bilateral trade flows, a proxy for bilateral current account balances. In particular, Hobza and Zeugner (2014) have shown that this is the case for the euro area. France, for example, recorded a trade deficit with the euro area and a small surplus with the rest of the world in

[15] By way of analogy, one would not look at regional trade balances to assess the pattern of financing across regions in a given country. For example, the concentration of subprime loans in certain US states and the complex web through which such loans were pooled and distributed across the US financial system would hardly be visible in such data.

the years leading up to 2007, but its financial flows exhibited the opposite pattern – ie France was a net capital exporter to the euro area and a net importer from the rest of the world. Moreover, while the geographical pattern of bilateral trade balances did not change much during the crisis, that of bilateral financial balances did change considerably.

Gross capital flows and current account balances

As a percentage of world GDP — Figure 8



[1] Gross flows equal the sum of inflows and outflows of direct, portfolio and other investments and change in reserve assets. [2] Australia, Canada Denmark, the euro area, Japan, New Zealand, Norway, Sweden, Switzerland, the United Kingdom and the United States. [3] Emerging Asia: China, Chinese Taipei, Hong Kong SAR, India, Indonesia, Korea, Malaysia, the Philippines, Singapore and Thailand. Latin America: Argentina, Brazil, Chile, Colombia, Mexico and Peru. Other: the Czech Republic, Hungary, Poland, Russia, Saudi Arabia, South Africa and Turkey. [4] Both advanced and emerging market economies are sorted into surplus or deficit each by the signs (positive or negative, respectively) of their current account balances.

Source: IMF, *World Economic Outlook*.

Finally, there is little correspondence between country or region pairs in terms of their gross and net external financial positions (Figure 9). Data on bilateral financial linkages constructed by Milesi-Ferretti et al (2010) show that a country's main financial trading partners are not necessarily those holding the largest net claims on it. For the United States, for example, while the net bilateral positions vis-à-vis China and Japan are the largest, gross bilateral positions are much larger with respect to the United Kingdom, the euro area and, not surprisingly, offshore financial centres (see also Kubelec and Sá (2012)).

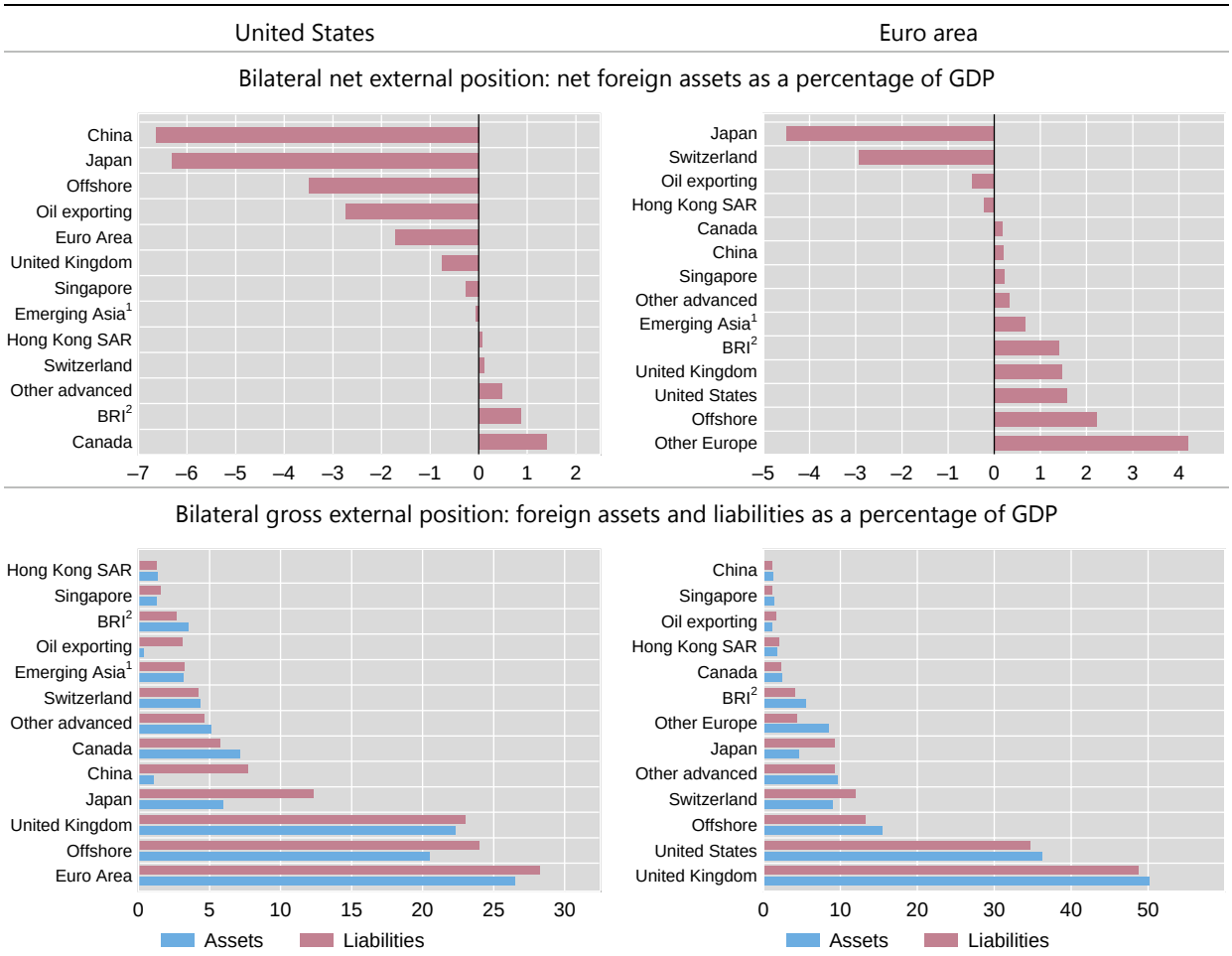
Hence neither net capital flows nor net external positions are sufficient to indicate the direction of financing between countries.

The failure to distinguish clearly between financing and resource flows can lead to misleading inferences when assessing cross-border financial flows.[16] In the Lucas paradox, the underlying focus is on the relative scarcity of *physical* capital. From this perspective, one

[16] For example, a large literature focuses on distortions in the financial sector as explanations for the observed pattern of net flows when in fact these weaknesses in capital and financial markets, such as weak enforcement of creditor rights, impact on gross financial flows.

should read standard models as stressing that the binding constraint on capital accumulation in poor countries is about real resources, not financing per se. As long as domestic intermediaries find it profitable, they could finance domestic investment quite elastically. *Domestic credit expansion is not constrained by saving*.

External positions of the United States and the euro area in 2007 Figure 9



[1] Excluding China and India. [2] Brazil, Russia and India.

Source: Milesi-Ferretti et al (2010).

Moreover, by assuming that financial assets and fixed capital are either the same thing or have the same rates of return under arbitrage, standard models imply that all capital ought to flow in the same direction. But such one-way capital flow is not observed in reality. In fact, it has been well documented that FDI flows, which better represent the returns to capital embodied in a country's potential growth, do behave more in accordance with the models. Prasad et al (2006), for example, show that the weighted-average relative income of countries experiencing net FDI inflows is generally lower than that of FDI-exporting countries. For non-industrial countries, net FDI flows also tend to flow more to countries that grow faster, with China receiving substantial amounts. Fast-growing countries with better

investment opportunities do attract "real" capital. In contrast to current accounts, there does not seem to be a Lucas paradox or an allocation puzzle with respect to FDI flows.[17]

Once the tight link between financing flows and resource flows is relaxed, it becomes easier to rationalise observed current account patterns between rich and poor countries. For example, poor countries that open up to trade and foreign capital typically have an abundance of labour earning low wages. Early industrialisation steps usually involve developing labour-intensive export sectors, often supported by FDI inflows. The FDI financing *inflow* supporting the development of local export industries in turn contributes to subsequent current account surpluses. In the case of China, for example, over 50% of exports in 2005 were produced by foreign-owned firms, and a further 23% by joint-venture companies (Manova and Zhang (2009)). From this viewpoint, investment *does* flow south to poorer countries through FDI to take advantage of lower production costs, and the fruits of that investment, chiefly manufactured goods, *do* flow north.

All this highlights the problems of identifying financing flows with current accounts and with trying to rationalise them through a saving-investment perspective. And as we suggest in Box 1, it may be possible to develop complementary explanations of the overall configuration of global imbalances by considering also the influence of trade and production structures.

Feldstein-Horioka puzzle redux

The distinction between financing flows and net real resource flows also casts further light on the Feldstein-Horioka puzzle. By focusing on saving and investment, the puzzle's narrative takes net resource flows as a gauge of capital mobility. Financial market integration is seen as freeing saving to seek out the most profitable opportunities worldwide, in turn freeing investment from the shackles of the available pool of domestic saving.

Again, this conflates saving with financing. The constraint on investment, or any expenditure for that matter, is not saving but financing. Cross-border financing flows may indeed alleviate domestic agents' financing constraints and facilitate higher investment. But the relaxation of financing constraints can equally be of domestic origin, such as through easier bank lending standards. Moreover, the impact of a given relaxation of (foreign or domestic) financing constraints on net resource flows is, strictly speaking, ambiguous. For example, it will depend on whether it helps boost expenditures in the traded or the non-traded sector and hence on its impact on production.

A financially integrated world is not one in which, literally, saving flows freely across countries, because, by definition, it can't. Rather, it is one in which financing flows freely, because it is allowed to. And, as we have seen, this need not, and for the most part does not, involve any changes in net resource flows. This echoes Golub's (1990) arguments, well recognised by others, that Feldstein-Horioka-type regressions may not sufficiently capture financial market integration because they focus on net rather than gross capital flows.

[17] Emphasising the existence of two-way capital flows, Ju and Wei (2010) and Wang et al (2012) have developed models to explain why developing countries tend to be net importers of FDI, on the one hand, but net exporters of financial capital, on the other, while developed countries are the reverse.

Put differently, the decoupling of saving and investment is neither a necessary nor a sufficient condition for financial market integration. It is not necessary because markets can be fully integrated with current account positions fully in balance; it is not sufficient because positions may be persistently positive or negative even with little in the way of cross-border trade in financial assets or financing flows. The cross-country transfers in net wealth that current accounts represent are only indirectly linked to the degree of financial integration.

Our model can help illustrate some of these points.

Consider the "necessary" part of the condition first.[18] In the basic two-country setup, suppose we collapse production and consumption into one period. Here countries A and B will indeed trade, but over the whole period current accounts will balance out to zero. Feldstein-Horioka-type saving-investment regressions will reveal a unit coefficient for β even though financial markets are, by construction, perfectly integrated. Alternatively, suppose that production firms, storage firms and households are all located in country A, while banks are in country B. In this case, current accounts will be zero given that there is no trade in goods, but cross-border financing takes place and underpins all activity in country A. Again, saving-investment regressions will indicate no capital market integration even though cross-border financing flows are prevalent – in fact, essential.

Consider next the "sufficient" part of the condition. Imagine that a country has a tightly controlled capital account but is open to trade. Here only importers and exporters will have access to foreign exchange and cross-border claims. Even so, the country could run substantial current account imbalances. Thus saving and investment can diverge persistently even with little financial market integration. Present-day China is an illustration of this possibility, although, admittedly, its capital controls are porous.

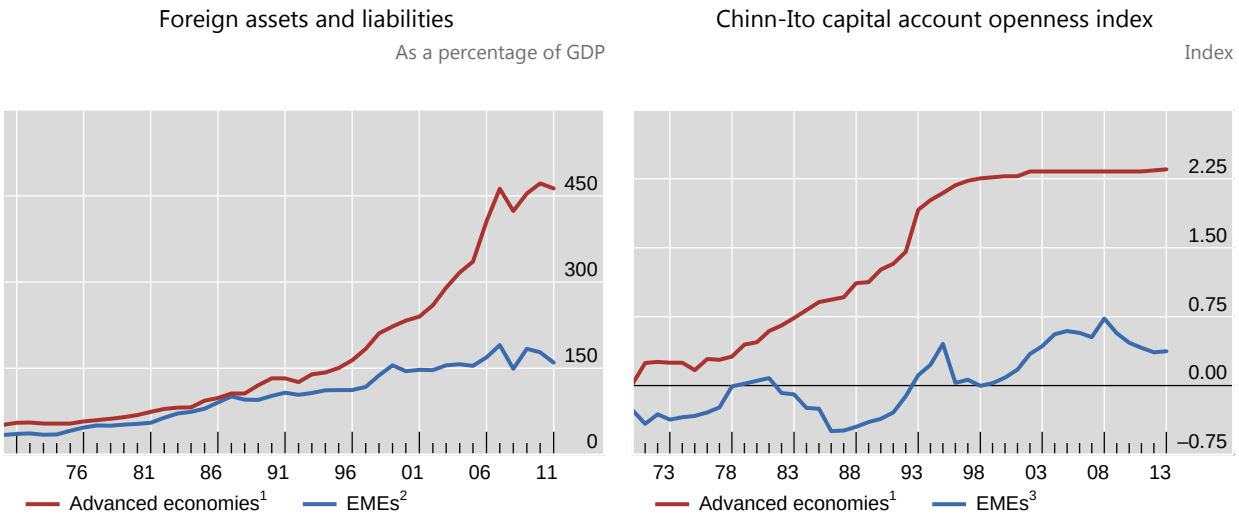
There is little doubt that capital market integration has deepened rapidly in the past two decades and is at a high level, especially so for advanced economies. This is reflected in a number of measures such as gross flows and stocks of foreign assets and liabilities, indices of capital account openness, interest rate differentials or measures of real rates of return.[19] Figure 10 shows two of the most popular measures of financial integration. Notably, the ratio of assets and liabilities to GDP has risen, from 70% in the 1980s to over 450% in 2011 for advanced economies. The Chinn-Ito index likewise shows increased capital account openness for both advanced and emerging market economies. Similarly, recent evidence indicates that differences in real returns to physical capital have narrowed substantially. Caselli and Feyrer (2007), for example, found that real returns to capital are equalised across the world, while David et al (2014) argue that when long-run risks are taken into account, real returns in emerging market countries are not that dissimilar to those in the United States.

[18] This point has been well recognised in the literature for a long time (eg Obstfeld (1986)). We are just providing an explanation firmly anchored on the distinction between saving and financing.

[19] De jure measures of financial integration based on the institutional framework are described in the IMF Annual Report on Exchange Arrangements and Exchange Restrictions and have been refined in Quinn (1997), Quinn and Toyoda (2008) and Chinn and Ito (2008). Other, de facto measures are based on convergence in asset prices, rather than on the quantities traded. After assessing a wide variety of indicators, Kose et al (2006) recommended the sum of stocks of assets and liabilities to GDP as the preferred measure.

Deepening financial integration

Figure 10



[1] Australia, Canada Denmark, the euro area, Japan, New Zealand, Norway, Sweden, Switzerland, the United Kingdom and the United States. [2] Emerging Asia: China, Chinese Taipei, Hong Kong SAR, India, Indonesia, Korea, Malaysia, the Philippines, Singapore and Thailand. Latin America: Argentina, Brazil, Chile, Colombia, Mexico and Peru. Other: the Czech Republic, Hungary, Poland, Russia, Saudi Arabia, South Africa and Turkey. [3] Countries as listed in footnote 2, excluding Chinese Taipei.

Sources: Updated and extended version of data set constructed by Lane and Milesi-Ferretti (2007); Chinn and Ito (2006).

Having said all this, financial market integration is indeed likely to support and even encourage more persistent current account positions. Greater capital mobility goes hand in hand with greater ease of financing. If this facilitates, in particular, the export sector, it may contribute to current account surpluses. More often perhaps, it has tended to boost domestic demand relative to output resulting in current account deficits. The role of capital flows in amplifying domestic financial cycles has been amply documented (eg Borio et al (2011), Avdjiev et al (2012), Lane and McQuade (2014)). It is probably no coincidence that countries have tended to run larger and more persistent positions during historical phases when capital markets have been more integrated, such as during the gold standard and since the early 1990s. This is consistent with time variation in Feldstein-Horioka-type tests.

Box 1: A trade-centric view of global imbalances

The distinction between financing flows and resource flows suggests broadening the perspective from which to view current accounts. Clearly, the output/absorption (saving/investment) paradigm is very important; the intertemporal consumption-smoothing approach falls into this category. But to reach a fuller understanding of the issues, it could be helpful to broaden the perspective to considering countries' factor endowments, the relative intensities with which those factors are used in production, and countries' role in global production networks. For instance, in the highly stylised model employed in this paper, it is the assumed production structure that shapes the configuration of current accounts. Given the postulated consumption patterns, and irrespective of financing patterns, the country with the storage firm will always import in the first period. Relative specialisation patterns matter.

Against the backdrop of large structural changes in a country's comparative advantage, and hence its trade structure, greater consideration of *intratemporal* goods trade seems warranted. A more trade-centric view of the current account would recognise the fundamental changes in international trade patterns brought about by globalisation over the last two decades. In

particular, improvements in transportation, communication and the ability to manage globally diversified production networks have tremendously increased the international mobility of means of production (capital and technology). The production process has become more diversified globally, driven by efforts to take advantage of lower costs – be it undervalued exchange rates, low taxes, subsidies, light regulation or abundant cheap labour.

One consequence of the creation of flexible international production networks (ie supply-chain trade; Baldwin and López-González (2013)) has been the shift of manufacturing production to emerging market economies. The example of how Apple's iPhone is manufactured in China using parts imported from a myriad of countries is particularly instructive (Xing and Detert (2010)). The resulting pattern of international trade and the associated global configuration of current account balances surely reflect these radical changes to some extent.

More generally, the key insights from trade theory, derived from deep and careful consideration of who should export/import and what based on factor proportions, have little role in standard approaches to the determination of the current account. Indeed, most trade models assume balanced trade, while open economy macro models typically consider only two countries and ignore heterogeneity in production structure. Integrating the two strands of research could well lead to useful insights. This is important not least because calls for global rebalancing ignore the highly asymmetric trade relationships between countries. Thus, a reduction of China's trade surplus, for example, could have a very different global impact than that of Japan's, as these two countries occupy different positions in the global value chain.

There have been a few notable attempts to proceed along these lines. Jin (2012) presents a model where relative factor intensities drive net capital flows. In her framework, in addition to the traditional intertemporal trade motive, there is also an intratemporal one, since capital will tend to flow to countries that are more specialised in capital-intensive industries. An industrial structure that is tilted towards capital-intensive sectors will face greater investment demands, and this "composition" effect can offset the standard force that channels capital to where it is scarcer. Ju and Wei (2009) propose a model with multiple tradable sectors where the composition of tradable sectors in output and trade as well as sector-biased productivity shocks explain current account movements. The discussion highlights the role of trade liberalisation in driving net capital flows (see also Ju et al (2012)).

Barattieri (2014) highlights the fact that the United States has a large deficit in the goods balance and a modest surplus in the service balance while the opposite is true for Japan, Germany and China. He offers an explanation of global imbalances based on the interplay between the United States' comparative advantage in services and the post-mid-1990s asymmetric trade liberalisation process, whereby goods trade has been significantly liberalised while service trade has not. An index of relative comparative advantage is able to explain a large portion of the cross-country variation of current account balances.

In a similar vein, but admittedly much closer to the traditional approach, other researchers have stressed the relationship between real exchange rate undervaluation and the export-led growth model. Both Dooley et al (2004) and Rodrik (2008), for example, focus on the role of policies to resist real exchange rate appreciation in countries with a rapidly growing tradable sector, such as China. The observation that developing countries with high growth in the tradable sector tend to have current account surpluses is then a reflection of their underlying growth model. As noted above, a typical development pattern involves economies going through export-led growth in the early stages of industrialisation.

The common theme underlying these papers is that the global configuration of current account imbalances may to some extent reflect underlying structure of trade and production. They also offer alternative explanations to the Lucas and Feldstein-Horioka puzzles. Relative factor intensities and specialisation can help explain the pattern of net capital flows, while high saving-investment correlation, or small and persistent current accounts, may in part reflect the slow-moving nature of trade and production structure. From this perspective, the question is not so much why poor countries export capital, but why they export goods and services and how this is related to their growth pattern.

IV. Current accounts and financial stability

The failure to maintain a clear distinction between net resource flows and financing flows has implications that extend beyond the Lucas and Feldstein-Horioka puzzles. Most prominently, it calls into question the central role sometimes accorded to current accounts in assessments of financial vulnerabilities. For one, current account deficits are typically seen as financing credit booms.[20] More generally, current accounts loom large in assessments of external stability and the risk of sudden stops, being the main focus in multilateral surveillance frameworks used by the International Monetary Fund and the other agencies (IMF (2013)).

Why such a central role of current accounts in the assessment of *financial* vulnerabilities? The reason is that current account deficits are regarded as exposing countries to foreign investors' and lenders' sentiment, and hence to sudden stops, in ways that current account surpluses do not. Current account deficits are seen as implying greater reliance on foreign financing and hence as heightening the vulnerability to financing reversals. Conversely, "protracted current account surpluses do not depend on the willingness of foreign investors to finance domestic consumption and investment, and hence are not hostage to changes in investor sentiment" (Blanchard and Milesi-Ferretti (2011), p 6).

Nevertheless, there are reasons to question whether this overwhelming attention is warranted.

First, current accounts do not indicate the extent to which countries' obligations to "pay back" funds change. Both current account surplus and deficit countries are exposed to financing reversals. Sudden stops arise from an inability to meet financial obligations, ie to pay back money. Here, it is *gross* exposures that matter. While this is often recognised, it is oddly often overshadowed by a heavy emphasis on current accounts in assessing countries' external vulnerability. Apart from market perceptions – ill-founded as they may be – there is no reason why current account deficits *in and of themselves* imply such greater exposure. Investors don't stop financing current accounts, they stop financing debt (or engage in asset fire sales). Sudden-stop risks can be present even with no imbalance in either the current account or net external positions. Indeed, whether the holders of liabilities that need to be rolled over are domestic or foreign seems secondary.[21]

In this light, the emphasis on the "need" for current accounts to adjust when crises do occur appears misplaced (eg IMF (2014)). In such situations, the underlying problem typically stems from balance sheet exposures that disrupt the flow of financing rather than some sudden binding constraint on net resource flows. "Current account reversals", or reductions in deficits, are not means to pay back obligations. They typically reflect the macroeconomic adjustment that accompanies the financing disruptions. And the crisis ends not when or because the current account is reduced, but when the funding gap is eliminated through either new financing or debt restructuring. Moreover, the adjustment process is no

[20] A recent example is the "excess saving" view that links global current account imbalances to the global financial crisis (Borio and Disyatat (2011) list extensive references). There is also a view that a large part of the current account deficits of euro zone periphery countries has been financed by cash transfers through the TARGET2 payment system (see Buiter et al (2011) for references and discussion).

[21] See Avdjiev et al (2015) for a discussion and documentation of the need to focus on balance sheets in the analysis of global financial vulnerabilities.

different for a surplus country that experiences a sudden stop. The current account is very much the tail of the dog in these situations.

Second, externally sourced credit booms take place through inflows of foreign financing, not net resource flows as reflected in current accounts (eg Borio et al (2011), Avdjiev et al (2012)). As we have seen, the link between these two types of flows is quite tenuous. Credit booms have been associated with both current account deficits (such as pre-1997 crisis Asia and pre-2008 US) and current account surpluses (such as Japan in the 1980s, the Netherlands recently or China, Sweden and Switzerland now).[22] The current account is simply not informative of the financing of expenditures.

Third, the configuration of current accounts does not reflect how the sources of risk are distributed. Consider the three-country example in Section II. Based on the configuration of current accounts and net international positions, country B, which runs a current account deficit, might be seen as more vulnerable to a sudden stop, while country A, as a creditor nation, might be perceived as exposed to possible losses in the event of a crisis. Country C would be out of the picture. But considering the financing flows shown in Figure 7, it is clear that country C is at the heart of potential vulnerabilities. As an intermediary, it is dependent on deposit funding from households in country A and holds loans on country B, which could potentially be of longer maturity. Financial stability risks could originate in C or be transmitted through C. But based on overall current account and net international positions, both of which are zero, it would not be a focus of risk assessment. The situation of the euro area on the eve of the 2008 global financial crisis was similar to that of country C (Borio and Disyatat (2011)).

Fourth, given the large cross-border holdings of many financial assets in different currencies (Gourinchas and Rey (2007a,b), Obstfeld (2011, 2012)), focusing on the current account and net positions potentially neglects balance sheet vulnerabilities inherent in outstanding positions. The composition of assets and liabilities, especially debt versus equity, seems very important. Catão and Milesi-Ferretti (2013), for example, find that net external debt is a significant predictor of external crises while net FDI liabilities seem, if anything, to reduce the likelihood of crises.

Finally, one could even question whether the premises underlying the construction of current account statistics – and, in fact, balance of payments statistics more generally – are fully appropriate for assessing financial stability. In particular, the aggregation of individual balance sheets masks the *distribution* of financial vulnerabilities. And the definition of the relevant economic unit on a residency basis often does not give an accurate picture of the effective exposures of large global conglomerates. Box 2 discusses these issues in more detail.

All in all, even though current account deficits may go hand in hand with elevated risks of sudden stops (eg Catão and Milesi-Ferretti (2013)), we suspect that this reflects other factors. Specifically, it may be an indication of the underlying build-up of financial risks and exposures, either domestically or abroad, which typically takes place in conjunction with macroeconomic outcomes that coincide with a current account deficit (eg credit-fuelled consumption booms). As shown by various empirical studies in recent years, the dominant

[22] See Hume and Sentance (2009) and Jordà et al (2011).

predictors of financial crises are not current account imbalances but credit growth (Taylor (2012), Jordà et al (2011), Gourinchas and Obstfeld (2012), Borio and Lowe (2002)). In terms of capital flows, the risks from debt flows seem to be particularly elevated. For example, Borio et al (2011) and Avdjiev et al (2012) find that external gross credit flows play a key role in disruptive credit booms. Similarly, Lane and McQuade (2013) find that domestic credit growth in European countries is strongly related to net debt inflows. And Yaser et al (2013) find that gross private external debt is an important factor explaining the size of output declines across countries after the global financial crisis.

Box 2: What is the relevant economic unit?

The underlying premise for focusing on current accounts when assessing external stability is the intertemporal budget constraint (equation (4) in Annex I), which relates developments in a country's net foreign asset position to future net exports. This also bears reconsideration. The problem is one of *consolidation*.

Aggregate budget constraints, and the associated consolidation of individual balance sheets, presume an unrealistic degree of risk-sharing. The presumption is that individual risks can be diversified away, leaving only idiosyncratic "country" risk to be managed. But the distribution of assets and liabilities does matter. Asset owners are not the same as liability issuers. It is the gross stocks of assets held across-borders that must be managed for risk. A consolidated constraint will not reflect the true constraint facing each individual and hence will not describe the collective behaviour resulting from their individual choices. Violation of the consolidated intertemporal budget constraint is thus often not the most relevant or informative criterion for a crisis to occur.

Moreover, there is the deeper question as to whether the residency principle, which underlies balance of payments statistics, is the appropriate one (eg Borio (2013), Borio et al (2014b)). In an increasingly globalised world, boundaries of the relevant economic unit often do not coincide with national borders. For example, the transfer of funds across entities that are located in different countries but owned by a single common agent may generate current account imbalances but have no impact on countries' true external obligations. A US company, say, that sets up a subsidiary in the United Kingdom and transfers its holdings of US bonds there will be accruing interest receipts on those bonds, generating current account deficits in the United Kingdom. Over time, the rise in net claims of the United States on the United Kingdom reflects the intra-office claims of the US company which on a consolidated basis do not constitute a real obligation or funding risk for the United Kingdom as a whole.

More concretely, in the basic model of Section II, suppose that production firms in country A are wholly owned subsidiaries of storage firms in country B. To simplify matters, we abstract from the financing requirements of production firms by assuming that households in country A now wish to consume in period 1 and provide labour directly in return for a fraction of the consumption goods produced. The rest of the output is exported to storage firms in country B as an intra-office transfer. The stored goods output in period 2 is subsequently consumed by the storage firms (or sold to some consumer in country B). The upshot is that country B will record a current account deficit in period 1 matched by a net claim held by country A in the form of an inter-office claim of the production firm on its parent company. As this process continues, country B will run persistent current account deficits, progressively increasing the net claims on itself held by country A. Even so, the "debt" that storage firms owe to production firms does not represent a real burden for country B since the claims net out on a consolidated basis. The firm owes money to itself, and when the borders for viewing net claims are drawn according to the effective economic unit (the consolidated firm) rather than along national boundaries, there is no "external" sustainability problem.[i]

Potential interpretation problems also arise with respect to gross flows. In the presence of global conglomerates and special purpose entities, the residency principle often gives a

distorted picture of the true economic and financial linkages between countries. Countries such as the Netherlands, for example, exhibit outsize gross FDI flows relative to their domestic economy given the presence of a number of multinationals that are based there, with all equity capital typically being redistributed and invested from the head office. Funding flows from subsidiaries in one country to parent companies in another also create complications because they do not represent genuine changes in economic interest between countries.

The shortcomings of the residency principle for assessing financial stability risks deserve close attention (eg Borio and Disyatat (2011), Borio et al (2014b)). For example, residency-based data may overstate exposures to and of small financial centres that play an important role for international financial intermediaries. Or they may underestimate them when firms from a given country finance themselves to a large extent through their subsidiaries abroad (eg Avdjiev et al (2014)). Similarly, currency and funding mismatches can arise even without net creditor or debtor positions vis-à-vis specific geographical areas (eg McGuire and von Peter (2009)). It is thus important to complement residency-based analysis with consolidated data – based on nationality, for example – as well as with data on ultimate exposures and currency of denomination. Moreover, once the distinction between residents and non-residents is blurred, policies that are premised fundamentally on this separation, such as capital controls, become more questionable. Avdjiev et al (2015) provide a recent in-depth discussion of these issues.

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[i] The need to rely also on statistics that consider firms' cross-border operations has long been recognised in the literature on multinational companies (eg Kravis and Lipsey (1985), Baldwin et al (1998), Claassen and van den Dool (2013)). And, in the wake of financial crises, it has provided a reason for the collection of the BIS international banking statistics on that basis, as a way of casting light on the international risks these financial institutions incur (eg Borio (2013)). See also BIS (2015, Box V.E) for an estimate of the US balance sheet on such a basis.

When it comes to financial stability, we find it more productive to apply the concept of *financial system elasticity* (Borio and Disyatat (2011)). This is defined as the degree to which the monetary and financial regimes constrain the credit creation process and the availability of funding more generally. In the extreme case that banks are unwilling or unable to extend any credit, no production takes place. The elasticity is essentially zero. In the model described above, banks extend credit as demanded, so the financial system elasticity is high. In fact, real outcomes are equivalent to those for the case of frictionless exchange, where agents can transact directly with one another without the need for banks. But while money and finance do not perceptibly impinge on real outcomes in this simple benchmark case, they do have the potential to do so and, as such, are not just a "veil" in terms of equilibrium outcomes.

In particular, it is possible that credit extension accommodates the build-up of financial imbalances whenever economic agents are not perfectly informed, overestimate future returns, or their incentives are not aligned with the public good ("externalities"). Thus, weak constraints imply a high elasticity, much like a rubber band that stretches easily. If the band stretches too far, at some point it inevitably snaps. As argued in detail elsewhere (Borio and Disyatat (2011)), the recurrence of major financial crises with serious macroeconomic costs across countries of all types is a reflection of these deep-seated forces. They are symptoms of "excess financial elasticity".[23]

[23] In this view, finance is, in fact, a "fundamental" factor just as more traditional ones like technology and household preferences, because it influences how the economy addresses the inefficiencies involved in the process of exchange. Finance is not neutral, not even in the long run. In our simple model, the potential

Conclusion

Overall, we agree with Obstfeld's (2012) affirmative answer to his provocatively titled Richard T Ely Lecture, "Does the Current Account Still Matter?". Large current account imbalances are useful indicators that can signal elevated macroeconomic risks, but they must be complemented by examination of gross flows and gross positions to fully assess financial stability risks. That said, we go further and argue that inferring the *scale* and *directional* flows of capital and financing from current account positions, as typical interpretations of open macro models assert and as has become popular in the policy debates, is misleading. Net resource flows and financing flows are distinct concepts. This is mirrored in the divergence between gross and net capital flows. The patterns of cross-border capital flows that finance real activity cannot be inferred from current accounts, which simply reflect the expenditure outcomes of such financing.

The basic insights of the intertemporal approach to the current account rest on, or at least encourage, a narrow conceptualisation of capital flows that ends up neglecting the role of financing flows. This can lead, and has led, to misleading interpretations and empirical applications of the models. The Lucas paradox is best thought of as a paradox with respect to real returns, not so much the pattern of north-south financing flows. It is not, in fact, about who is borrowing and who is lending. The Feldstein-Horioka puzzle is not a puzzle about the degree of international financial market integration so much as a reflection of the inadequacies in using net resource flows as a gauge of gross financial flows. All this underlies how the way we talk about identities and our models can inadvertently shape in unhelpful ways the inferences we draw from them.

Recognising the distinction between saving and financing has important policy implications too. It suggests that the focus of international macroeconomic cooperation should be rebalanced, away from current account imbalances and towards financial imbalances. For too long, "global imbalances" have been treated as almost synonymous with current account imbalances. In a world of massive cross-border financial flows, financial imbalances can be a more important source of macroeconomic dislocations. In some cases, excessive attention to current account imbalances can even be counterproductive (eg Borio (2014)). When surplus countries are pushed to boost aggregate demand in order to "rebalance" the economy with little regard for developments in domestic financial vulnerabilities, the end result could be quite harmful. Japan in the 1980s and China more recently are such examples. Finally, once attention shifts from current account imbalances to financial imbalances, the role of central banks takes centre stage. Through its ability to set the price of leverage, monetary policy can have a first-order influence on financial conditions and the evolution of financial imbalances, both within and across countries.

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influence of financing on real outcomes is deliberately stark: with no financing, there is no output. In more elaborate models with a richer labour supply function, endogenous paths of capital and debt stocks, and different degrees of financial constraint, an economy's attainable output will depend also on the state of financial factors. It is thus not possible to completely separate the long-run trajectory of output from the financial cycle. For instance, Borio et al (2013, 2014a) present empirical estimates of sustainable output that incorporate the influence of financial factors.

Annex I: Modelling capital flows – the intertemporal approach

The intertemporal approach to the current account has been the workhorse framework in the international finance literature since the seminal contributions of Obstfeld and Rogoff (1995, 1996). The approach extends the permanent income hypothesis under rational expectations to an open economy. In the most basic form, where the only asset is a risk-free bond earning a constant real interest rate, r, the current account can be written as the change in a country's net foreign asset:

$$CA_t = B_{t+1} - B_t, \tag{1}$$

where B_{t+1} denotes the value of net foreign assets at the end of period t. The country's intertemporal resource constraint is given by:

$$B_{t+1} = (1+r)B_t + Y_t - I_t - C_t, \tag{2}$$

where Y_t is output, I_t investment and C_t consumption, all in real terms. Combining (1) and (2) yields:

$$CA_t = Y_t + rB_t - I_t - C_t = S_t - I_t, \tag{3}$$

with $S_t = Y_t + rB_t - C_t$ denoting the country's saving. Iterating (2) forward and imposing a no-Ponzi game condition yields:

$$B_t = -E_t \sum_{s=0}^{\infty} (1+r)^{-s} NX_{t+s}, \tag{4}$$

where E_t is the expectations operator and $NX_t = Y_t - I_t - C_t$ denotes net exports. This is the intertemporal budget constraint and relates movements in net foreign asset positions to present and future expected net exports.

Specifying a standard Cobb-Douglas production function with capital adjustment costs and time-varying productivity, A_t, yields an investment function of the form:

$$I_t = \alpha_1 I_{t-1} + \alpha_2 \sum_{s=1}^{\infty} \alpha_3^s \, \Delta E_t A_{t+s} \quad 0 < \alpha_1 < 1, 0 < \alpha_2, 0 < \alpha_3 < 1, \tag{5}$$

where $\Delta E_t A_{t+s} \equiv E_t A_{t+s} - E_{t-1} A_{t+s-1}$ represents the impact of revisions in expectations about the future path of productivity.[24] The optimal level of investment thus depends on past investment and expected changes in total factor productivity. Notably, it is independent of household's consumption preferences.

The remaining ingredient is the representative household's intertemporal utility function:

$$E_t \sum_{s=0}^{\infty} \beta^s U(C_{t+s}) \qquad 0 < \beta < 1. \tag{6}$$

Maximising (6) subject to (2) and making use of (1), yields the fundamental current account equation:

$$CA_t = (Y_t - \hat{Y}_t) - (I_t - \hat{I}_t), \tag{7}$$

[24] See Decressin and Disyatat (2008) for details of the derivation.

where $\hat{Y}_t \equiv \frac{r}{(1+r)} E_t \sum_{s=t}^{\infty} \left(\frac{1}{(1+r)}\right)^{(s-t)} Y_s$ and $\hat{I}_t \equiv \frac{r}{(1+r)} E_t \sum_{s=t}^{\infty} \left(\frac{1}{(1+r)}\right)^{(s-t)} I_s$ are the permanent – present value discounted – levels of output and investment, respectively.[25]

Thus, conceptually the intertemporal approach ascribes movements in a country's current account to the difference between the current situation of a country and its long-run steady state. From (3), non-zero balances imply that a country's expenditures in that period differ from its flow of resources, taking into account net investment income. This generates a net flow of resources through time and amounts to borrowing or lending resources abroad. The precise amount of borrowing or lending is pinned down by the requirement that debts be repaid, and returns to non-consumption (ie investment) be equated across countries.

[25] See Obstfeld and Rogoff (1995). For simplicity, it is assumed that $\beta = \frac{1}{(1+r)}$.

Annex II: A model of financing

This section sets out the stylised model underlying the discussion in the text. To fix ideas, we start with the closed-economy case before moving to the open-economy version.

Consider a two-period economy comprised of households, production firms, storage firms and banks. For each type, assume that there are a large number of agents with unit mass and that markets are competitive. Thus, both types of firm and banks will earn zero profits in equilibrium and all output will be consumed by households. There is no uncertainty.

Households are assumed to consume only in period 2 and production firms to produce a non-storable good in period 1. Storage firms enable goods to be carried over the period to be sold to households. All transactions between agents can be carried out only through the transfer of bank deposits. Thus all real economic activity is underpinned by the need to finance expenditures on a *cash flow basis*.

Banks

Banks use no resources in the process of intermediation. And since they operate in a competitive market, they earn no profits in equilibrium. New loans are funded completely by issuing deposits. These deposits serve as the only means of settlement in the economy.[26]

We assume the existence of a risk-free government bond that provides a fixed nominal gross rate of return of $(1 + r_f)$ that is set by the central bank. This represents depositors' opportunity costs and pins down the level of interest rates in the economy given that banks make zero profits.[27] It will also determine the rate of goods inflation.

Production firms

Production firms produce a non-storable good in period 1 using only labour input through the following production function:

$$Y = N^{\beta} \qquad 0 < \beta < 1, \tag{9}$$

where Y is the output of the perishable good and N the labour input. Production is assumed to be instantaneous, so that the output becomes available immediately in period 1 once labour is employed.[28] To hire labour, firms have to pay workers a nominal wage rate, w, as

[26] This can be motivated in a number of ways, such as by matching or physical trading frictions. But it is more intuitive to think of it as arising from agents' inability to commit to honouring bilateral obligations owing to, say, moral hazard problems. Thus, agents are not able to issue their own IOUs. Only banks are assumed to be able to enforce contracts, making their IOUs (deposits) acceptable as a settlement medium. Effectively, individual IOUs are not transferable, and hence not liquid, while banks' deposits are. This is similar in spirit to Kiyotaki and Moore (2002) and reflects the fundamental nature of a monetary economy where "money buys goods and goods buy money; but goods do not buy goods" (Clower (1967), pp 207–8).

[27] In a similar setting, Disyatat (2011) develops the bank loan supply function further by considering the role of bank capital in the presence of default risk. He shows how variations in banks' health can affect the level of activity.

[28] This timing convention is purely for convenience, as it simplifies the notation but does not affect the results qualitatively.

well as a fixed cost, F. The latter can be thought of as a participation fee (for example, to buy uniforms or commuting costs) and ensures that production takes place in the zero profit equilibrium. We assume that workers must be paid upfront, so that firms have to obtain credit to finance their total labour costs *prior* to production. Loans carry an interest rate of $(1 + r_f)$ to be paid in period 2, when the loans are extinguished.

Since production firms' output is not storable, they need to sell it to the storage firm at the price P_1 in return for deposits at the bank. They hold these deposits until period 2, earning interest $(1 + r_f)$, which they can then draw on to repay their loans.[29] Thus, production firms' profit function in period 1 is:[30]

$$\pi_1^P = P_1 N^\beta - (wN + F). \tag{10}$$

Taking the price and wage as given, the first-order condition for optimal employment is:

$$N^* = \left[\frac{P_1 \beta}{w}\right]^{\frac{1}{1-\beta}}. \tag{11}$$

In period 2, production firms' deposits at the bank amount to $(1 + r_f)P_1 N^\beta$ while their loan obligation is $\left(1 + r_f\right)(wN + F)$. These will be equal in the zero profit equilibrium that we present below.

Storage firms

Storage firms essentially act at as capital producers. Their activity represents investment. We assume a particularly simple technology, namely storage, which allows 1 unit of goods in period 1 to be preserved fully over the period. Thus investment has a gross real return of 1. To pay for the goods in period 1, storage firms need to borrow from banks at the gross interest rate $(1 + r_f)$. They then store the goods and sell them in period 2 to households at the price P_2. Their profits are given by:

$$\pi_2^S = P_2 Y - \left(1 + r_f\right)P_1 Y. \tag{12}$$

These will also be zero in equilibrium.

Households

Finally, households are endowed with labour supply equal to $\bar{N}$ hours in period 1 and want to consume only in period 2. They need to choose how much labour to supply in period 1 in return for bank deposits, which they can then use to purchase consumption goods from storage firms. Their labour income amounts to $(wN + F)$ on which they earn the deposit rate $\left(1 + r_f\right)$. Their budget constraint in period 2 is then simply:

$$P_2 C_2 = (1 + r_f)(wN + F). \tag{13}$$

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[29] We are assuming that bank loans, once contracted, cannot be repaid until period 2. Hence firms keep their sale proceeds in deposits over the period. This is to simplify notation.

[30] Alternatively, one can express the firms' profit function over the two periods as $\pi^P = \left(1 + r_f\right)P_1 N^\beta - \left(1 + r_f\right)(wN + F)$. This makes no difference to the solution.

Assuming a utility function that is increasing in period 2 consumption, C_2, trivially implies that they will supply all of their labour in period 1 in order to guarantee as much goods produced as possible.

Equilibrium

From (11), period 1 labour market clearing implies:

$$N^* = \left[\frac{P_1\beta}{w}\right]^{\frac{1}{1-\beta}} = \bar{N}, \tag{14}$$

so that equilibrium output is $Y = \bar{N}^{\beta}$. With free entry, production firms make zero profits. The price they receive, P_1, in equilibrium is determined by:

$$P_1 = w\bar{N}^{(1-\beta)} + F\bar{N}^{-\beta}. \tag{15}$$

This just states that price equals average costs. Combining (11) and (15) yields, respectively, expressions for the wage rate and period 1 price:

$$w = \frac{\beta F}{(1-\beta)\bar{N}}, \tag{16}$$

$$P_1 = \frac{F}{(1-\beta)\bar{N}^{\beta}}. \tag{17}$$

In period 2, households withdraw their deposits to buy goods from storage firms. The zero-profit condition for storage firms pins down the price level P_2 as:

$$P_2\bar{N}^{\beta} = \left(1 + r_f\right)(w\bar{N} + F). \tag{18}$$

Using (16), this can be simplified to:

$$P_2 = \frac{\left(1 + r_f\right)F}{(1-\beta)\bar{N}^{\beta}} = \left(1 + r_f\right)P_1. \tag{19}$$

Thus, the inflation rate is equal to the nominal interest rate, and the gross real return in this economy is equal to 1, as dictated by the storage technology. This also implies zero profits for storage firms from (12).

It remains to be verified that all debts can be cleared. In period 2, production firms owe $\left(1 + r_f\right)(w\bar{N} + F)$ and have deposits equal to $\left(1 + r_f\right)P_1\bar{N}^{\beta}$. Storage firms owe $\left(1 + r_f\right)P_1\bar{N}^{\beta}$ and receive the deposits of households in period 2 amounting to $\left(1 + r_f\right)(w\bar{N} + F)$. Equation (15) confirms that these are equal.

Open-economy version

The extension of the model to the open-economy case is described in the text. The basic assumption is that firms and banks are located in different countries.[31] Here we simply elaborate on the financial flows and stocks in the economy.

If banks are located in country B, the outstanding balance sheet positions at the end of period 1 are depicted in Figure A1. Country A's net claims on country B take the form of households' deposits, with no liability counterpart, and hence represent net wealth.

Figure A1: End of period 1 balance sheets

Country A

Households

Asset	Liability
Deposits $(w\bar{N}+F)$	Equity $(w\bar{N}+F)$

Production Firms

Asset	Liability
Deposits $\left(P_1\bar{N}^{\beta}\right)$	Bank Loan $(w\bar{N}+F)$

Country B

Storage Firms

Asset	Liability
Goods $\left(P_1\bar{N}^{\beta}\right)$	Bank Loan $\left(P_1\bar{N}^{\beta}\right)$

Banks

Asset	Liability
Loans Production Firms $(w\bar{N}+F)$ Storage Firms $\left(P_1\bar{N}^{\beta}\right)$	Deposits Production Firms $\left(P_1\bar{N}^{\beta}\right)$ Households $(w\bar{N}+F)$

Saving, investment and the current account in the two countries are captured in Table 2 in the main text. It suffices to note here that Table 2 shows variables in real terms. We can also express them in nominal terms. In this case, country A's current account surplus in period 1 is P_1Y and its current account deficit in period 2 is $P_2Y - r_f(w\bar{N}+F)$, the latter term being net interest receipts. These offset each other.

[31] Note that it is possible to have two replicas of the closed-economy model of Section III in each country, thereby defining different autarky consumption and real interest rates in each. While this would add reasons for intertemporal trade, primarily arising from different preferences or production and storage technology, it would make the derivation less transparent and not add any additional insights regarding the role of financing.

Annex III: Extension to multiple currencies

In this section, we extend the basic model to the case where each country has its own banking system and currency to show that the basic message still goes through. We will allow cross-border financing through capital markets as well as banks to illustrate the complexities involved in tracking international capital flows. For simplicity, the underlying real activity and trade remain unchanged. Hence the configuration of current accounts is exactly the same as before. Importantly, however, the underlying financing flows are very different.

In the two-country setup, suppose now that each country has its own currency and its own banks. Let $\$_A$ denote country A's currency, $\$_B$ country B's and E the exchange rate between the two (units of $\$_B$ per 1 unit of $\$_A$). Let P_1, P_2, w and F be defined in terms of $\$_A$. We will assume that non-residents wishing to buy goods from a country need to pay for them in the local currency. That is, importers need to obtain foreign currency to purchase foreign goods (equivalently, exporters get paid in their local currency). Given that production firms are located in country A, they will export goods in period 1 charging the price P_1 in $\$_A$ terms. Conversely, storage firms in country B sell goods in period 2 at a price of EP_2 in terms of $\$_B$. To simplify, we will consider the case where interest rates in both countries are identical and equal to $(1 + r_f)$.

As regards financing, we make things a bit more general, by assuming that there is also a capital market in country A where non-residents may participate. Suppose that production firms in country A fund their labour costs ($w\bar{N} + F$) by issuing $\$_A$ bonds in this market which are then bought by banks in country B. The latter are assumed to fund their investment by borrowing $\$_A$ in the wholesale market from banks in country A (ie through an interbank market). Thus banks in country B act as cross-border intermediaries between production firms and banks in country A, much like euro area banks in the United States before the global financial crisis (as documented by Bernanke et al (2011)). These banks are not taking exchange rate exposure but simply grossing up their balance sheets in $\$_A$ assets and liabilities and financing production activity in country A.[32]

Households in country A receive their labour payments in $\$_A$ but know that they will need $\$_B$ to import from country B in period 2. In order to avoid a foreign currency mismatch, we assume that they convert their labour income into $\$_B$ and hold these deposits until period 2 earning interest $(1 + r_f)$.[33] This creates a demand for $\$_B$ and a supply of $\$_A$ in the foreign exchange market. The other side of this trade will be taken up by storage firms in country B, as we now explain.

[32] Gross balance sheets of banks in country A also expand, with loans to banks in B matched by a rise in deposits, which are initially transferred to production firms and subsequently to households.

[33] Alternatively, we could have assumed that households sell $\$_A$ forward to banks in country A which, in turn, square their position simply by selling $\$_A$ spot and holding the $\$_B$ proceeds or through a forward position. We stick to the version in the text to avoid additional notation for off-balance sheet items.

Storage firms are assumed to have no access to capital markets and must borrow domestically in $\$_B$ from banks in country B, as before. To purchase goods from production firms, storage firms must borrow $EP_1\bar{N}^{\beta}$ in $\$_B$ and then convert these funds into $\$_A$ in the foreign exchange market. The amount of $\$_A$ that households wish to sell is $(w\bar{N}+F)$, which we know from before equals $P_1\bar{N}^{\beta}$ in equilibrium. The foreign exchange market clears. Once $\$_A$ are obtained, storage firms then transfer these to the production firm in return for goods.

Figure A2: Period 1 flow of funds

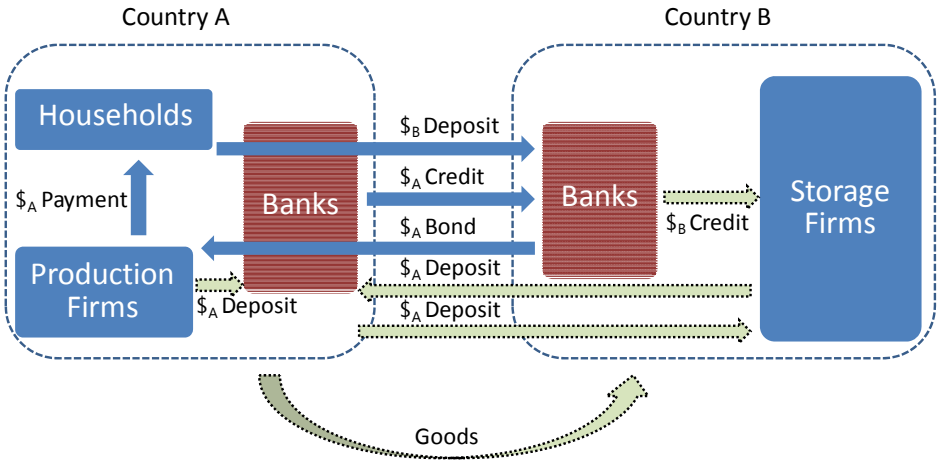

Figure A2 provides a schematic flow of funds in period 1. The solid arrows indicate the flow of funds related to the financing of production firms. This starts with $\$_A$ financing and ends with households' converting their labour income proceeds into $\$_B$ deposits held with banks in country B. The dotted arrows depict the flow of funds associated with the financing of storage firms. This starts with $\$_B$ funding from banks in country B that is then exchanged for $\$_A$ deposits in banks located in country A, and ends with production firms acquiring those $\$_A$ deposits. Most of these cross-border transactions generate two-way gross flows that offset each other. The only exception is when storage firms use $\$_A$ deposits to pay production firms for goods. This deposit run-down is captured in Figure A2 by the dotted arrow from banks in country A to storage firms.

Figure A3: End of period 1 balance sheets

Country A

Households

Asset	Liability
Deposits $E(w\bar{N}+F)$	Equity $E(w\bar{N}+F)$

Production Firms

Asset	Liability
Deposits $(P_1\bar{N}^{\beta})$	Bonds $(w\bar{N}+F)$

Banks (A)

Asset	Liability
Loans Banks (B) $(w\bar{N}+F)$	Deposits Production Firms $(P_1\bar{N}^{\beta})$

Country B

Storage Firms

Asset	Liability
Goods $(EP_1\bar{N}^{\beta})$	Bank Loan $(EP_1\bar{N}^{\beta})$

Banks (B)

Asset	Liability
Production Firms Bonds $(w\bar{N}+F)$ Storage Firms Loans $(EP_1\bar{N}^{\beta})$	Loan from Banks (A) $(w\bar{N}+F)$ Household Deposit $E(w\bar{N}+F)$

Figure A3 captures the end-of-period 1 balance sheet positions of agents, with items expressed in their currency of denomination. Expressions with E in front are in terms of $\$_B$. Banks in both countries incur no foreign exchange exposure. Households in country A are long $\$_B$ while storage firms in country B are short $\$_B$ (although their holding of goods is a natural hedge since they will be sold for $\$_B$ in period 2). As before, country A's net claims on country B take the form of households' deposits, with no corresponding liability.

Thus, despite the greater complexity of cross-border flows, allowing for multiple currencies and banks does not change the findings of the basic model. The overall picture for *net* cross-border claims is the same. Likewise, financing still underpins all economic activity, and the pattern of financing can take on numerous forms for a given net resource flow (current account). Here, production in country A is financed by banks in B even as country A acquires net claims on B. Again, it could just as easily be the case that production in A is financed domestically holding constant the pattern of net claims as in Section II.

Follow the money

In all this, it is important to understand the evolution of bank deposits in both countries. $\$_B$ deposits in period 1 are initially created as counterparts to loans to storage firms before being transferred to households in country A through the foreign exchange market. By contrast, $\$_A$ deposits created as part of production firms' financing are initially held by banks in B, then transferred to production firms in exchange for bonds, then transferred to households in exchange for labour services, then acquired by storage firms and exchanged for $\$_B$ bank deposits, and finally transferred to production firms in exchange for goods.

Clearly, much of cross-border capital flows involve the *transfer of ownership* of bank deposits between residents and non-residents. Indeed, in an economy where payments are settled in bank deposits (money), essentially a*ll* capital flows involve some transfer of bank deposits. Non-residents wishing to acquire local currency claims need first to obtain local purchasing power (bank deposits) from somebody else. Non-residents extinguishing their claims on a country will be selling local purchasing power to somebody else. Contrary to popular images, capital inflows and outflows generally do not involve "money" coming in and going out of a country. The money (deposits) never leave the country – ownership simply changes hands.

As regards external sustainability, a corollary is that capital inflows, both gross and net, do not necessarily entail an expansion of the economy's total gross liabilities. They may simply transfer ownership of existing gross liabilities to foreigners. In practice, persistent current account deficits or increasingly negative net international positions often represent merely a change in the ownership composition of existing liabilities.

Figure A2 also highlights a more general point: real economic activity is underpinned by multiple layers of financing both within and across economies. Even with just the simple financing pattern assumed in the model, the gross flows are substantial. With the complex web of financing in practice, the gross flows of funds and interrelationships will be much more voluminous and elaborate. Most macro models ignore these flows, either by abstracting from them completely or by assuming that agents in different countries can trade securities directly with one another costlessly. This greatly reduces the volume of fund

flows compared with that which takes place in reality, when the exchange of bank deposits underpins all trades. This often results in a long sequence of so-called "hot potato" trades.

The fact that gross flows are much larger than in models with no financing has important implications. In general, large financing flows imply a greater and more intertwined web of financial claims and counterclaims among parties. As discussed above, the build-up of multiple layers of gross positions may have financial stability implications and hence be potentially "non-neutral" with respect to real outcomes. This echoes the risk, highlighted by Adrian and Shin (2010), associated with the lengthening of the financial intermediation chain, and the resulting grossing-up of private balance sheets, which was seen as a contributing factor to the global financial crisis.

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