Global Imbalances or Bad Accounting? The Missing Dark Matter in the Wealth of Nations and Its Implications for Global...

Article *in* Economic Policy · July 2007

DOI: 10.1111/j.1468-0327.2007.00182.x · Source: RePEc

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SUMMARY

Current account statistics may not be good indicators of the evolution of a country's net foreign assets and of its external position's sustainability. The value of existing assets may vary independently of current account flows, so-called 'return privileges' may allow some countries to obtain abnormal returns, and mismeasurement of FDI, unreported trade of insurance or liquidity services, and debt relief may also play a role. We analyse the relevant evidence in a large set of countries and periods, and examine measures of net foreign assets obtained by capitalizing the net investment income and then estimating the current account from the changes in this stock of foreign assets. We call dark matter the difference between our measure of net foreign assets and that measured by official statistics. We find it to be important for many countries, analyse its relationship with theoretically relevant factors, and note that the resulting perspective tends to make global net asset positions appear relatively stable.

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Economic Policy July 2007 Printed in Great Britain

The missing dark matter in the wealth of nations and its implications for global imbalances

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1. MOTIVATION

Economists pay attention to the current account as a way of keeping track of the change in net foreign assets for any given country over time. Large deficits signal that

We benefited from comments by the discussants and other participants at the 44th Panel Meeting of *Economic Policy* held in the New York Federal Reserve Bank on 12 February 2007. We also thank two anonymous referees, Robert Barro, Joe Beaulieu, Eduardo Borensztein, Willem Buiter, Richard Cooper, Joshua Coval, Alex Culiuc, Barry Eichengreen, Jeffrey Frankel, Sebastian Galiani, Matthew Higgins, Philip Lane, Robert Lawrence, Gian Maria Milesi-Ferretti, Ugo Panizza, Roberto Rigobon, Dani Rodrik, Julio Rotemberg, Andrei Shleifer, Alan Taylor, Beatrice Weder, as well as seminar participants at the Lunch on International Economic Policy, Kennedy School of Government, Harvard University, Harvard Business School, American University in Paris, Chatham House in London and New York, JP Morgan, Fedesarrollo, FIEL, Central Bank of Argentina, and Universidad Torcuato Di Tella for useful comments. The first draft of this paper gave rise to an inordinate amount of reaction. This version benefits from discussions of the dark matter hypothesis in McKelvey (2005), Buiter (2006), Eichengreen (2006), Higgins *et al.* (2007), Meissner and Taylor (2006) and Milesi-Ferretti (2006), and 2006 press articles: among others, in *The Economist*, Gongloff in *The Wall Street Journal*, Mandel in *Business Week*, and editorials in *The Wall Street Journal* and Krugman in the *New York Times*. We thank Federico Dorso, Pablo Gluzmann, Maria Fernandez Vidal, and Victoria Vanasco for able research assistance.

The Managing Editor in charge of this paper was Giuseppe Bertola.

Economic Policy July 2007 pp. 469–518 Printed in Great Britain

a country is running up its foreign liabilities, and if the countries experiencing such imbalances are themselves large, the resulting 'global imbalances' may require major changes throughout the whole international financial system. In fact, the current state of affairs, with large measured imbalances in the United States, has been a source of concern for a large number of academics and analysts.

In a nutshell, the point of our paper is that global imbalances are not as evident if the analysis is done on the basis of trends in the income flows paid by countries' net foreign assets, which appear to be significantly more stable than what could be inferred by current account dynamics. There is a reason to focus on income payments. Current account deficits are worrisome because they are the prelude to higher payments in the future. But if repayment does not need to occur then current account trends need not motivate strong concerns.

Why would the dynamic of income flows diverge from what should be expected from current account dynamics? The literature has stressed two main reasons: valuation effects that change the value of the assets independently of the current account, and return privileges that allow some countries to obtain abnormal returns (positive or negative). Of course, to have an impact on the way we perceive current imbalances these valuation effects or yield privileges must not only be large enough but should be expected to persist going forward.

To discuss whether such a claim can be made, this paper shows that for some countries these abnormal returns respond in a fairly stable manner to some key underlying economic fundamentals and as a result appear to be quite persistent. For example, poor countries may systematically benefit from debt relief allowing them to run deficits without increasing their payments abroad. Stable countries like Switzerland may be able to pay less for their liabilities because investors associate their assets with an extra sense of security, which lets it earn larger net income from foreign assets than what would be expected from its current account surpluses. Other countries may run deficits without accumulating liabilities because their currency is used by other countries, or may earn income from unrecorded services that multinationals' headquarters supply to their affiliates around the world.

To the extent that these factors are fairly stable it makes sense to factor their effect on income flows into the analysis of global imbalances. One, albeit imperfect, way of doing so is to use the income flows to compute a notional stock of assets. This has problems of its own but provides an alternative to the traditional computation, one that puts the focus on the income data. Because this may deliver a valuation of net foreign assets that is different from traditional valuation, there is a difference, that we call 'dark matter'. Dark matter is a way of measuring the difference between what income flows are and what they should have been as inferred from current account dynamics and is an object of interest in its own right. To the extent that the sources of dark matter are systematic, they may shed new light on the current account dynamics of each country.

The paper is organized as follows. Section 2 describes the inconsistencies between stock and flow data and documents the existence and persistence of yield differentials.

Section 3 discusses whether these differences are systematic or not, and provides empirical evidence relating them to a few underlying fundamentals. In Section 4 we suggest a measure of these discrepancies by introducing the concept of dark matter. Section 5 looks at global imbalances under the light of dark matter. Section 6 concludes with suggestions for further research.

2. TWO PUZZLES IN THE CURRENT ACCOUNT STATISTICS

The purpose of this section is to characterize the 'typical' yield countries make on their net foreign assets, and then to document the evolution of 'return privileges', i.e. the systematic differences in the return to net foreign assets from the typical yield.

We are not the first to study this issue. In a recent paper Meissner and Taylor (2006) estimate these return privileges by regressing the net investment income (*NII*) on the amount of net foreign assets (*NFA*):

$$\frac{NII_{it}}{GDP_{it}} = r\left[\frac{NFA_{it}}{GDP_{it}}\right] + \alpha_i + \varepsilon_{it}. \tag{1}$$

The normalization by GDP is intended to reduce the heteroscedasticity problems arising from different country sizes. The model is estimated for a panel of G-7 countries. A constant slope coefficient r approximates the 'typical yield' obtained on net foreign assets. The fixed effect is an estimate of the return privilege. Meissner and Taylor find that the United States, the United Kingdom and Japan benefit from returns privileges relative to other G-7 countries, while the opposite is true for Canada and Italy. They also find small return differentials in favour of France and Germany but these appear not to be statistically significant.

To run this regression, we have to restrict the sample to countries with net foreign asset data. This reduces significantly the number of observations and makes it necessary to simplify the specification if the aim is to estimate return privileges for a larger set of countries. To do so, we start from the typical equation that describes the evolution of net foreign assets. As discussed in Lane and Milesi-Ferretti (2006a), the change in the net foreign asset position (B) of a country can be written as:

$$B_t - B_{t-1} = CA_t + KG_t + KA_t + E_t \tag{2}$$

where *CA* is the current account balance, *KG* is the capital gain or loss on net foreign assets (equal to the change in stocks minus the underlying flows), *KA* includes factors such as capital account transfers (the so-called capital account balance) and E stands for errors and omissions.

An alternative representation of Equation (1) can be obtained by multiplying (2) by the interest rate and then by dividing by *GDP*. Using the fact that the return on net foreign assets times the net stock provides a measure of net investment income we can write:

Table 1. Typical returns on net foreign assets

	All countries	Industrial countries	Non-industrial countries	Emerging countries	Non-industrial non-emerging countries
Since 1980s	0.052***	0.044**	0.052***	0.034*	0.054***
	(0.017)	(0.018)	(0.018)	(0.018)	(0.019)
Observations	2466	597	1869	635	1234
R-squared	0.074	0.141	0.068	0.039	0.080
Since 1990s	0.057***	0.084***	0.056***	0.021	0.059***
	(0.019)	(0.031)	(0.020)	(0.021)	(0.019)
Observations	1431	348	1083	369	714
R-squared	0.097	0.137	0.094	0.061	0.109

Notes: Estimated with fixed effects. Robust standard errors in parentheses.

* Significant at 10%; ** significant at 5%; *** significant at 1%.

$$\frac{r(B_t - B_{t-1})}{GDP_t} = \frac{\Delta NII_t}{GDP_t} = r\left[\frac{CA_t}{GDP_t}\right] + r\left[\frac{KG_t + KA_t}{GDP_t}\right] + \frac{rE_t}{GDP_t} \tag{3}$$

The advantage of this specification is that we have investment income and current account for many countries. We can thus run (3), assuming the second term in the right-hand side to be a fixed country effect, for a large sample of countries:

$$\frac{\Delta NII_{it}}{GDP_{it}} = r\left[\frac{CA_{it}}{GDP_{it}}\right] + \alpha_i + \varepsilon_{it} \tag{4}$$

Here $\varepsilon_{it} = rE_t/GDP$ is the error term, and α_i represents the return privileges as in Meissner and Taylor (2006) except that, as (3) makes it clear, it may include capital gains and capital account transfers in addition to return privileges. Table 1 shows the typical yield obtained on net foreign assets as estimated by an OLS estimation of Equation (4). The regressions are run for different subsamples and for different time periods. Column (i) includes all countries in our sample (see Appendix A for a list of countries included in each group, and Appendix B for data sources), column (ii) includes industrial economies, column (iii) non-industrial countries, column (iv) includes only emerging countries – defined as countries in the J.P. Morgan Emerging Market Bond Index Global (EMBI Global)[1] – and column (v) the rest of the non-industrial countries.

The results are presented for data since 1980, as well as for a subsample since 1990 in order to verify the stability of the results over time. The results of all the specifications are fairly similar, and the typical yield, if anything, higher during the 1990s. The results for the full sample indicate a return of 5.2% since 1980 and 5.7% since 1990. For other subsamples we obtain somewhat lower values. In what follows we will consider 5% to be a reasonable proxy for the 'typical yield'.

[1] To be included in the EMBI Global a country must have a bond of large enough size and sufficient liquidity, two conditions that signal an effective integration in international financial markets.

Table 2. Return privileges for selected countries

	1980–2004	1990–2004
Positive		
Nicaragua	1.117* (0.642)	1.244 (0.761)
Malawi	0.785*** (0.278)	0.701** (0.312)
Laos People's Dem. Rep	0.533** (0.256)	0.467 (0.298)
Tanzania	0.459** (0.230)	0.874*** (0.326)
Madagascar	0.307 (0.188)	0.597*** (0.215)
Senegal	0.275* (0.161)	0.310* (0.178)
Benin	0.241 (0.222)	0.422** (0.215)
Nepal	0.215* (0.114)	0.207 (0.152)
United Kingdom	0.211* (0.125)	0.345* (0.184)
Guatemala	0.141 (0.114)	0.240* (0.139)
Haiti	0.141* (0.079)	0.130 (0.116)
Kenya	0.135 (0.088)	0.269** (0.107)
Sri Lanka	0.130 (0.118)	0.210* (0.109)
United States	0.120** (0.048)	0.150** (0.065)
Ethiopia	0.083* (0.043)	0.137** (0.056)
Negative		
Italy	−0.077* (0.044)	−0.026 (0.053)
China P.R.: Mainland	−0.123 (0.081)	−0.225* (0.124)
Dominican Republic	−0.263 (0.208)	−0.598* (0.309)
Venezuela, Rep. Bol.	−0.355 (0.224)	−0.507** (0.231)
Singapore	−0.437 (0.411)	−1.264** (0.576)
Ireland	−1.455*** (0.276)	−1.636*** (0.440)
Observations	2466	1431
R-squared	0.074	0.097

Notes: Robust standard errors in parentheses.

* Significant at 10%; ** significant at 5%; *** significant at 1%.

In addition to this 'typical yield', the specification also provides an estimate of the return privileges as in Meissner and Taylor. The estimated return privileges are similar when the different subsamples of countries are used so that in Table 2 it is sufficient to show the results corresponding to the full sample. Table 2 shows the value of the fixed effects in specification (4) for those countries where it was significant at least at the 10% level in at least one of the samples, and splits the countries in two groups, those with positive yield differentials and those with negative differential. One immediate point that is made by the table is that return privileges (positive and negative) are not a widespread phenomenon, with only a handful of countries managing to obtain them in a systematic fashion. The diversity of countries that are able to sustain a privilege also suggests that it may originate for a variety of different reasons. For example, it is likely that the factors underlying privileges for very rich countries, such as the United Kingdom and the United States, are not the same as those that are relevant for very poor countries such as Tanzania or Laos. The same should hold for the countries with unusually low returns among which we find rich countries such as Ireland, Italy and Singapore as well as very poor countries such as

China and Dominican Republic. The explanations for why the return privileges differ for each sub-group will be the focus of our discussion below.

Having established that there are differences in the returns that countries obtain from net foreign assets, we move to the question as to whether these return differentials present any systematic patterns. In the next section we do this by exploring the relationship between return privileges and country characteristics. Before that, however, we address two issues that can be analysed with the aggregate data. First, we discuss whether the return differentials are persistent. Second, we address a feature that is critical to evaluate the potential danger of global imbalances: whether there is a systematic relationship between return privileges and registered imbalances or, in other words, whether the size of the yield privilege is systematically different for those countries that run a current account surplus relative to those that run a current account deficit.

To analyse the first issue we cannot rely on the fixed effect, so we compute a time series for the privilege by looking at the difference between the changes in the net income payments of a country, and the changes one would have expected on the basis of current account dynamics. This expectation is computed by applying the 'typical yield' on foreign assets that we estimated in (4) to the cumulative current account during this period. Specifically the definition of abnormal returns between any two years, t and $t + j$ is

$$AR_{t,t+j} = \Delta NII_{t,t+j} - 0.05\left(\sum_{i=t-1}^{t+j-1} CA_i\right) \tag{5}$$

The fixed effect estimated in Equation (4) and the abnormal return defined in Equation (5) will be the two measures of yield privileges we will use throughout the paper. To test for the persistence of return privileges we estimate for each country this privilege as in (5), except that in building our series we compute the cumulative privilege since 1980. The reason we look at the persistence of the cumulative return privilege is because we want to test if previous abnormal returns are likely to be reversed or not. In other words, we want to test if deviations in net income from what would be expected from current account dynamics are likely to persist over time. If a country runs a deficit (surplus) but seems not to pay (earn) for these deficits (surpluses), we want to know if this advantage (disadvantage) may disappear over time. For the case of the United States, for example, this is tantamount to asking whether the large abnormal returns obtained in the past are likely to be reversed in the foreseeable future.[2] This is tested by checking if the cumulative return privilege is persistent.

To do so, we run both an autoregressive specification as well as a random walk test on these cumulative returns. The autoregressive coefficient is close to one, and typically

[2] As an alternative example consider a country that has benefited from debt relief. The year the debt relief is granted the country has a large return privilege. This large privilege will not repeat itself in future years (so that the measured privilege year after year may not show a high degree of persistence), but the effect of this shock on net income payments will not be undone, allowing the country to pay less relative to what it would have otherwise paid for the indefinite future, leading to persistence in the abnormal cumulative return.

the DF-GLS test fails to reject the random walk hypothesis, indicating that these privileges appear to exhibit substantial persistence over time. These results are shown in Table 3 to hold both when the abnormal return is measured as a share of GDP (series denoted a) as well as when it is expressed in nominal terms (series denoted b).

Figure 1 explores the second issue, by showing the scatter plot relating the yield privileges estimated by the fixed effects of regression (4) with the cumulative current account.[3] Table 4 shows that the relation appears to be negative, though not statistically significant either for the industrial and emerging group. However, as can be seen from the scatter plots, the lack of significance may result from one or two big outliers as there is a clear negative relation for the rest of the group. The coefficients of the regressions between these two variables shown in Table 4 indicate that, when using the abnormal return over the last 23 years as a measure of return privilege, an increase in the accumulated current account deficit of 1% is typically associated with an increase in the privilege of between 0.033% and 0.04%. Somewhat larger results are obtained when using the fixed effect (the point estimate is now smaller because the fixed effect provides an estimate for the effect per year rather than over the whole sample). For this measure of yield privilege a 1% current account deficit appears related to an increase in yield privileges of between 0.046% and 0.069% over the sample period 1980–2004 (obtained by multiplying the coefficients for the sample that includes all the countries by 23).

We believe that the fact that the relation is negative may be indicative of two things. First, that large imbalances are to some extent self-correcting. For example, if a country over-borrows it may be with the expectation (validated later on) of obtaining a sufficient amount of debt relief that make its accounts sustainable. Alternatively, it may be an indication that the current account may not be a good indicator of the changes in the net asset position of the country. For example, consider a country where absorption appears to be high, leading to a current account deficit, but where income flows remain stable over time. This may be signalling that the current account is not properly reflecting the true asset position which may be larger than measured. Because the value of assets is appropriately perceived by its owners the consumption levels are consistent with this true asset position and therefore fail to build into a problem over time. This anticipates one of the main implications of our work: to the extent that countries that have surpluses tend to have lower returns than the typical return, and those with deficits higher returns, global disequilibria must be *smaller* than those reported by official numbers. This will be the reason why we will find below more stability in net foreign positions than that usually derived from official numbers.[4]

[3] The scatter plots using the abnormal return over the whole 24 years look very similar and are omitted for brevity.

[4] This is reminiscent of the 'financial adjustment channel' described in Gourinchas and Rey (2005), except that we show it applies to many countries – they focus only on the United States. The sources for the financial adjustment channel may be different in different countries.

Table 3. Tests of persistence of the yield differential

	Autoregression coefficient (a)	Autoregression coefficient (b)	DF-GLS test statistic (a)	5% critical value for DF-GLS (a)	DF-GLS test statistic (b)	5% critical value for DF-GLS (b)
Benin	0.992***	1.058***	−1.014	−2.612	−0.224	−2.602
China, P.R.: Mainland	0.954***	1.022***	−0.779	−2.617	−0.307	−2.602
Dominican Republic	0.967***	1.094***	−0.970	−2.612	−0.022	−2.602
Ethiopia	1.058***	1.110***	−0.608	−2.612	0.287	−2.602
Guatemala	0.958***	1.042***	−0.257	−2.612	0.421	−2.602
Haiti	0.995***	1.039***	−1.470	−2.612	0.240	−2.602
Italy	1.003***	1.028***	−0.984	−2.612	−0.610	−2.602
Ireland	1.046***	1.173***	0.628	−2.612	1.497	−2.602
Kenya	1.029***	1.067***	−1.054	−2.612	0.128	−2.602
Laos People's Dem.Rep	1.001***	1.054***	−1.017	−2.604	0.581	−2.602
Madagascar	1.053***	1.085***	0.083	−2.612	−0.108	−2.602
Malawi	1.002***	1.043***	−1.348	−2.612	0.175	−2.602
Nepal	1.010***	1.032***	−0.653	−2.612	−0.519	−2.602
Nicaragua	0.602*	1.084***	−4.599	−2.612	0.334	−2.602
Senegal	0.995***	1.048***	−0.857	−2.612	0.024	−2.602
Singapore	1.023***	1.164***	0.565	−2.612	0.983	−2.602
Sri Lanka	1.003***	1.077***	0.354	−2.612	0.793	−2.602
Tanzania	1.028***	1.086***	−0.772	−2.612	0.020	−2.602
United Kingdom	1.003***	1.147***	−0.552	−2.612	0.577	−2.602
United States	1.098***	1.165***	2.206	−2.612	1.559	−2.602
Venezuela, Rep. Bol.	0.999***	1.069***	−2.184	−2.612	0.837	−2.602

Notes:

[a] β in $\frac{AR_{80,t}}{GDP_t} = \alpha + \beta * \frac{AR_{80,t-1}}{GDP_{t-1}} + \varepsilon_t$ see appendix for variable definitions.

[b] β in $AR_{80,t} = \alpha + \beta * AR_{80,t-1} + \varepsilon_t$ see appendix for variable definitions.

* Significant at 10%; ** significant at 5%; *** significant at 1%.

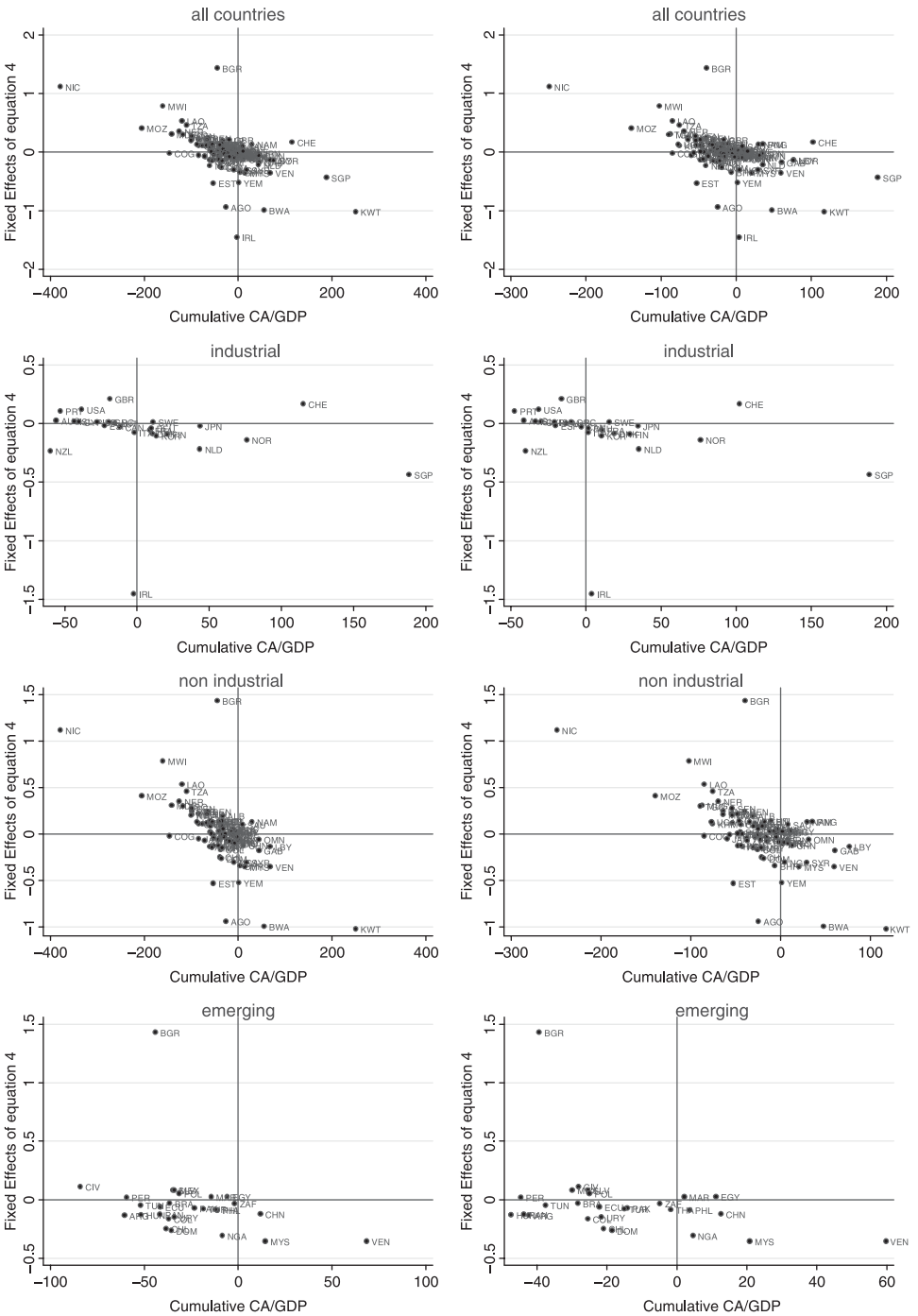

Figure 1. The current account and the level of privilege

Notes: Left side: 1980–2004. Right side: 1990–2004.

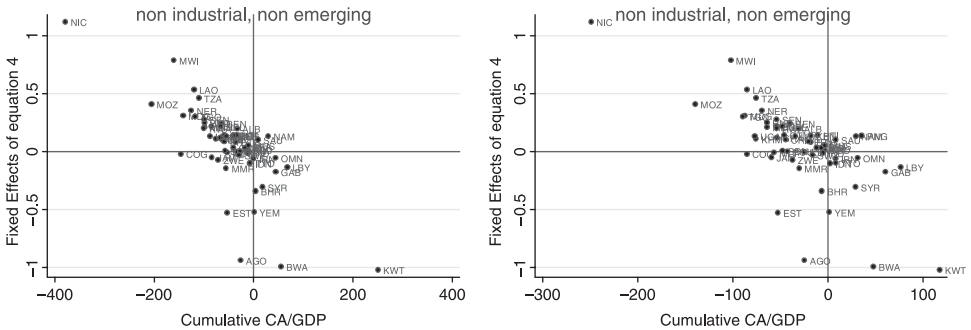

Figure 1. *Continued*

Table 4. The current account and the return privilege

	All countries	Industrial	Non-industrial	Emerging	Non-industrial non-emerging
	Using fixed effects as measure of return privilege				
1980–2004					
Change in current account	−0.002***	−0.001	−0.003***	−0.001	−0.003***
	(0.000)	(0.001)	(0.000)	(0.002)	(0.000)
Observations	109	25	84	27	57
R-squared	0.283	0.040	0.359	0.021	0.498
1990–2004					
Change in current account	−0.003***	−0.002	−0.004***	−0.003	−0.004***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Observations	109	25	84	27	57
R-squared	0.256	0.060	0.331	0.054	0.439
	Using abnormal returns as measure of return privilege				
1980–2004					
Change in current account	−0.033***	−0.028*	−0.034***	0.004	−0.037***
	(0.004)	(0.014)	(0.004)	(0.013)	(0.004)
Observations	109	25	84	27	57
R-squared	0.377	0.143	0.445	0.003	0.557
1990–2004					
Change in current account	−0.040***	−0.039***	−0.041***	−0.006	−0.044***
	(0.005)	(0.013)	(0.006)	(0.017)	(0.006)
Observations	109	25	84	27	57
R-squared	0.361	0.272	0.394	0.004	0.503

Notes: Robust standard errors in parentheses.

* Significant at 10%; ** significant at 5%; *** significant at 1%.

3. STUDYING THE DETERMINANTS OF INCOME FLOWS – ASSET STOCK DISCREPANCIES

Why would the dynamic of income flows diverge from what we should expect from current account dynamics? As we mentioned above the literature has stressed two main reasons: valuation effects that change the value of the assets independently of the current account, and yield privileges that imply that some countries exhibit

abnormal returns. The first has received substantial attention, as it is potentially relevant for explaining the US current account imbalance. Because the US economy can issue liabilities in its own currency, a dollar depreciation implies a capital gain by diminishing the value of net foreign liabilities (see, for example, Blanchard *et al.*, 2005) thus easing the burden of an adjustment. But, of course, that channel plays only a limited role when explaining the discrepancies for a much wider range of countries as we do here, many of whom cannot issue debt in their own currency. There are multiple other reasons why income flows may not track current account dynamics closely. Some of these reasons have been the object of a recent and intense debate, and therefore deserve a brief review here.

A first channel involves the notion that foreign direct investment (FDI) abroad is a vehicle for two income flows that are very imperfectly captured in official statistics. First, the valuation effects that are associated to the fact that FDI allows for the dissemination of ideas, blueprints and knowledge. The valuation effects are not picked up because market value adjustments to FDI assets that do not have visible market prices occur at best on the basis of the host (not source) country characteristics, and these are not likely to be strongly related to the earnings potential of the firm.[5] Second, the return to unrecorded exports of services from headquarters to their affiliates around the world. These are missed simply because there is no registration of the services shared across national borders within the firm.

A second channel may come from the underlying stability or instability of a given economy that may allow some economies to sell some of this stability to the rest of world, and charge for it, while other countries pay to diversify away some of their own instability. This is just the standard risk premia argument (dating back to Frankel, 1982), which will persist in equilibrium. The payments corresponding to this risk premia are akin to the trading of insurance services. Some of the most innovative recent interpretations to explain the US current account imbalance rely on this channel. Mendoza *et al.* (2006) provide a story where agents in financially sophisticated markets can insure their local and worldwide claims, something that agents in less financially developed countries cannot do. In equilibrium assets in the less financially developed country must earn a higher return, because local agents are unable to fully insure their claims there.[6]

The Mendoza *et al.* (2006) approach directly derives the risk premia resulting from financial backwardness. The related perspective of Caballero *et al.* (2005) focuses on financial backwardness in some fast-growing countries, such as China. Underdeveloped financial systems can prevent agents in those countries from writing claims on their

[5] For a description of the methodological approach see Kozlow (2002) on US data, and Simard and Boulay (2006) on Canadian data.

[6] In fact there are three main reasons why assets in equilibrium may be discounted at different rates: surprises, risk premia and embedded services. Surprises refer to the fact that assets may turn out to have a lower rate of return if faced with expropriation, restructuring or unexpected negative business conditions, and this risk requires an *ex ante* higher discount rate to compensate for these expected losses. But the net income flows already take this into account because they are *ex post* returns. Because they average out over a large number of assets it seems implausible (though not impossible) that realized returns may differ significantly and for very long periods from expected returns. This leaves the risk premia and embedded services as drivers of *ex post* return differentials.

own productive assets. This forces residents in those countries to use their savings to buy foreign assets while allowing foreign companies to own their productive assets. The superior financing/corporate governance technology provides a return differential. In their interpretation financially developed countries sell financial services and charge for them.[7]

Another explanation, though focused on the United States, is provided by Dooley *et al.* (2004) who argue that current imbalances are sustained by peripheral countries adopting export-led strategies with undervalued pegged exchange rates and capital controls. In this approach, dubbed Bretton Woods II, some countries are willing to purchase specifically US assets at lower (*expected*) returns as part of an implicit contract with the United States, whereby they are guaranteed access to its domestic market. To the extent that this is a 'purchase' of the access to the US market, it is another reason for a yield differential.

Alternatively a yield differential may arise from the provision of liquidity services, basically through the use of a foreign currency or by paying a premium for purchasing instruments in liquid financial markets. The simplest example is when people around the world need liquid assets and choose to hold a particular currency, dollars, pounds or euros in cash, that earns them a zero interest rate. By having foreigners accumulate this currency, and by paying no interest on this, the source country can accumulate current account deficits, in the amount of the demand of this currency, without deteriorating its net investment income account. But liquidity services do not only originate from seignorage. Deep financial markets may also carry a liquidity premia advantage that allows paying lower returns for the issuers in those markets. This is likely relevant for the few countries that issue vehicle currencies for global or regional markets (the dollar, the pound, the euro, the Swiss franc and the rand are natural examples).

Finally, the empirical results that identify very poor countries that have been the target of debt relief as showing high return privileges suggests that an additional channel is debt relief that also allows large deficits to be accumulated but never repaid.

Some of these mechanisms have been studied and quantified in previous work. In what follows we first discuss mismeasurement problems for FDI, which has received less attention in the literature, and then provide a systematic analysis of the relevance of the different stories based on cross-country evidence.[8]

3.1. Mismeasurement of foreign direct investment

We suggest that one explanation for the existence of yield differentials may be the result of measurement problems with FDI.[9] There are three basic methodologies for estimating FDI assets. The most traditional is the use of book value estimates. This,

[7] Ju and Wei (2006) provide a similar story.

[8] See also Cooper (2005) who mentions most of these channels.

[9] Yield differentials in FDI has been extensively studied for the US. However, the evidence appears inconclusive. Higgins *et al.* (2005) provide supporting evidence in favour of large yield differential in FDI. In contrast, Gourinchas and Rey (2006), compute a more comprehensive gross returns figure (i.e. including capital gains) and when comparing foreign assets in the US with US assets abroad find that there are large differences in the returns of debt, equity, bank loans and trade credit in favour of the US, but virtually no difference in FDI.

while commonly used, is a fairly poor measure of the value of investments abroad. An improved version uses the current cost method, which adjusts book value by estimated changes in the value of the underlying investments (usually exchange rate and inflation adjustments). A third alternative is to adjust the values by using stock market data, to approximate market valuations for the underlying assets. As described in Lane and Milesi-Ferretti (2006a), in recent years a wider range of countries have implemented market valuation methodologies, but book value remains the method of choice for a large number of countries.[10] To obtain the market value estimate, current methodologies start from the book value declared by companies and update it with the evolution of the stock markets of the country where the investment is located (the US follows this procedure, see Kozlow, 2002) or with capitalization ratios that compare market to book value (for example in Canada, see Simard and Boulay, 2006, though they explain that this is done for investments in Canadian firms, with no adjustments made on the investment of Canadian firms abroad). Updating by the stock market of the host country makes sense to the extent that *host* markets capture the profitability, tax, expropriation risks, and similar types of constraints faced by firms in those markets. However, it is also equally reasonable to think that the productive capacity of a multinational may be somewhat captured by the conditions in the source country, and, eventually, its stock market. An example may help illustrate the point. The S&P 500 may better capture the profitability of Intel-Costa Rica, than the San Jose stock market. In fact, we believe the San Jose stock market probably has no relation to the profitability of Intel's factory in Costa Rica. But how large of an adjustment would this lead to? One alternative is to recompute the FDI using the source country stock market data rather than that of the host country. One way of doing this is taking the book value of FDI abroad and multiplying it by the market to book ratio in the home country. We do this exercise for the United States, where sufficient information is available to perform the exercise and assess its potential relevance. Table 5 goes through the computations. For US FDI abroad this exercise is fairly simple because it boils down to revaluing assets abroad by using the S&P 500 market to book (rather than foreign stock markets). This is done in the left half of the table and suggests a potentially massive revaluation of foreign assets. By the end of the sample the adjustment is close to $2.7 trillion.[11]

[10] For the specific case of the US it has been long since the Bureau of Economic Analysis (BEA) introduced a market value alternative to the original measure, and updated the book value alternative by its improved current cost method. For a careful (and official) description of the two methodologies see Kozlow (2002). The original book value is no longer published though still being reported in the BEA's website.

[11] This computation is done with 2004 data, the latest available at the time of writing. We thank Willem Buiter and Gian Maria Milesi-Ferretti for suggesting this calculation. One of our discussants shows that an alternative way to perform the exercise is to use BEA's market to book ratio for foreign FDI assets in the US to reassess the value of US assets abroad, under the presumption that this adjustment is similar to the one we are proposing. He shows, however, that our procedure delivers much larger adjustments. The answer lies in the fact that FDI series use the stock market index to value only those assets that do not have market prices, thus the discrepancy would come to confirm that foreigners' investments in the US have taken place in firms that have done particularly poor relative to the S&P. This may be because foreigners invest in low risk low return activities, i.e. that they purchase insurance through FDI investments. It also reveals that in our adjustment of FDI abroad we are assuming these assets deliver a general equivalent to that of the S&P, an assumption that also may not be correct.

Table 5. Foreign direct investment of US abroad, and FDI of Japan in the US

	Estimation of FDI investment of US abroad					Estimation of Japanese FDI in the US				
End of the year	FDI abroad at market value (a)	FDI abroad at historical cost (b)	Ratio market to book value S&P (c)	Adjusted FDI abroad (d)	Adjustment (e)	FDI of Japan in US, at historical cost (f)	Ratio market to book value BEA (g)	Ratio market to book value Nikkei 500 (h)	Adjusted FDI of Japan in US (i)	Adjustment (j)
1982	226 638	207 752	1.22	252 447	25 809	9 677	1.05			
1983	274 342	212 150	1.37	291 000	16 658	11 336	1.12			
1984	270 574	218 093	1.31	286 767	16 193	16 044	1.05			
1985	386 352	238 369	1.58	377 531	–8 821	19 313	1.19			
1986	530 074	270 472	1.74	471 836	–58 238	26 824	1.24			
1987	590 246	326 253	1.67	544 740	–45 506	34 421	1.20			
1988	692 461	347 179	1.73	602 164	–90 297	51 126	1.24			
1989	832 460	381 781	2.09	797 455	–35 005	67 268	1.45	5.67	381 410	–283 908
1990	731 762	430 521	1.84	790 693	58 931	83 091	1.37	2.87	238 471	–124 937
1991	827 537	467 844	2.24	1 048 820	221 283	95 142	1.60	2.71	257 835	–105 934
1992	798 630	502 063	2.40	1 204 194	405 564	97 769	1.65	2.02	197 493	–36 634
1993	1 061 299	564 283	2.53	1 430 177	368 878	100 721	1.64	2.23	224 608	–59 028
1994	1 114 582	612 893	2.38	1 455 672	341 090	98 513	1.58	2.40	236 431	–81 109
1995	1 363 792	699 015	2.85	1 995 108	631 316	104 997	1.88	2.43	255 143	–57 967
1996	1 608 340	795 195	3.13	2 486 524	878 184	116 144	2.06	2.35	272 938	–34 227
1997	1 879 285	871 316	3.87	3 368 327	1 489 042	125 041	2.40	1.93	241 329	58 950
1998	2 279 601	1 000 703	4.55	4 557 423	2 277 822	134 340	2.80	1.80	241 812	134 248
1999	2 839 639	1 215 960	5.00	6 085 599	3 245 960	153 815	2.93	2.60	399 919	50 424
2000	2 694 014	1 316 247	4.05	5 333 992	2 639 978	159 690	2.21	2.02	322 574	31 047
2001	2 314 934	1 460 352	3.39	4 954 934	2 640 000	149 859	1.90	1.58	236 777	48 704

Table 5. *Continued*

Estimation of FDI investment of US abroad						Estimation of Japanese FDI in the US				
End of the year	FDI abroad at market value (a)	FDI abroad at historical cost (b)	Ratio market to book value S&P (c)	Adjusted FDI abroad (d)	Adjustment (e)	FDI of Japan in US, at historical cost (f)	Ratio market to book value BEA (g)	Ratio market to book value Nikkei 500 (h)	Adjusted FDI of Japan in US (i)	Adjustment (j)
2002	2 022 588	1 616 548	2.73	4 420 836	2 398 248	147 372	1.52	1.34	197 478	27 029
2003	2 718 203	1 791 891	3.03	5 426 477	2 708 274	157 176	1.76	1.73	271 914	4 647
2004	3 287 373	2 063 998	2.92	6 031 104	2 743 731	175 728	1.78	1.74	305 767	6 659

Sources:

(a) Line 18, Table 2, 'International Investment Position of the United States at Yearend, 1976–2005' available at http://www.bea.gov/international/xls/intinv05_t2.xls.

(b) BEA, data available at http://www.bea.gov/international/zip/extract.zip.

(c) Ratio between S&P 500® Composite Price Index and S&P 500 Composite Book Value both available at www.globalfinancialdata.com.

(d) = (b) * (c)

(e) = (d) – (a)

(f) Data from BEA. From 1989–1999 data available at http://www.bea.gov/international/zip/IID03-15.zip. From 1999–2002 data available at http://www.bea.gov/international/zip/9702.zip. From 2002–2004 data available at http://www.bea.gov/international/xls/FDI16_0205.xls.

(g) Ratio between line 36 Table 2, 'International Investment Position of the United States at Yearend, 1976–2005' available at http://www.bea.gov/international/xls/intinv05_t2.xls and Bea's direct investment in the United States at historical cost from 1989–1999 available at http://www.bea.gov/international/zip/IID03-15.zip, from 1999–2002 data available at http://www.bea.gov/international/zip/9702.zip and from 2002–2004 available at http://www.bea.gov/international/xls/FDI16_0205.xls.

(h) Bloomberg.

(i) = (f) * (h)

(j) = [(f) * (g)] – (i)

To adjust the value of FDI at home we need to use foreign stock indices corresponding to the source country of each investment. Unfortunately only Japan publishes market to book value ratios for its main stock index. So we use this case as an example to estimate potential revaluations of foreign assets in the United States. The right-hand side of the table then looks at the market value of Japanese investment in the United States, estimated by assuming it is adjusted from book value at the typical market to book value used for all foreign FDI in the United States, and then compares it with an alternative adjustment based on the market to book value of the Nikkei. The table shows that in the early 1990s the investment of Japanese firms in the United States could have been undervalued, but that in recent years it has been overvalued. While it is unlikely that this number can be extrapolated due to the special circumstances of the Japanese stock market during this period, the example illustrates our point that FDI assets may be significantly mismeasured. In the specific case of the United States that we have discussed here, the analysis suggests a significant undervaluation of net foreign assets.

Another way of assessing the potential mismeasurement in the stock of FDI is by relying on micro evidence, that is, by following the evolution of stock prices in the aftermath of a takeover of a given corporation by a company from a different country. If this price goes up in an abnormal fashion, this increase in valuation will be lost by statistics that use the aggregate foreign stock market to value individual firms that do not trade in public markets. In a recent work based on micro data Chari *et al.* (2007) tackle this question specifically and show it could lead to a very substantial underestimation of the value of FDI. They analyse a sample of 370 takeovers of emerging market firms by developed countries' companies. For these transactions there were significant abnormal returns for the developed-market acquirers. These abnormal returns translated into a dollar value gain of 1.5 times the transaction price. More specifically their sample includes purchases for $111 billion, on which they estimate valuation gains of $142 billion. Furthermore, they show evidence that these abnormal returns are related to better governance in source countries or to the importance of R&D in the original company, providing some hints as to the sources of the valuation gain.

3.2. Testing for the sources of yield differentials

After discussing reasons why countries may earn different income on their net foreign assets (mismeasurement of assets and services, debt relief, liquidity and seignorage), we proceed to assess the empirical relevance of the different explanations.

Some of the underlying mechanisms reviewed above and studied in the literature may be fairly stable over time; others may depend on the circumstances of an economy at a specific time. Thus, we tackle the testing in two parts. First, we estimate a cross-section of yield privileges over a relatively long period to test for the effect of relatively stable variables. Then, we estimate an unbalanced panel with yearly data

to discuss the effect of variables for which short-term volatility is key. Our dependent variable is always the return privileges obtained on net foreign assets. These are estimated in the two ways we discussed in Section 2, either through the fixed effects coefficients estimated in Equation (4) or by estimating the abnormal return of Equation (5), though only the second alternative can be used when we work with yearly data.

We use the cross-section mainly to test the mismeasurement hypothesis. To do so we include as independent variables the stock of FDI assets and liabilities as a percentage of the GDP (see Appendix B for descriptions and sources of all the variables used), and spending in R&D in each country. We expect FDI liabilities to come in with a negative sign, and FDI assets to be associated with larger than expected returns, though this result may be muted when including countries where FDI outflows may respond to unstable conditions in the home economy. Spending in R&D measures the ability of local firms to innovate and their higher earning potential in their targeted firms abroad and is expected to have a positive sign. So should a rule of law variable that is included to test whether it is the superior institutional framework of a particular country that allows it to earn extraordinary returns as in the Caballero–Wei hypothesis discussed above. Finally, to test for other sources of return privileges we include a variable for highly indebted poor countries (HIPC) which includes a group of poor countries that have been favoured by debt relief, a dummy for OPEC countries that appear to earn surprisingly low returns on their assets, as well as a measure of corporate taxes to test for the possibility of tax shifting.

Table 6 shows the cross-section results for 103 countries for which we could compile at least partial data up to 2004. Column (i) includes only the FDI variables measures. Columns (ii) and (iii) show the results when the sample is restricted to either industrial or non-industrial countries. Columns (iv) to (vi) include the other potential determinants of yield privileges: rule of law, the HIPC and OPEC dummies and corporate taxes. Finally, columns (vii) to (ix) focus on countries with complete current account data during the sample period.

The results in Table 6 provide some support for the mismeasurement hypothesis. In Table 6a where we use the abnormal return on net foreign assets as the dependent variable, we find that countries that are short on FDI typically have negative yield privileges. The effect seems to be large with a 1% increase in the FDI liabilities as a percentage of GDP inducing a decrease in net income payments of about 0.05% of GDP during the 23 years. The number is twice as high for industrial countries. For this group, for example a country with 20% of GDP, higher FDI liabilities would see a deterioration in its net income of about 2.28% of GDP (0.114×20). For industrial countries there is also a statistically significant effect on the asset side. The regression indicates that an increase equivalent to 20% of GDP in the FDI abroad increases net income by about 1.18% over the sample period. Of course these numbers are dwarfed by the effect of debt relief. The highly indebted poor countries (HIPC) have typically enjoyed debt relief equivalent to an improvement in the return

Table 6a. Return privileges (measured as abnormal returns over 1980–2004) and fundamentals

	Entire dataset						Only countries with full sample		
	All countries (i)	Industrial (ii)	Non-industrial (iii)	All countries (iv)	Industrial (v)	Non-industrial (vi)	All countries (vii)	Industrial (viii)	Non-industrial (ix)
FDI Assets / GDP	−0.005	0.059**	−0.178***	0.020	0.078**	−0.114**	0.039*	0.089***	−0.067
	(0.017)	(0.021)	(0.063)	(0.021)	(0.028)	(0.054)	(0.020)	(0.027)	(0.050)
FDI Liabilities / GDP	−0.051***	−0.114***	−0.010	−0.070***	−0.129***	−0.022	−0.083***	−0.127***	−0.035*
	(0.014)	(0.017)	(0.018)	(0.014)	(0.022)	(0.017)	(0.014)	(0.021)	(0.018)
Rule of law				−0.303	−1.118	0.026	0.107	−1.240	0.751
				(0.475)	(1.412)	(0.549)	(0.499)	(1.373)	(0.564)
Corporate tax rate				0.029	−0.041	0.019	0.028	−0.049	0.050
				(0.033)	(0.073)	(0.035)	(0.037)	(0.071)	(0.040)
Research & Development				−0.003	−0.611	−0.021	−0.346	−0.530	−0.048
				(0.491)	(0.642)	(1.372)	(0.491)	(0.671)	(1.326)
Dummy OPEC				−5.623***		−4.954***	−4.801***		−3.513**
				(1.154)		(1.060)	(1.571)		(1.353)
Dummy HIPC				3.432***		3.204***	4.032***		3.259**
				(1.041)		(0.961)	(1.405)		(1.198)
Constant	1.220**	1.354	0.528	0.708	5.277	0.150	0.709	5.039	−0.952
	(0.524)	(0.818)	(0.629)	(1.160)	(3.280)	(1.239)	(1.274)	(3.239)	(1.300)
Observations	103	25	78	77	23	54	59	22	37
R-squared	0.168	0.688	0.131	0.517	0.719	0.553	0.522	0.726	0.520

Notes: Standard errors in parentheses. See appendix for variable definition and sources.

* Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6b. Return privileges (measured as fixed effect in Equation 4) and fundamentals

	Entire dataset						Only countries with full sample		
	All countries (i)	Industrial (ii)	Non-industrial (iii)	All countries (iv)	Industrial (v)	Non-industrial (vi)	All countries (vii)	Industrial (viii)	Non-industrial (ix)
FDI Assets/GDP	–0.001	0.005**	–0.016***	0.002	0.006*	–0.007*	0.002	0.006*	–0.006
	(0.002)	(0.002)	(0.006)	(0.002)	(0.003)	(0.004)	(0.002)	(0.003)	(0.005)
FDI Liabilities/GDP	–0.003**	–0.008***	0.000	–0.004***	–0.009***	–0.001	–0.005***	–0.009***	0.000
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
Rule of law				–0.042	–0.082	–0.019	–0.022	–0.082	–0.004
				(0.039)	(0.144)	(0.041)	(0.048)	(0.148)	(0.054)
Corporate tax rate				0.004	0.000	0.003	0.004	0.000	0.003
				(0.003)	(0.007)	(0.003)	(0.004)	(0.008)	(0.004)
Research & Development				0.005	–0.034	0.007	–0.015	–0.040	0.020
				(0.040)	(0.065)	(0.102)	(0.047)	(0.072)	(0.128)
Dummy OPEC				–0.291***		–0.243***	–0.414***		–0.332**
				(0.094)		(0.079)	(0.152)		(0.131)
Dummy HIPC				0.231***		0.216***	0.295**		0.221*
				(0.085)		(0.071)	(0.136)		(0.116)
Constant	0.090*	0.061	0.051	–0.039	0.225	–0.083	0.010	0.238	–0.097
	(0.049)	(0.080)	(0.060)	(0.094)	(0.334)	(0.092)	(0.123)	(0.349)	(0.125)
Observations	103	25	78	77	23	54	59	22	37
R-squared	0.098	0.513	0.108	0.400	0.529	0.466	0.390	0.528	0.447

Notes: Standard errors in parentheses. See appendix for variable definition and sources.

* Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 7. Yield privileges and short run variables

	All countries	Industrial	Non-industrial
Output volatility	−5.940** (2.525)	0.071 (5.608)	−6.337** (3.005)
Business cycle	0.828 (1.123)	−2.859 (2.362)	1.105 (1.359)
Percent change of nom. exchange rate	0.000 0.000	−0.003 (0.002)	0.000 0.000
Constant	−0.294 (0.225)	−0.004 (0.319)	−0.273 (0.298)
Observations	1267	426	841
R-squared	0.071	0.123	0.077

Notes: Time dummies added. Standard errors in parentheses. See appendix for variable definition and sources.
* Significant at 10%; ** significant at 5%; *** significant at 1%.

privilege of somewhat more the 3% of their GDP. OPEC countries, on the other hand, show a return that is lower than expected, of close to 5% of GDP.[12]

In summary, the results seem to provide some support to the mismeasurement hypothesis, in particular for industrial countries. However, the variables related to scientific innovation, rule of law and tax shifting variables do not appear significant in any specification. The results are virtually unchanged when using the fixed effect from Equation (4) as a measure of return privilege in Table 6b.[13]

The yearly panel estimation can provide a test of relevance of insurance services. To this end, we use a measure of output volatility estimated as a five-year centred standard deviation of output.[14] We also include a variable of business cycle under the presumption that insurance paid may respond to business cycle conditions. To test for the existence of valuation effects that come through the exchange rate we include a variable that measures the change in the nominal exchange rate.[15]

Table 7 shows the results from a fixed effects pooled panel that relates the abnormal returns in a specific year with fundamentals for that year. In these regressions we exclude the variables that do not change significantly within the sample for each country and restrict ourselves to the sample of countries with complete data. These regressions (except for the industrial subset where, as expected, no variable is significant) suggest that countries with higher volatility (defined as the standard deviation of real GDP × 100) appear to have lower returns on their net foreign assets as in the insurance hypothesis. The insurance channel also appears very strong: an increase in 1% in the volatility of the business cycle implies typically a loss in return privileges of about 0.05% of GDP for each year.

On the other hand a business cycle measure, obtained as deviations from a Hodrik–Prescott trend for real GDP, and changes in the nominal exchange rate appear unrelated to returns on net foreign assets, indicating that the main mechanism does

[12] This could be due to under-reporting of some of their investments abroad in order to avoid publicity.

[13] Again, to make these comparable the coefficients need to be multiplied by 23, the number of years on which the tests in Table 6a are conducted.

[14] We tried with a measure of correlation with world GDP but did not obtain significant results.

[15] In some specifications we interacted the change in the nominal exchange rate with a measure of the ability to issue debts in its own currency but we did not obtain any results.

not appear to be valuation changes through the exchange rate. Notice that in the specification of Table 7 we include time trends, a similar estimation without time trends delivers the same results.

4. INTRODUCING DARK MATTER

The previous section showed that some fundamentals may be important and stable drivers of yield differentials. If so, it may make sense to consider these return differentials as arising from an underlying asset that gives origin to the return differential.

Why is this interpretation useful and why does it help in the interpretation of global imbalances? First, because there has been a growing awareness that intangible capital is an important source of income. Corrado *et al.* (2006) argue that US national income accounts miss about $800 billion a year in intangible capital, and thus under-report the total capital stock of the economy in close to $3 trillion. Parente and Prescott (2002)[16] along the same lines, provide back of the envelope estimates of intangible investment that are even larger than those of Corrado and co-authors. The point is that to the extent that this capital is there, it will generate income on a steady basis. Second, because we have shown that abnormal returns build up over time and appear to be persistent. To the extent that they are persistent it is useful to factor them into the dynamics of payments on net foreign assets to get a more realistic picture of what these payments may be in the future, and ascribing them to an asset makes it unavoidable to consider them when analysing the sustainability of imbalances, something that has been missed in previous discussions that assumed that abnormal returns were the result of shocks that could/would easily be reverted or whose effect may suddenly disappear. Furthermore, if the return differentials arise from hidden assets, within firm transactions, risk or liquidity premia they correspond to embedded services that produce output that should be measured. This, in fact, is exactly what is done in standard GDP estimation, where many components of GDP are imputed by assimilating return differentials to the sale of specific services. A sector where net interest differentials are imputed as income is the banking sector.[17] In the case of the US, the System of National Accounts (SNA) recommended

> 'measuring implicit financial services to depositors, using the difference between a risk-free reference rate and the average interest rate paid to depositors, and it recommends measuring the implicit services to borrowers using the difference between the average interest rate paid by borrowers and the reference rate' . . . 'depositors could dispense with the services of a bank entirely and keep their money in securities paying the reference rate of interest. Depositors who forego the opportunity to earn the reference rate in order to obtain the services of a bank choose to pay the implicit price for depositor services equal to the margin between the reference rate and the deposit rate' (Fixler *et al.*, 2003, pp. 33 and 34).

[16] See also McGrattan and Prescott (2006).

[17] We thank Joe Beaulieu for pointing this out to us.

In our context, the analogy would be that when a foreigner decides to invest, say in the US or in Switzerland at a lower rate, it is because she values the insurance services provided by this investment. In this case we would say the US and Switzerland are selling insurance abroad, in the same way banks sell financial services by paying a lower rate on their deposits. To the extent that the underlying risk properties of the economies remain relatively stable, then so will the return differential, and the return differentials will be a source of income. For example, Kugler and Weder (2004 and 2005) study these return differentials for Switzerland, a natural provider of insurance services, particularly after World War I. They find that the return differential arose when Switzerland remained neutral during World War I, and since then has remained very strong and persistent.

Thus we propose measuring the stock of net foreign assets (*NFA*) as the capitalized value of the net investment income (*NII*), discounted at a constant rate of interest (r):

$$NFA_t^{DM} = \frac{NII_t}{r} \tag{6}$$

The superscript *DM* corresponds to *dark matter*, a term that we have chosen to reflect the discrepancy between our measure of net foreign assets and the measure that can be obtained from official figures or from accumulating the current account imbalances. The name is taken from a term used in physics to account for the fact that the world is more stable than you would think if it were held together only by the gravity emanating from visible matter. In the same way that physicists infer matter in the world from its gravitational pull, and not from adding up the visible matter, we infer the assets from their returns, and not from adding the current account imbalances. As a result countries with net investment income larger than what is presumed on the basis of their asset base will have dark matter assets, while countries where the net investment income is too low will have dark matter liabilities.

In turn, we define the current account as the change in net foreign assets defined in (6):

$$CA_t = NFA_t^{DM} - NFA_{t-1}^{DM} = \frac{NII_t - NII_{t-1}}{r}. \tag{7}$$

This way of computing the current account has been suggested by Cline (2005) and previously by Ulan and Dewald (1989). It was discussed by US government officials, but the Bureau of Economic Analysis (BEA) eventually discarded it because it was difficult to choose a discount rate (see Landefeld and Lawson, 1991).

This estimation suffers from all the same problems that we confront when estimating the value of a firm using price-earnings ratio, such as making sure the earnings are relatively stable, that earnings show up as earnings and not as capital gains, that the earnings data be of good quality, and that the discount rate appropriately reflects expected growth and the opportunity cost of time. Even though the discounting interest rate can be taken from our estimation of specification (4), and is therefore not arbitrary, and even if in the estimation it appears to be relatively stable over the sample period, the relevant rate may change over time (with changes in expected growth or interest rates). We discuss income-data quality issues in Box 1 and Box 2.

Box 1. Is income data reliable?

Our measure does appear to hinge on the net income data, at least in comparison with official stock data. But how good is either of these data? Gros (2006a), for example, discussing the United States, points out that the stock data is wrong because US surveys systematically miss on assets that foreigners hold in the United States. Because it is known that the US income payments have remained relatively constant over time, the fact that its liabilities are larger than measured increases the inconsistency between the two series. Gros (2006b) tries to explain the puzzle by arguing that the income flow data is wrong as well, because foreign firms in the United States seem to understate retained earnings. Some evidence is provided by the fact that once investments are categorized as direct investment, reported retained earnings fall dramatically. Gros disregards transfer pricing as an explanation (so does Mataloni, 2000), and argues that retained earnings in the United States should be similar to those of US firms abroad, so that they could be pulled out altogether from balance of payments statistics. If one is willing to make this assumption, it would imply a $100 billion overestimation of the net income which in our methodology would be equivalent to a $2 trillion drop in net foreign assets (when a 5% discount rate is used). Because Gros (2006a) suggests that net foreign assets stocks are $1 trillion less than actually measured, in the Gros accounting system there is still a large inconsistency between official stock data and the income flow data. As of 2005 the puzzle in the US data was of the order of $5 trillion, representing the cumulative current accounts since 1980 that had not led to payments abroad. In the Gros account system the discrepancy is of the order of $4 trillion, because he claims net assets are $1 trillion less than reported (thus, around $6 trillion in debt) but that income payments are $100 billion less than what official figures register (which would be equivalent to a $2 trillion liability paying 5%).* Either way the purpose of our analysis it simply to point out the discrepancy between the two data sources and provide an attempt to understand why this is so. The Gros correction does not eliminate the discrepancy; it reduces it by a small amount.

* A point that has been made (Buiter, 2006) is that mistakes may arise because income data is computed on an accrual basis. Thus if a country is in default, for example, the interest accrued but not paid will still be imputed to the income flow. While this may lead to some distortions, these apply to a very small set of countries, and only until the default is resolved. Once this happens, it is true that the numbers are not revised backwards; however, our final estimation for the stock of assets, and therefore our cumulative current account numbers would still be correct.

Box 2. The tax shifting hypothesis

It has been pointed out that income data is unreliable as a result of tax avoiding strategies, whereby firms report income in low-tax locations (see, for example, Eichengreen, 2006, and Lawrence and Lara, 2006). Lawrence and Lara (2006), in the context of the Puerto Rican economy, argue that this advantage is highest for firms with large intangible assets, which explains why there is a disproportionate amount of R&D intensive industries such as pharmaceuticals, instruments and electronics located in the island: these firms allegedly 'allocate high-cost activities, such as R&D spending, to the parent company and highly profitable production activities (that benefit from the R&D) to the foreign (or Puerto Rican) subsidiary.' This argument has been used as an explanation for why the income account of the United States has remained stable in spite of growing cumulative imbalances. But does the tax shifting hypothesis stand up the test of the data? Our results in Tables 6a and 6b suggesting that the corporate tax rate is not a relevant driver of abnormal returns is consistent with earlier results by Mataloni (2000) who checks if reported profitability is sensible to firms with large intra-firm imports, but finds no relationship. But there is a more compelling reason why tax shifting cannot be a relevant factor. For the United States, for example, the BEA reports for 2005 $227 billion of income from foreign direct investments abroad. Most of this comes from Europe, Canada and Japan (that add up to $139 billion of the total), where it is unlikely that tax considerations are relevant. Among the low tax jurisdictions, Ireland stands out with $12 billion, Bermuda with $8 billion and UK Caribbean with $7.7 billion. What role can these jurisdictions play in explaining the stability of the US net income? It is easy to see that for tax shifting to explain the mismatch between asset and flow data on a sustained basis requires that profit shifting be increasing in a way that is not verified in the data. If the US runs a current account deficit of $600 billion in a particular year, this implies that there should be roughly $30 billion more in net payments the following year (using the panel average yield of 5%). So for this not to show up in the net income, tax diversion should have *increased* relative to previous years by that amount. For the about $4.3 trillion of cumulative deficits the US has run between 1994 and 2005, tax shifting should have increased about $214 billion if assets earn the typical yield. If the tax shifting hypothesis is correct, this would have been reflected by an equivalent increase in income originating in low tax jurisdictions. Going back to 1994, the earliest year when this data is available, firms had reported income from Bermuda of $3.2 billion, from Ireland of $1.5 billion and $0.35 billion from the UK Caribbean, so the change of approximately $15 billion is quantitatively small relative to the $214 billion that are necessary for tax shifting to be an important part of the story (this data can be retrieved from http://www.bea.gov/international/xls/usdiainc.xls).

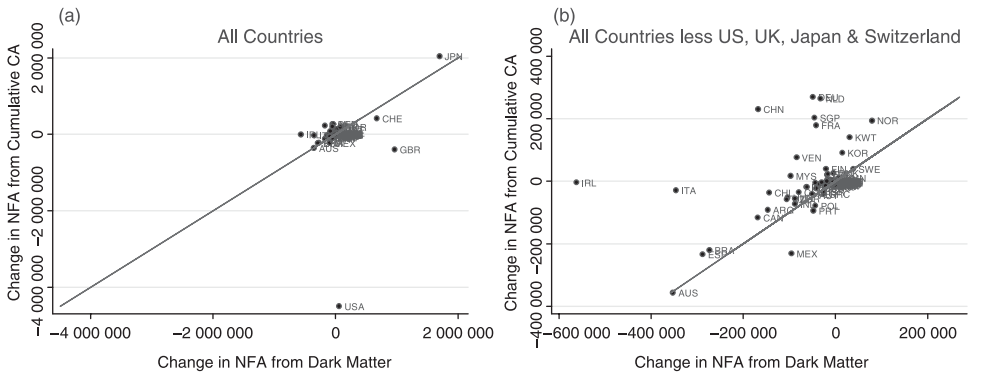

Figure 2. Official current account and change in net foreign assets, 1980–2004: (a) all countries; (b) all countries excluding the United States, United Kingdom, Japan and Switzerland

Table 8. Official and dark matter estimates of the current account

	Full sample	Excluding US	Excluding US and UK	Excluding US, UK and Japan
Change in dark matter NFA	0.648***	0.708***	0.963***	0.458***
	(0.204)	(0.068)	(0.049)	(0.067)
Constant	−22 957.46	19 265.42	33 722.684***	13 815.759*
	(44 569.766)	(14 985.336)	(9 770.491)	(7 691.446)
Observations	109	108	107	106
R-squared	0.086	0.504	0.787	0.309

Notes: Standard errors in parentheses.

* Significant at 10%; ** significant at 5%; *** significant at 1%.

One potential advantage of applying this methodology to the overall earnings on net foreign assets is that we average over a large number of firms and agents, so that the resulting earning flow may be relatively stable. Yet, if the earnings of any given year still give an unreliable measure of its true earning potential, if we average over an economy and look at trends over a couple of years, we should obtain reasonable results.[18]

To assess the coherence of the relationship between current account measures, Figure 2a plots the current account as measured from changes in the net stock of foreign assets computed from capitalizing the net investment income, against the official current account, for all the 109 countries for which we have complete data from 1980 through 2004.[19] Countries along the 45 degree line are countries where the two estimates of the current account match each other. Table 8 provides some OLS regressions to

[18] China provides a clear example of some of these problems. Its current account deficit surely dates much earlier than 1995 when it starts paying on its net foreign assets. We fully miss all these imbalances in previous years, thus showing that the multiyear perspective is critical for this methodology.

[19] In this exercise and in what follows we use net foreign investment income receipts, i.e. netting out net employee compensation which is not a form of capital income and we use the 5% typical yield to discount net income flows.

suggest that the correlation between the two measures is positive, strong and statistically robust. In fact, once the US and the UK are withdrawn from the sample the coefficient relating both measures is 0.96 and highly significant, though this result, as shown in the last column, is mostly driven by Japan.

Countries to the right of the 45 degree line have dark matter assets as their imputed net asset stocks appears larger than indicated by the official current account. Countries to the left of the 45 degree line have dark matter liabilities. While most countries lie close to the 45 degree line, the data shows some important outliers: the US, UK and Switzerland as owners of dark matter assets, and Japan, Ireland, Italy, Germany and China as owners of dark matter liabilities. Figure 2b zooms into the central cluster to verify that this positive relationship holds within that group as well.

To further understand the sources of the stock of dark matter (*DM*) it is useful to write it as:

$$DM = NFA_t^{DM} - NFA_t = \frac{NII_t}{r} - NFA_t = \frac{\tilde{r}(NFA_t + \mu_t)}{r} - NFA_t = \frac{\tilde{r}}{r}\mu_t + \frac{(\tilde{r} - r)}{r}NFA_t \qquad (8)$$

where NFA_t stands for the official measure of net foreign assets as estimated from the accumulation of the current account.[20] In this expression we allow for assets to be mismeasured, with μ indicating that error in measurement. In addition we assume assets to yield a rate of return $\tilde{r}$ different from the constant rate used for discounting. The two terms in the last expression of Equation (8) allow us to visualize that dark matter may have two origins: the capitalized return to unaccounted assets and to yield 'privileges'.[21] This makes sense to the extent that *ex post* returns reflect expected returns and the return premium is consistently paid, i.e. when the return privileges appear to be stable. In Section 2 we provided evidence that this was the case.

From the second term of the last equality in Equation (8) it should be clear that our difference with Gourinchas and Rey (2006) is that we capitalize the return differential, add it to the stock of net foreign assets, and then adjust the current account accordingly. It is the fact that we consider as an asset the capitalized value of the return differential that makes our description of the current account dynamics so different from the standard analysis.

[20] We choose to compare the dark matter assets to those that would result from accumulating the current account, not the measured stock of assets. The reason for this is that the measured stock already contains some of the drivers of dark matter, so that comparing its value to the adjusted measure would split the dark matter into two: the part that is accounted in the asset valuation (the more visible part of dark matter) and the part that is not. Because this could lead to erroneous interpretation of how dark matter assets evolve over time, we choose to group dark matter into a unique estimation.

[21] The second term in Equation (8) may change dramatically over time, making the stock of dark matter quite volatile. McKelvey (2005) refers to the very large volatility of dark matter, something that he found did not bear well with what he believed were stable underlying economic reasons for the existence of dark matter. Equation (8) clarifies the point by showing that dark matter will be affected by the capitalized value of changes in the actual return differentials. Thus small changes can lead to swings in our dark matter estimate. As much as in corporate finance, earnings in a particular year may provide a poor guide to the income of a particular corporation over the medium term. In our case the income flow is the average of many different individual returns, but it is still true that these returns may be affected by macro shocks, thus still exhibiting some volatility. Under this light, our estimates for any particular year should be taken with care, with averages over longer periods being more informative. Trends over 25 years, as we use in this paper, are relatively stable.

5. A NEW LOOK AT GLOBAL IMBALANCES

With a better understanding of what dark matter is, we apply our methodology to the understanding of global imbalances. In order to have a working benchmark Figure 3a presents the evolution of the net asset position of major global players as can be inferred from accumulating the current accounts over the last 30 years for Japan, the United States, the European Union and the rest of the world (ROW) (which is estimated as a residual so that all positions add up to zero) all expressed as a share of world GDP. It shows a world that is increasingly unbalanced with Japan and the rest of the world financing Europe and primarily the United States, which appears accumulating a growing external debt.

The work of Lane and Milesi-Ferretti (2001, 2006a, 2006b), resulting in the *External Wealth of Nations Database*, is an attempt to provide better estimates of net foreign positions. In the first of their three papers on the topic they correct official numbers by adjusting for a series of problems (capital account transfers, debt reductions, exchange rate changes, portfolio equity adjustments, etc.). However, to obtain comparability across countries, FDI was taken at book value. By the time of the 2006 version of their Wealth of Nations database, a large fraction of countries had started publishing reliable market value estimates of their net stock of FDI, so the latter version relies more heavily on this data. But, while this data improves on current statistics it is mostly based on official numbers so it does not provide a description that is very different from that of official statistics. Figure 3b therefore shows a similar picture to that of 3a with data taken from Lane and Milesi-Ferretti (2006a). As can be seen, the description provided

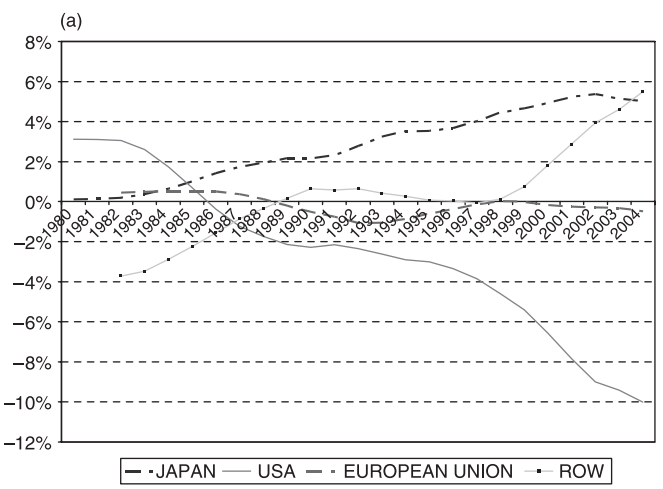

Figure 3a. Net asset positions from official data

Notes: European Union countries includes: Austria, Belgium, Finland, Germany, Italy, the Netherlands, Spain, Sweden, the United Kingdom. Official net foreign assets: accumulated current account from IFS, code: ALDZF divided by world GDP, WEO, Subject Code: NGDPD. Initial stock of assets corresponds to the net investment position from the following source.

Source: IFS lines 79AADZF-79LADZF, see appendix for details.

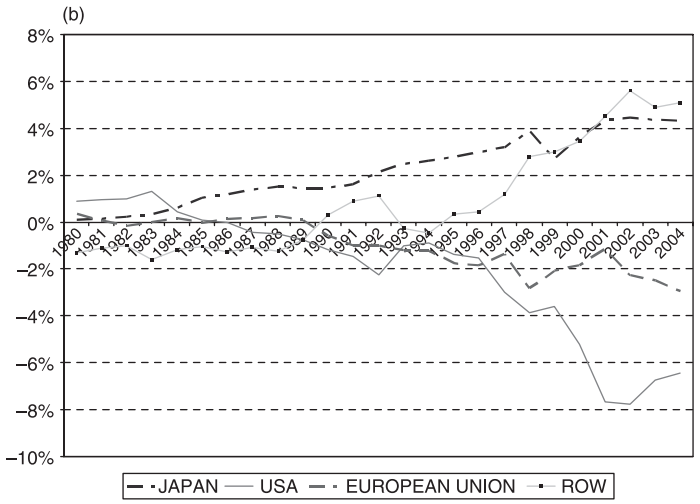

Figure 3b. Net foreign assets from Wealth of Nations database

Notes: European Union countries includes: Austria, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden, the United Kingdom.

Source: Lane and Milesi-Ferretti (2006a), divided by world nominal dollar GDP from WEO, see appendix for details.

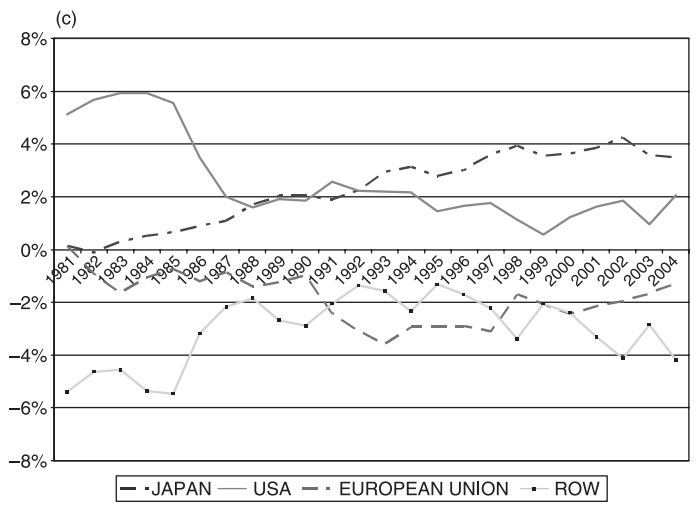

Figure 3c. Net foreign assets with dark matter

Notes: European Union countries includes: Austria, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden, the United Kingdom.

Source: IFS, lines (AGDZF-AHDZF) / 0.05, divided by world nominal dollar GDP from WEO (see Appendix B).

by Lane and Milesi-Ferretti is similar to that depicted in official statistics. In both databases the net asset positions seem to trend for most of country groups.

Figure 3c presents an alternative view, using the net asset positions that we construct by capitalizing the net investment income for each country. As can be seen, the world

Box 3. Is China a net creditor?

It has been argued that China is accumulating a large amount of foreign assets. Its official reserves, topping $1 trillion, are indeed the largest in the world. But what does dark matter have to say about China's net asset position? Figure 4 shows the evolution of the net foreign asset position of China including dark matter. It unveils that in spite of its large official reserves, China is still a net debtor, not a creditor. The graph also shows that China has reduced its net foreign debt considerably in recent years and that reduction has been very quick, yet China remains an important importer of dark matter and that is why it still pays out on its net asset position.

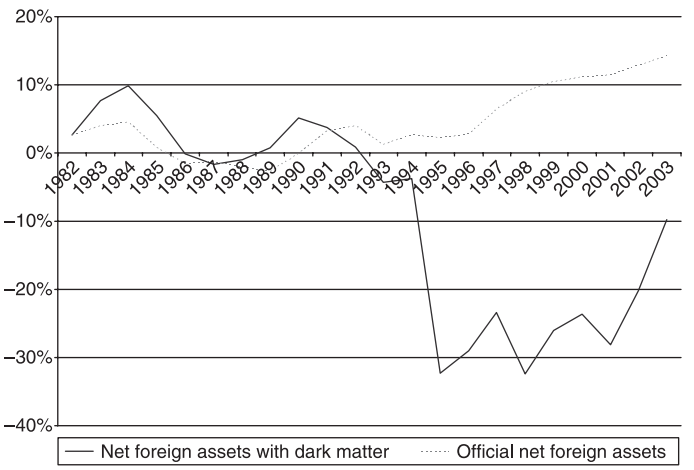

Figure 4. Net foreign assets position with dark matter, China (as % of China's GDP)

Notes: In the first year the two series start at the value of net foreign assets with dark matter.

Sources: Net foreign assets with dark matter: IFS, lines (AGDZF-AHDZF) / 0.05, divided by world GDP, WEO, Subject Code: NGDPD, see appendix for details.
Official net foreign assets: accumulated current account from IFS, code: ALDZF divided by world GDP, WEO, Subject Code: NGDPD see appendix for details.

looks quite different, at least relative to the previous two graphs. First and foremost, the United States does not appear as a net debtor but as a net creditor and its net foreign asset position remains stable over the last 20 years. Japan shows a pattern that is similar to that in official data, i.e. a growing creditor, while the European Union and the rest of world are net debtors. (Box 3 discusses the case of China.) Perhaps the most striking feature of Figure 3c is that it shows a world that is surprisingly balanced with relatively little trend in the net asset position for most groups.

5.1. An analysis of the United States

The centre of the discussion on the sustainability of recent global imbalances has focused squarely on the persistent and large US current account deficits.[22] In spite of this, over the recent years net investment income has been stable, indicating that accumulation of dark matter assets is compensating the large current account deficits leaving its net asset position unchanged. Typically the answer to the question of why the net investment position of the US appears more stable than implied by its current account, particularly when thinking about the 2001–2005 period, was that the US enjoyed capital gains associated with exchange rate fluctuations. But these were viewed as unreliable, as exchange rates can move the other way without notice (Lane and Milesi-Ferretti, 2006a). Were the US dollar to appreciate, the US would be left not only with a large current account deficit but also with a large capital loss in its net stock of foreign assets, compounding the downfall. The exchange rate channel has been discussed by Gros (2006a) and Kitchen (2006), who conclude it is not an important part of the story. In addition the story runs into problems when applied to the 2004/5 period, when the dollar did not further depreciate relative to the euro, while net income remained stable.

So, while it is a fact that the United States has been able to maintain a stable income flow in spite of large and increasing current account deficits, can dark matter (or return differentials) explain the discrepancy? There are two ways of answering the puzzle. Given the close to zero net investment income, and the approximately $5.2 trillion in accumulated debt (as measured through the cumulative current account deficits observed between 1980 and 2005) it seems we are missing this much of US assets. Alternatively, we could try to account for missing income payments from abroad of about $250 billion, that would compensate the payments that measured debt should be generating.

The first piece of the puzzle is provided by FDI mismeasurement. Table 5 computed the potential mismeasurement of the FDI data. While we did not provide an estimate for the potential underestimation of foreign assets in the United States we did compute an upper bound for the underestimation of US assets abroad. Our exercise suggested a potential adjustment in the stock of FDI assets of close to $3 trillion. Because we provide an upper bound to the required adjustment in FDI assets the number is likely to be somewhat smaller, but it has the potential to go a long way in explaining the missing gap and, in fact, could justify up to $150 billion of the $250 billion of missing income payments. One feature that suggests that our proposed adjustment may not be too far from reality is that it does not differ significantly from the 1.5 adjustment coefficient found by Chari *et al.* (2007) using micro level data.

How could we estimate the risk premia payments to the United States? One alternative is to multiply the amount of US debt held by foreigners by the return privilege of

[22] Some authors such as Engel and Rogers (2006), Mendoza *et al.* (2006) or Caballero *et al.* (2005) as well as two papers by us (Hausmann and Sturzenegger, 2006, 2007), suggest the current state of affairs is sustainable and not a source of concern. On the other hand Cline (2005), Obstfeld and Rogoff (2005a, 2005b), Roubini and Setser (2004), Lane and Milesi-Ferretti (2005) and Higgins *et al.* (2005), among others, consider the situation to be unsustainable.

Table 9. Portfolio assets for the US economy in 2005 (in millions of dollars)

	Official assets in the United States	
(a)	US Treasury securities	1 288 881
(b)	Other private assets in the United States	360 516
(c)	US Treasury securities	704 875
(d)	US securities other US Treasury securities	4 390 682
(a) + (b) + (c) + (d)	Total portfolio assets	6 744 954
	Income privilege (@ 0.68%)	45 866

Sources: Lines 28, 29, 37 and 38 of Table 2, 'International Investment Position of the United States at Yearend, 1976–2005' available at http://www.bea.gov/international/xls/intinv05_t2.xls

Table 10. Dark matter assets and income (in millions of dollars)

		Dark matter sources	Income equivalent
(a)	FDI asset	2 743 731	137 187
(b)	FDI liabilities	na	Na
(c)	Insurance	917 314	45 866
(d)	Seigniorage	325 000	16 250
(e)	Liquidity	63 800	3 190
	Total	4 049 845	202 493

Sources:
(a) Table 5, income estimated at 5%.
(c) Table 9, income privilege estimated at 0.68%.
(d) Line 38 of Table 2, 'International Investment Position of the United States at Yearend, 1976–2005' available at http://www.bea.gov/international/xls/intinv05_t2.xls. Income estimated at 5%.
(e) Income estimated by adding lines 1 + 3 of Table 9 at 0.16%. Stock is income divided by 0.05.

US portfolio assets estimated, for example, by Gourinchas and Rey (2006). These authors estimate for the post-Bretton Woods period a total return advantage of 0.68% for US portfolio debt. Table 9 shows the amount of US debt held by foreigners, which can be divided into official and corporate instruments (all data is for 2005). The total holding of US debt by foreigners adds up to about $6.75 trillion, which implies a yield privilege of $45 billion, or alternatively, almost $1 trillion in additional wealth.

On the other hand, the evidence does not seem to assign an important role to seignorage. Buiter (2006) estimates dark matter assets from seignorage (holdings of US dollar bills abroad) of between $210 billion and $525 billion, a small share of the total. The BEA reports a holding of foreigners in 2005 of $325 billion, at a 5% typical return this implies an extra income of $16 billion. Even less important is the liquidity premia channel. Longstaff (2004) finds the average liquidity premia for US treasuries to run between 10 and 16 basis points. Applied to the stock of US treasuries held abroad which currently adds to about $2 trillion (see Table 9), gives an upper bound estimate for net income of $3 billion, equivalent to an additional stock of assets of $64 billion.

Table 10 adds up dark matter sources for the United States. Our back of the envelope calculations, using the work of other scholars, allows us to estimate that the sources

of dark matter discussed may add up to close to $4 trillion, mostly compensating the accumulated current account over the recent years. It is these assets that have allowed the United States to maintain its current income stable in spite of measured current account imbalances.

There are basically three ways of assessing whether dark matter assets will continue to play a role in the future. One is to analyse the underlying reasons for the existence of dark matter, and seek to understand whether they will continue to play a role in coming years. In our analysis, the reasons for why the return differential exists may be identified in the health of innovation and creativity of the US corporate sector, the underlying stability of the US economy, the role of the dollar as a leading global store of value. To the extent that these fundamental features remain stable, so will the return differential. As global markets continue to grow, these return privileges may act on a larger base, and thus potentially lead to increases in dark matter assets.

A second way to assess persistence of the mechanisms we focus on, and their contribution to sustainability of the US current account, is to look at historical evidence. Did other countries enjoy similar return differentials in the past? Were these stable? Meissner and Taylor (2006) address this issue by analysing the United Kingdom at the end of the 19th century, as well as the United States in the postwar period. They argue that the evidence points to the fact that yield differentials declined over time, which they use as a cautionary note on the possibility of the United States sustaining large differentials in the future, though – we may add – they conclude this from extrapolating a linear trend. In addition, they also find that these differentials for the United States, and for the United Kingdom, were fairly stable as a share of GDP, due to an increase in leverage. In the case of the United Kingdom the process continued up until an abrupt collapse at the outbreak of World War I, leaving open the question as to what would have happened if such event had not occurred. A similar but more flexible estimation than that of Meissner and Taylor (2006) would allow for a quadratic trend. If the specification of Equation (4) was augmented with a quadratic trend we would be able to see how the return privilege changes over time. To see this we re-estimate the fixed effect model using the specification

$$\frac{\Delta NII_{it}}{GDP_{it}} = r\left[\frac{CA_{it}}{GDP_{it}}\right] + \alpha_i + \gamma_{1i}t + \gamma_{2i}t^2 + \varepsilon_{it} \tag{9}$$

In Figure 5 we plot the estimated return for the US economy as estimated from Equation (9). As can be seen it declined in the late 1980s (which explains why the trend in Meissner and Taylor turned out negative) but has been increasing in recent years. In fact the estimation since 1990 shows an almost linear and positively sloped trend.

Finally, a third alternative is to look at the time series properties of dark matter stock over recent years. This is an alternative way of presenting our results on the cumulative abnormal returns. We already argued that these were persistent, and this should translate in a relatively persistent stock of dark matter. We show this here with

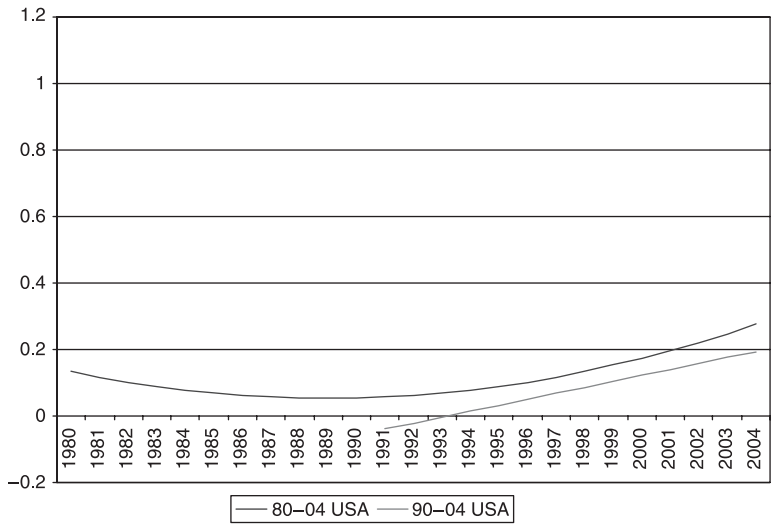

Figure 5. An estimate of the US return privilege

Notes: Predictions from the following specifications:

$80-04USA = Fixed\_effect_{US} + Trend\_effect^{*}_{US}(year - 1980) + Square\_trend\_effect^{*}_{US}(year - 1980)^2$.

$90-04USA = Fixed\_effect_{US} + Trend\_effect^{*}_{US}(year - 1990) + Square\_trend\_effect^{*}(year - 1990)^2$.

the aid of Figure 6, which benefits from the recent release of 2006 data that we have included in the figure. The stock stands now at over 40% of GDP. Since 1982 it has fallen only in 5 years and the largest drop, which took place in 1985, was barely of 1.6% of GDP. In short it would take an unprecedented deterioration of the value of dark matter to even approximate the net asset position that today worries analysts.[23] In recent years the accumulation has been very large, including 2006, during which the US economy added half a trillion in dark matter assets.

6. CONCLUSIONS AND FUTURE RESEARCH

In a nutshell our story is very simple. The net income paid by countries on their net foreign assets is affected by significant return differentials that originate in fundamental differences of these economies. In addition, payments on net foreign assets appear substantially more stable than what could be inferred from current account dynamics. Therefore when assets are valued using actual payments, net asset positions for Japan, Europe, the United States and the rest of the world seem fairly stable over time. In the specific case of the United States, which has drawn substantial attention due to its growing measured current account imbalances, we find that this return differential

[23] Econometrically one can show that the trend is positive standing at about 2.4% of GDP for the period 1982–2005, and strongly statistically significant (p-value = 0.00019).

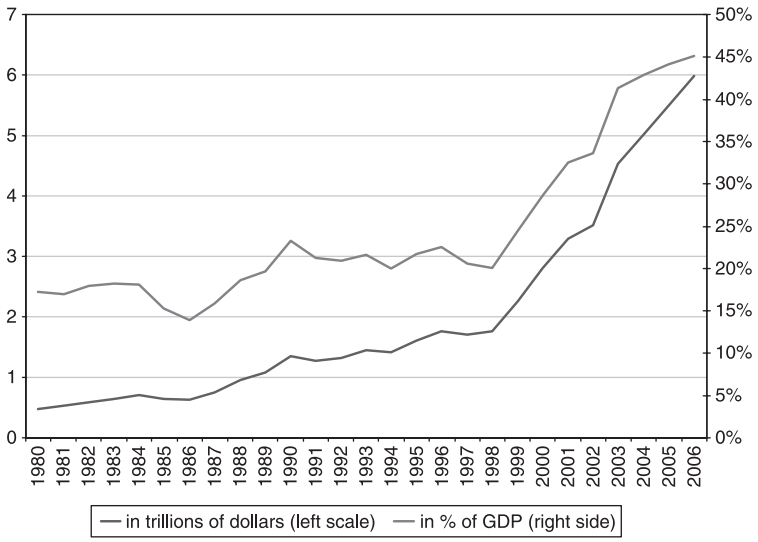

Figure 6. US stock of dark matter

Sources: Net foreign assets with dark matter: We take the yearly change in net income lines 13 + 30 of http://www.bea.gov/international/xls/table1.xls and divide it by 0.05. The result is subtracted from the current account (lines 1 + 18 + 35) of the same table. The resulting variable is accumulated over time. For net foreign assets with dark matter as percentage of GDP we divide by GDP from IFS, line 11199B.CZF. The last observation of the GDP (year 2006) is from WEO, subject code: NGDPD.

has grown in recent years allowing the United States to have a fairly stable net income on its foreign asset position. We think that this return differential should not be viewed as the result of US investors outsmarting investors in the rest of the world, or due to a stream of unprecedented good luck. Rather, it may well reflect some underlying fundamentals such as unaccounted export of know-how carried out by US corporations through their investments abroad, as well as the sale of insurance and liquidity services. The latter factors relate explicitly to characteristics of the United States that cannot be easily replicated elsewhere, and explains why the United States looks like a consistently smarter investor, making more money on its assets than it pays on its liabilities. For the United States as well as for other countries, it is these and other characteristics that explain the return differential. The discussion on the instability of global imbalance should focus on the sources of these return differentials: the stability of a given economy, its role as a cradle for ideas, or its ability to offer superior financial instruments. These issues have only recently taken centre stage in the discussion on global imbalances, whereas previously the debate had focused mostly on domestic savings or on speculating about the willingness of official creditors to finance the measured imbalances.

Dark matter also sheds a different light on the often discussed US savings puzzle. According to the official statistics, the United States appears as a profligate consumer with dismal savings. However, our numbers suggest that the US savings rate may be

understated by the amount of dark matter it exports and the savings of the rest of the world overstated by the amount of dark matter it imports. To the extent that there are unreported capital gains, these could be included in the current account and in national accounts, increasing the savings rate and national income.[24] If we did so it could be argued that the United States may have been saving significantly more than accounted by official statistics. The accumulation of dark matter assets is perceived by households as a source of income, and the US consumer is appropriating these benefits and spending accordingly. The result is a consumption level that seems inconsistent with measured statistics but that is normal and sustainable given actual wealth.

Our computation of dark matter leaves open several interesting areas of research. As a starter, we believe it signals the importance to improve the estimates of asset stocks in the balance of payments. Alternatively, it would be interesting to look at dark matter by sector and region, to get a better sense of where it is being created and deployed. While we have worked with the statistical properties of aggregate dark matter, it could certainly be split into different components such as distinguishing the piece that comes from the yield gap from the rest or distinguishing the piece that is captured in official net foreign assets (the 'visible' part of dark matter) from the piece that is not. Our approach has also put the focus on net investment income which can also be analysed in other ways; for example splitting its changes in those arising from current account results, capital gains, increases in leverage and changes in interest rates. These alternative decompositions may lead to new insights. Likewise, while we have somewhat looked into the evolution of dark matter for the United States, and briefly for other countries, individual country cases, in particular if the different decompositions can be made, are likely to be different and equally interesting.

Globalization and financial integration have made asset positions all the more relevant. As the gross stock of assets and liabilities increases, valuation adjustments on these assets may overshadow the traditional measure of the current account as drivers of the net asset position. If return privileges permanently tend to stabilize net income across countries, they make current imbalances less worrisome than what could be inferred from a simple analysis of current account dynamics.

[24] According to Perozek and Reinsdorf (2002), national income is defined as originating from current production of goods and services, so it excludes capital gains. This is because with capital gains excluded from income, national saving becomes conceptually equal to domestic investment plus net foreign investment. According to these authors when making consumption decisions, households appear to treat capital gains differently from ordinary income, so a measure of income that includes capital gains would not relate as well to consumption as the National Income and Product Accounts (NIPA) concept of income. Also because capital gains tend to be volatile, if included, measures of income or saving would exhibit large fluctuations that would limit their usefulness. Alternatives to the definition of income that is used in the NIPAs are, of course, possible. Haig (1921) and Simons (1938), for example, define income as consumption plus change in wealth, which has the effect of including capital gains. At the opposite pole is Fisher (1906), who identifies income with consumption and treats it as a flow of services rendered by capital. If capital gains were to be included then measures of savings would have been under-reported in the case of the United States.

Discussion

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The profession is indebted to the authors: with their provocative first draft of this paper, with its snazzy title, they made balance of payments accounting trendy. They detail the splash that they made in their first footnote. The current version of the paper is far more sedate, but will still cause controversy.

The authors begin with a simple regression. A country's within-period budget constraint says that the country's net exports of goods and services minus net transfers made plus net investment income (including capital gains) equals the change in net asset holdings. Thus, multiplying the change in net asset holdings by the interest rate, which is assumed to be constant over time and across countries, and using the budget constraint, the authors write that the change in net investment income is equal to the sum of the interest rate multiplied by the current account, a 'privileges' term and a statistical error term (errors and omissions in the balance of payments multiplied by the interest rate). The privileges term comprises long-term transfers and unmeasured capital gains, both multiplied by the interest rate. Regressing the change in measured net investment on the current account and a fixed country term then yields an estimate of each country's 'privilege' and the interest rate.

What emerges from this exercise is that 'privileges' – both positive and negative – are relatively rare and that positive privileges are enjoyed by such countries as the United States, the United Kingdom and Malawi. Upon seeing this result, one must wonder about the specification. It is unlikely that the factors that ensure privilege for the United States and the United Kingdom are at work in Malawi. Indeed, one might surmise that Malawi – one of the poorest countries on earth – only looks as if it has 'privilege' because it is receiving sizeable debt relief. The authors could have avoided this confusion by removing the long-term transfers (which can be measured by the capital account) from the privilege term and putting them in with the current account term where they belong conceptually. This would also have eliminated the authors' need to include dummy terms for highly indebted poor countries later on in the paper when testing for the source of extraordinary returns.

Even if the apples and oranges problem were eliminated, one must have some qualms. First, errors and omissions are an unlikely statistical error term as they may well be unrecorded capital flows, say, the capital outflows associated with unrecorded investment income. Second, investment income in the balance of payments data is probably a rather noisy measure of actual investment income.

The authors go on to explain privilege as resulting from *dark matter*. It is typical to explain yield privileges as arising from two factors: valuation changes that are not measured as investment income in the balance of payments and differential rates of return. The authors' empirical measure of privilege appears to ignore the second

factor. This is because their concept of dark matter enables them to explain what appear to be differential rates of return as actually resulting from valuation changes. Dark matter is an unrecorded service that is bundled with a financial asset and, when exported with the asset, generates a favourable valuation change.

As an example, suppose that the world rate of interest on risk-free consols is 5% and that a large country with an active secondary market for its consols finances its conventionally measured current account deficit of 100 units by issuing 100 units of consols that pay 4%. Using the dark matter concept the country is viewed as having exported dark matter in the form of liquidity services worth 20 units. Its corrected current account deficit is thus 80 units and the decrease in its net foreign assets is only 80 units – the present discounted value of its net interest payments at the world rate of interest of 5%. It is not viewed as getting a preferential interest rate; instead, the export of dark matter resulted in a reduction in the value of the outstanding asset.

The authors then return to their initial equation to measure black matter. Recall that this equation said that the change in net investment income equals the interest rate times the sum of the measured current account, unmeasured valuation changes, long-term transfers and errors and omissions. If it is then assumed that there are no errors and omissions and either that there are no long-term transfers or that long-term transfers are somehow conceptually the same as unmeasured valuation changes, it can then be stated that the change in net investment income is equal to the interest rate times the sum of the measured current account and the unmeasured valuation changes. If black matter is then identified as unmeasured valuation changes, we have the paper's Equation (7): black matter is the change in net investment income divided by the interest rate minus the current account. Measured this way, the United States, the United Kingdom and Switzerland are all exporters of dark matter. This is a bit heroic, however, as errors and omissions are large; long-term transfers are important for many countries and are not conceptually the same as black matter; net investment income is notoriously poorly measured; the choice of a 'world' interest rate is controversial.

This paper was probably motivated by the recent and puzzling experience of the United States. At the start of the 1980s the United States was a small net creditor. Between 1980 and today the United States has run cumulative measured current account deficits that dwarf its 1980s measured foreign net asset position. As a result one would expect that the United States would now be sizeably in debt and making large interest payments. Surprisingly, however, the United States still has measured positive net investment income. This puzzle has recently attracted much attention. Many researchers argue that the United States is 'privileged' in that it receives a higher return on its foreign assets than it pays on its liabilities. This is because – it is claimed – US liabilities are mostly low-return debt and US assets are mostly high return equity. More strikingly, Gourinchas and Rey (2006) argue that US investors earn higher returns on their cross-border returns than do foreigners within each asset class as well: US investors' returns on foreign equities and bonds were higher than foreigners' returns on US equities and bonds by 6.21% and 3.72% *per year*,

respectively. The authors' claim that the US is an exporter of dark matter is consistent with this evidence.

Another view is provided in an interesting and careful new paper by Curcuru *et al.* (2007). They use data from actual bond and equity portfolios to argue that there has been – in fact – *no* return differential. This is because US equity markets have performed relatively well over the past 12 years and bond returns have been more or less equalized across the developed world.

Cédric Tille

Federal Reserve Bank of New York[25]

Introduction

A striking feature of the world economy is the ability of some countries, including the United States, to borrow large amounts from foreign investors without any corresponding increase in their net factor payments to the rest of the world. Understanding the drivers of this disconnect is relevant for assessing the sustainability of current imbalances, as the ability of some countries to borrow on favourable terms can reduce the need for a prompt re-balancing of current accounts.

The authors review the evidence on such return privileges across a broad range of countries, and assess the implications for the sustainability of current imbalances. The next section of my comments briefly reviews the main claims of the paper. The third section focuses on potential mismeasurements of FDI holdings highlighted by the authors. The fourth section presents a breakdown of the dark matter measure across various components, with different implications in terms of sustainability, and the final section concludes.

Return privileges and their determinants

The central point of the paper is reflected in Equation (4). In a context where all assets and liabilities earn a yield r we would expect the dynamics of the net investment income to parallel the current account. This is not the case in general, and Equation (4) includes a country-specific term α (a privilege) that captures the component of overall returns which does not take the form of income streams, i.e. are not reflected in yields. This privilege can consist of capital gains, insurance or liquidity premia, or exports that are not captured in the data.

The authors find that such privileges are relatively uncommon, and significant only for a handful of countries. Many of these are poor countries for which the privilege

[25] I thank Matthew Higgins and Tom Klitgaard for useful comments. The views expressed here are those of the author and are not necessarily reflective of views at the Federal Reserve Bank of New York or the Federal Reserve System.

reflects debt forgiveness. More importantly for global imbalances, several large countries show significant privileges. In particular, the net income payments by the United States and the United Kingdom are more favourable than what one would infer from their net foreign assets. In addition to documenting the presence of return privileges, the authors find that they are quite persistent and should be taken into account when assessing the sustainability of external imbalances.

The determinant of return privileges are assessed through an econometric exercise which shows three main points. First, HIPC countries benefit from favourable returns, reflecting the write-off of some of their debts. Second, OPEC countries face unfavourable returns, possibly reflecting a concentration of their external assets in low-yield securities. Third, industrialized countries with large FDI liabilities face unfavourable returns. This last point is somewhat puzzling. If FDI holdings entail a component that is not captured in the data, such as managerial skills from the foreign parent company, one would expect FDI recipients to face unfavourable returns. One would, however, expect this effect to be relatively more pronounced for non-industrialized countries, while the econometric analysis shows the opposite pattern, with the effect being insignificant among these countries.

Are FDI holdings substantially mismeasured?

In Section 3.1 the authors argue that US FDI assets and liabilities are not evaluated correctly by the Bureau of Economic Analysis. Specifically, they stress that FDI assets of US multinationals abroad should be valued using US equity prices instead of local prices, as the BEA does. Combining the ratio between book and market value of the S&P and the FDI asset at historical costs, the authors argue that the market value of US FDI assets abroad is nearly twice that reported by the BEA ($6.0 trillion at the end of 2004, compared to $3.3 trillion from the BEA, Table 5). The difference between the two measures accounts for the bulk of the overall 'dark matter' assets estimates presented in Table 10.

This large gap mostly reflects the particular method chosen by the authors, which can lead to a large overestimation. The BEA presents three measures of FDI assets and liabilities: historical cost, current cost and market value, with the difference between historical cost and market value reflecting the revaluation of the equity component of the investment. As pointed out by the authors, the BEA uses foreign stock prices to estimate the market value of US FDI assets, and using US stock prices could lead to different results. One can, however, assess this point in a simple way directly from the BEA data. Taking the ratio between market value and historical cost for FDI liabilities gives the adjustment by the BEA that reflects US stock prices. One can then apply this ratio from the liability side to the historical value of FDI assets in order to compute an alternative market value.

The resulting estimates of FDI assets are shown in Figure 7. The BEA data at historical cost and market value are represented by the dotted and solid lines respectively

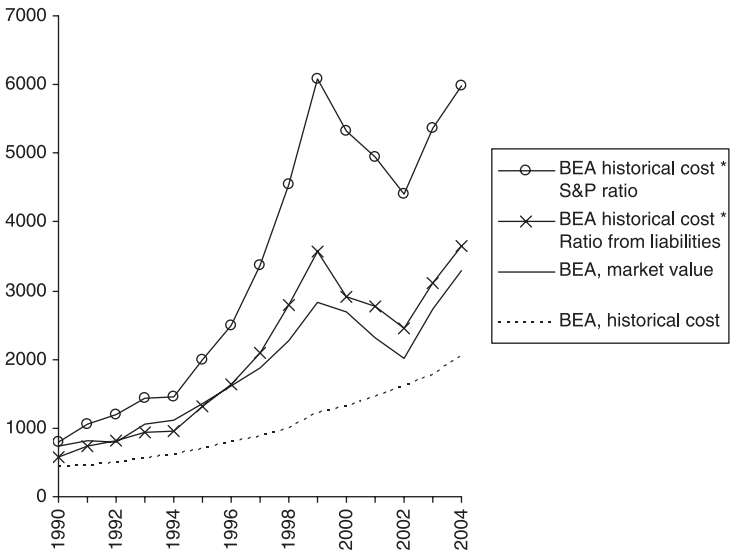

Figure 7. FDI assets ($ billion)

(columns a and b in Table 5). The crossed line shows the estimates computed by multiplying the assets at historical costs by the ratio of market value to historical costs from the liability side. The rounded line shows the authors' estimates multiplying the assets at historical costs by the S&P ratio of market to book value (column d in Table 5). Using the S&P ratio clearly leads to estimates that are much larger than the ones obtained from using the ratio from FDI liabilities, with the latter raising the estimate of FDI assets at market value by only 10% in 2004. The large adjustment computed by the authors in Table 5 should therefore be taken with caution, as it does not merely reflect the use of stock prices in different countries.

In addition to computing an alternative estimate of FDI assets at market value, we can derive the corresponding estimate for FDI liabilities by multiplying liabilities at historical costs by the ratio of market value to historical costs from the asset side. Doing so leads to a net FDI position that is somewhat larger than from the BEA data at market value, although the difference is moderate, averaging 3% of GDP since 1990. While measuring FDI holdings is a delicate exercise due to the lack of market prices, the claim by the authors that the BEA measures are substantially off the mark due to the particular equity prices used is questionable.

How sustainable is dark matter?

In Section 4, the authors present a capitalized measure of the return privileges, and refer to the difference between this measure and the cumulated current accounts as 'dark matter'. Specifically, a country with positive dark matter has a capitalized value

of net income payments that is more favourable than what one would infer from its past current account deficits. The authors then use this measure to argue that current imbalances are less worrisome than suggested by the current account themselves. In particular, they argue that the large current account deficits run by the United States have been offset by exports of dark matter.

A closer look at the evidence, however, suggests that sustainability is more of a concern than the authors argue. The capitalized measure of net income payments, NFA^{DM}, is computed as:[26]

$$NFA_{t-1}^{DM} = \frac{1}{r} NII_t$$

Contrasting this measure with the official net international investment position, we write:

$$NFA_{t-1}^{DM} - (A_{t-1} - L_{t-1}) = \frac{r_t^{AVG} - r}{r}(A_{t-1} - L_{t-1}) + \frac{1}{2}\frac{r_t^D}{r}(A_{t-1} + L_{t-1})$$

$$r_t^{AVG} = \frac{1}{2}(r_t^A + r_t^L) \quad r_t^D = r_t^A - r_t^L$$

where A_{t-1} and L_{t-1} are gross external assets and liabilities at the end of period $t-1$, r_t^A and r_t^L are the yields on assets and liabilities in period t. The above relation shows that the gap between the capitalized measure and the net international position reflects two terms. The first is a cyclical component which captures the difference between the average yield on assets and liabilities and the constant discount factor (5%). Consider the case of a country that is a net debtor ($A_{t-1} - L_{t-1} < 0$) and faces a low interest rate ($r_t^{AVG} - r < 0$). The low rate reduces its stream of payments to foreign investors, as well as the capitalized value of these payments, which translates into positive dark matter ($NFA_{t-1}^{DM} > A_{t-1} - L_{t-1}$). The second term reflects the yield differential between assets and liabilities. If a country earns a larger yield on its assets, its net interest payment is more favourable than if the yield was the same on both assets and liabilities.

In addition to these two factors, the dark matter measure computed by the authors also reflects the gap between the net international investment position and the cumulated current account. This gap stems from valuation effects that have received a growing attention in the literature[27] and capture the impact of fluctuations in exchange rates and asset prices on the value of assets and liabilities. Such effects are sizeable as can be seen from Figures 3a and 3b in the paper. In particular, the US net international investment position has been stable in recent years (Figure 3b) despite the large current account deficits (Figure 3a).

Breaking the dark matter between the cyclical component, the yield differential component, and the valuation gain component, is relevant in assessing sustainability.

[26] I use a different timing convention than the author, with yields in year t combining income streams in year t and positions at the end of year $t-1$.

[27] See for instance Gourinchas and Rey (2005), Higgins *et al.* (2007), Lane and Milesi-Ferretti (2006b).

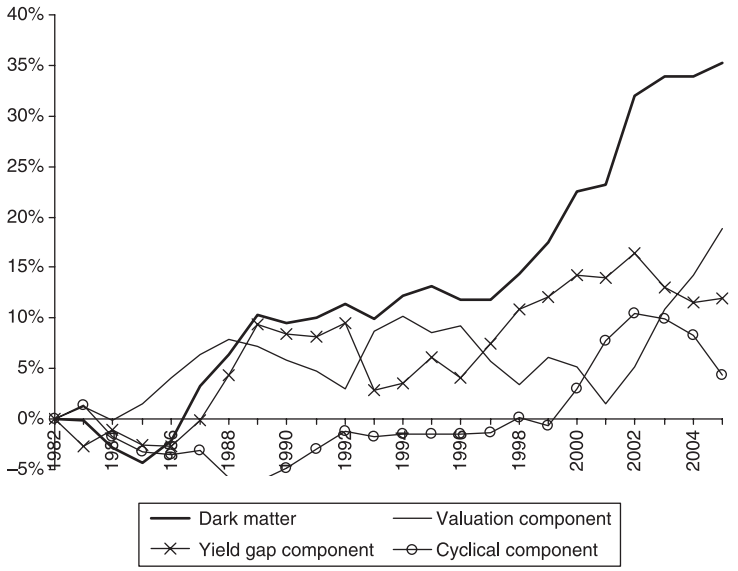

Figure 8. Decomposition of US dark matter (% GDP)

The first component is by definition temporary. The second component is likely to be more durable given the persistence of yield differentials. The final component falls in between: while valuation effects have favoured the US in recent years, the underlying movements in exchange rates and asset prices could prove short-lived.

Figure 8 shows the results for the United States. The decomposition across the three components is computed separately for FDI and other holdings, as the yield gap is concentrated in the former (Higgins *et al.*, 2007).[28] The thick line shows the stock of dark matter, corresponding to Figure 6 in the paper. The valuation component is represented by the thin line, while the cyclical and yield gap components are given by the rounded and crossed lines, respectively. Figure 8 shows that the increase in dark matter since 2000 has been driven by valuation gains, reflecting the depreciation of the dollar, and the cyclical component, reflecting the low level of interest rates. By contrast the yield gap component, which is likely to be the most sustainable, has been steady. While the United States has been able to export dark matter over the last 5 years, this reflects factors which could well prove temporary, hence the sustainability of the current situation is more fragile than the authors argue. A similar analysis can be conducted for the United Kingdom (Figure 9) which also benefits from a return privilege, again showing a sizeable role for temporary factors.[29]

[28] The estimates of the cyclical and yield differential components are sensitive to the extent of disaggregation. Computing them directly on total holdings shows a larger role for the yield differential.

[29] As for the United States the computations are done separately for FDI and other holdings, as the yield gap is concentrated in FDI (Whitaker, 2006).

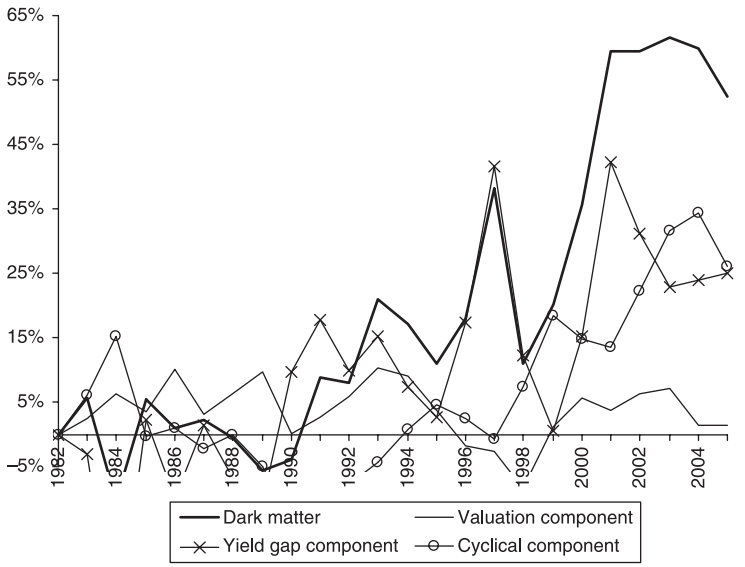

Figure 9. Decomposition of UK dark matter (% GDP)

Conclusion

The paper presents a broad review of the discrepancy between current accounts and net factor payments in many countries, and documents the existence of a privilege in several countries. This privilege suggests that the concerns about the sustainability of current imbalances could be tempered, as these imbalances have not fed into large payments burdens for the debtor countries. While ignoring return privileges could lead to an overtly pessimistic view of the current situation, as the paper argues, one should be careful not to draw an overtly optimistic view, as several factors that played a role in recent years could prove temporary.

Panel discussion

All meeting participants were intrigued by the paper's approach and results, but most Panel members felt that the version presented and discussed in New York drew excessively strong conclusions from insufficient data and unclear computations. The extensively revised version published in this issue heeds many of their critical comments and suggestions.

Gian Maria Milesi-Ferretti focused his comments on data definitions and statistical procedures. In particular he questioned whether and how one should value FDI assets

of foreigners in the United States using indicators from the country of ownership's stock market, and thought different sources of data of different quality should all be analysed in order to obtain a complete picture of foreign positions. While FDI data can be highly unreliable, statistics computed from portfolio surveys are generally very accurate. He pointed out that net foreign asset and net foreign income dynamics are readily explained by valuation effects over the last few years, and that past evidence is difficult to extrapolate in an environment of increasingly efficient financial integration. Philip Lane felt that a new 'dark matter' concept may or may not be needed to understand the data. Rate of return differentials and measurement problems are well understood to exist, and can be analysed without resorting to dark matter. Among measurement problems, tax-related reasons why some investment income may be reported as service income may be particularly important. He also pointed out that the BEA valuation of greenfield FDI investment is not really based on local stock market values.

Paul Krugman agreed that it would be important to understand very clearly how BEA actually computes the relevant statistics. At a more substantive level, he felt that the resilience of US net foreign investment income need not be relevant to sustainability concerns. In the last few years, positive net investment income has resulted from the decline of the dollar exchange rate and the relative strong performance of non-US stock markets. Neither of these are reasons to be cheerful as regards the strength of the US economy and the sustainability of its external position. From this perspective, 'dark matter' – while potentially useful as a conceptual measure – may give a false sense of comfort. Matthew Higgins noted that in recent cosmological theories 'dark energy' plays a role, and jokingly wondered whether that concept may also be applied to international financial issues. He pointed out that to ensure sustainability of a persistent trade deficit in the order of 6% of GDP, flows of FDI would have to amount to perhaps 4% of GDP, an unrealistic and never observed order of magnitude for the United States.

Richard Portes listed five reasons why he thought the concept of dark matter misleading and potentially dangerous. First, the authors' story rests on highly implausible assumptions. Second, the computations' results give a dangerous sense of comfort. Third, the BEA income flow data are faulty in many respects. Fourth, the source of excess net returns on US investment is unclear. Finally, and most importantly, the computations assume a constant rate of return, but returns on the US dollar are very likely to be falling. As once happened to the pound sterling, the US dollar is losing international currency status. Its increasing substitutability by other currencies, such as the euro, has to erode rate of return differentials: any 'dark matter' should be disappearing, and this is an important reason to be worried about the sustainability of US deficits. Federico Sturzenegger replied that the pound sterling's yield advantage declined only slightly over a protracted period of time, until World War I. The US yield differential has been remarkably stable for decades. It may well persist if the underlying factors do, and the data indicate that it does persist.

APPENDIX A

All countries

Albania, Angola, Argentina, Australia, Austria, Bahrain, Bangladesh, Benin, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Cambodia, Cameroon, Canada, Chile, China, P.R.: Mainland, Colombia, Congo, Republic of, Costa Rica, Côte d'Ivoire, Cyprus, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Fiji, Finland, France, Gabon, Germany, Ghana, Greece, Guatemala, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Iran, Islamic Republic of, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Korea, Kuwait, Lao People's Dem. Rep, Libya, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritius, Mexico, Morocco, Mozambique, Myanmar, Namibia, Nepal, the Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Rwanda, Saudi Arabia, Senegal, Singapore, South Africa, Spain, Sri Lanka, Sudan, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, United Kingdom, United States, Uruguay, Venezuela, Rep. Bol., Yemen, Republic of, Zimbabwe.

Industrial countries

Australia, Austria, Canada, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Korea, the Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, United Kingdom, United States.

Emerging countries

Argentina, Brazil, Bulgaria, Chile, China, P.R.: Mainland, Colombia, Côte d'Ivoire, Dominican Republic, Ecuador, Egypt, El Salvador, Greece, Hungary, Korea, Malaysia, Mexico, Morocco, Nigeria, Pakistan, Panama, Peru, Philippines, Poland, South Africa, Thailand, Tunisia, Turkey, Uruguay, Venezuela, Rep. Bol.

OPEC countries

Ecuador, Gabon, Indonesia, Iran, Islamic Republic of, Kuwait, Libya, Nigeria, Saudi Arabia, Venezuela, Rep. Bol.

HIPC countries

Benin, Bolivia, Burkina Faso, Cameroon, Ethiopia, Ghana, Honduras, Madagascar, Malawi, Mali, Mozambique, Nicaragua, Niger, Rwanda, Senegal, Tanzania, Uganda.

APPENDIX B

Variable name	Description	Source
Business Cycle	Deviation from a HP trend of gdpusd	Uses gdpusd.
CA	Current account	IFS, code: 78ALDZF available at http://ifs.apdi.net/imf/ImfBrowser.aspx
Research & Development	Research and development expenditure as a percentage of GDP	WDI, average of available data for each country
Corporate Tax Rate	Corporate income tax rate	KPMG
Dummy HIPC	Dummy for HIPC members	See Appendix A for list of countries
Dummy OPEC	Dummy for OPEC members	See Appendix A for list of countries
emerging	Dummy for emerging countries	See Appendix A for list of countries
FDI assets	FDI assets in millions of current dollars	Lane and Milesi-Ferretti database available at http://www.imf.org/external/pubs/cat/longres.cfm?sk=18942.0
FDI liabilities	FDI liabilities in millions of current dollars	Lane and Milesi-Ferretti database available at http://www.imf.org/external/pubs/cat/longres.cfm?sk=18942.0
gdpusd	Gross domestic product of each country in current dollars	WEO, Subject Code: NGDPD, available at http://www.imf.org/external/pubs/ft/weo/2006/02/data/download.aspx.
gdpwrd	World gross domestic product in current dollars	WEO, Subject Code: NGDPD, available at http://www.imf.org/external/pubs/ft/weo/2006/02/data/download.aspx.
indust	Dummy for industrial countries	
ner	Nominal exchange rate month in December	IFS, market rates available at http://ifs.apdi.net/imf/ImfBrowser.aspx.
Δ% of nominal exchange rate	Change in nominal exchange rate December–December	Percentage change in NER
Net_Income	Net income = Income credit – Income debit	IFS: code of income credit: 78AGDZF, code of income debit: 78AHDZF, available http://ifs.apdi.net/imf/ImfBrowser.aspx.
Output volatility	5 year centred standard deviation of gdpusd.	Uses gdpusd.
rgdp	Real GDP	IFS, code: 99BVPZF available at http://ifs.apdi.net/imf/ImfBrowser.aspx
Rule of Law	Rule of law	Rule of law, includes several indicators that measure the extent to which agents have confidence in and abide by the rules of society. (Source: Kaufmann *et al.* (2002)).

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