Global imbalances or bad accounting?
The missing dark matter in the wealth of nations[1]

Ricardo Hausmann
Kennedy School of Government and Center for International Development,, Harvard University

Federico Sturzenegger
Kennedy School of Government, Harvard University and Universidad Torcuato Di Tella

Abstract

This paper argues that current account statistics may grossly mismeasure the real evolution of a country's net foreign assets. The differences may arise due to mismeasurement of FDI, as well as from unreported trade of insurance or liquidity services across countries. We suggest estimating net foreign assets by capitalizing the service flow and estimating the current account from the changes in the foreign assets so computed. We call *dark matter* the difference between our measure of net foreign assets and that portrayed by official statistics. When we apply our methodology we find that the US has ran no current account deficits over the last two decades, and that global imbalances are relatively small and very stable. The exports of dark matter of the US appear to be fairly steady, casting doubts on the need of a major readjustment of the US dollar.

This version: December 2005

I. Introduction

Over the last couple of years the increasing US current account deficit, currently ticking at over 700 billion dollars a year in 2005 alone, has led to significant concerns about the future of the US and the possibility of a major global crisis. It comes after 27 years of unbroken deficits which have totaled over 5 trillion dollars. Once the massive financing required to keep on paying for such a widening gap dries up, perhaps because foreigners become satiated of owning such a large and rapidly growing amount of American debt, there will be an ugly adjustment in the world economy. The dollar will collapse, triggering a stampede away from American debt, interest rates will shoot up and a sharp global recession will ensue. Martin Wolf (2004) calls this situation an "unsustainable *black hole*" and points that "The U.S. is now on the comfortable path to ruin". Maurice Obstfeld and Kenneth Rogoff (2005) remark that "any sober policymaker or financial market analyst ought to regard the US current account deficit as a sword of Damocles hanging over the global economy". More dramatically, Nouriel Roubini and Brad Setser (2005) warn "The current account deficit will continue to grow on the back of higher and higher payments on U.S. foreign debt even if the trade deficit stabilizes. That is why sustained trade deficits will set off the kind of explosive debt dynamics that lead to financial crises". Figure 1 highlights the large and growing yearly and cumulative current account deficit of the US over the last 25 years which has made the US the largest net debtor in the world.

In addition to depicting a somber scenario, many authors have put basic international finance models to work in order to understand the amount of US depreciation needed to balance the US current account. Obstfeld and Rogoff (2000, 2004 and 2005) using a two country endowment model estimated a required depreciation of 12 to 14% in their 2000 piece, one of between 20 and 40% in their 2004 piece, and about 33% in their 2005 Brookings Paper. The later estimates were significantly larger than the original ones considering that the dollar had already depreciated between 2000 and 2004. Blanchard, Giavazzi and Sa (2005) use a portfolio model to obtain a required depreciation of 65% in a benchmark specification. Gourinchas and Rey (2006) taking account of the specific structure of US assets and liabilities find a required depreciation, for convergence in 5 years to a steady state, of between 18% and 13% depending on the assumed elasticity of net exports.

In addition to anticipating a potential adjustment of the dollar the increasing unbalanced position of the US also presents several theoretical challenges. First, there is the puzzle of why such a large and increasing indebtedness has not led to any visible crisis, and why the world is willing to lend continuously to the US and to do so at surprisingly low interest rates. Or put otherwise, why is the US itself willing to run such large current account imbalances? Many renditions, as of recent, have chosen to depict the US as an economy out of control, instead of allowing, at least the possibility, that the outcome may be an equilibrium or optimal response to underlying fundamentals. One popular version of these versions is that it is official sources that are keeping demand for US securities *artificially* large. But while this may be true it is an unsatisfactory answer: why would these governments buy into inevitable capital losses?

A second puzzle is that if the US is a large net debtor, someone else is a large net creditor. As we will show below, according to official statistics this large creditor is, not Europe (in fact Europe is a debtor as well), but Japan and the rest of the world. This implies that, over

the last decade, the less developed countries in the world have been financing the consumption excesses of the richest countries. This means that there is a huge puzzle of why capital is flowing away from the less developed world, not just why it does not flow in.

The conceptual and practical problems of the traditional rendition are so large that we are compelled to explore if there is something seriously wrong about this worldview. To motivate our analysis let us start by reviewing some facts. The Bureau of Economic Analysis (BEA) reports that in 1980 the US had about 365 billion dollars of net foreign assets (that is the difference between the foreign assets owned abroad and the local assets owned by foreigners). These assets rendered at the time a net return of about 30 billion dollars. Between 1980 and 2004, the US accumulated a current account deficit of 4.5 trillion dollars. It is natural to expect the net foreign assets of the US to fall by that amount, to say, *minus* 4.1 trillion. If the US paid 5 percent on that debt, the net return on its financial position should have moved from a surplus of 30 billion in 1982 to *minus* 210 billion dollars a year in 2004. After all, debtors need to service their debt. But the number for 2004 is, still a *positive* 30 billion, just like in 1980. According to this basic arithmetic the US has spent 4.5 trillion dollars more than it has earned (which is what the cumulative current account deficit implies) for free!

To respond to the incongruence of the flow and the asset data two answers have been suggested. One notes that the US benefited from about 1.6 trillion dollars of net capital gains so that instead of owing 4.1 trillion, it owes "only" 2.5 trillion (which, at best, cuts the puzzle by less than half, leaving more than a whole other half to be explained). This is the official view as represented by BEA in its rendition of the US international investment position, which shows a smaller deterioration than the cumulative current account measures (and noticeably show a constant stock of foreign assets over the last three years in spite of increasing current account deficits).

This discrepancy, is, in part, the result of the US government's decision in the early 1990s to compatibilize it's balance of payment statistics with IMF practice which required excluding capital gains and losses from current account estimates (when theoretically they should be included). While BEA also provides a separate market value estimate that tries to adjust for capital gains we will argue below that measuring these capital gains from foreign stock market performance may lead to significant underestimation of the value of FDI assets. In fact BEA's market value estimate is relatively close to the book value measure. Further adjustments are attempted by Lane and Milessi Ferreti (2001, 2005) as well as in Gourinchas and Rey (2005). Lane and Milessi Ferreti, for example, correct official numbers by adjusting FDI values on the basis of exchange rates changes, but this turns out to deliver only a minor change (as an example, according to this methodology, in recent years there would be no valuation adjustment for investments in China as the dollar/yuan exchange rate has remained constant). Furthermore, because their adjustments are mostly exchange rate based, even when they find that the US net foreign asset position has been stable in spite of increasing current account deficits , they conclude that "an important reason why the share of US liabilities in the portfolios of foreign investors has been maintained at a relatively stable level has been the operation of the valuation channel of exchange rate adjustment… it is not a viable long run strategy to rely on such valuation gains to ameliorate a structural reliance on net capital inflows."

The second answer to the incongruence between flow and stock data stresses the fact that the US earns a higher return on its holdings of foreign assets than it pays to foreigners on its liabilities a point made early on by Lawrence (1990) and more recently also highlighted by Obstfeld and Rogoff (2005). The most careful description is in Gourinchas and Rey who attempt a characterization of this differential return by documenting how the gross asset positions of the US economy have shown a trend towards larger shares of risky (equity) assets on the asset side and of riskless securities on the liability side. In fact they find that it is the differential return and not the composition effect that explains the US net financial income of the US economy. According to them, however, the action seems to be mostly in short term liquid assets with relatively minor effects from FDI.

Again, in spite of finding this return differential to be fairly steady Gourinchas and Rey also conclude on a somber tone. According to them the US has been able to overcome the debt costs of its growing indebtedness but only as a result of a concomitant increase in its unchallenged role as provider of liquidity and safety. Thus they also conclude that "foreign lenders could decide to stop financing the US external deficit and run away from the dollar, either in favor of another currency … or …require a risk premium on US liquid assets whose safety could not be guaranteed any longer. In either case, the repercussions could be quite severe, with a decline in the value of the dollar, higher domestic interest rates and yields, and a global recession".

Both explanations require further analysis. First if it is true that there have been significant capital gains on US foreign assets we need to understand where do those large capital gains really come from.. It is unlikely that they come from exchange rate movements, to the extent that the dollar has gone up and down since the 1980s without any clear trend. It seems unlikely that much of the dynamics can be accounted from this channel, this being the reason that Lane and Milessi Ferreti still find the US to be a large debtor. So what are the channels by which capital gains take place? Understanding the source is critical to asses the potential sustainability of this revalued stock of capital.

On the other hand the traditional rendition that US assets abroad deliver higher rates begs the question of why are US investors abroad so much smarter than foreign investors in the US? After all, are global portfolio investors not free to buy any assets they want? Why would foreigners consistently pick worse assets than American investors? Finally, isn't there something misleading about calling a country that makes money on its financial position the world's largest debtor?

The paper is organized as follows. In section II we present a new way of measuring current account imbalances for the US. We will see that our measure implies a large discrepancy with official number, at least for the US. We call this discrepancy dark matter. In Section III we discuss the factors that explain the existence of dark matter and provide a measure for the US, we show that once dark matter is taken into account the US economy has not been running current account deficits during the last two decades. In Section IV we address the issue that if the US has not really been running a current account deficit, then someone abroad has not really been running a surplus. If so who can this be? Who are the net exporters and importers of dark matter? In short we study how global imbalances in the world look once dark matter has been taken into account. Section V concludes with some closing thoughts and suggestions for future research.

Section II. Our view

Our view is that the whole debate is the result of a confusion caused by an unnatural set of accounting rules. All accounting systems are consistent but arbitrary. They all describe the same reality: measuring the temperature of the air in degrees centigrade does not make the world colder than if measured in Fahrenheit. But not all systems are equally transparent. If you choose to describe the orbit of the planets assuming that they circle the Earth and not the Sun as Ptolemy did, you will have to include a bunch of arbitrary epicycles to make the system fit the facts.

Thus, we propose a different way of describing the facts. We start from the spirit of current accounting conventions. The interest in a concept such as the current account balance is that it is related to the change in the net asset position of a country. In fact, most textbooks make the assumption that these two concepts are identical and would write an equation such as

$$CA = TB + i\,NFA = \Delta NFA$$

where *TB* is the trade balance and *i* is the interest earned by the foreign asset position. It is also typical to include a footnote saying that this formulation may be off because of potential valuation changes, but the idea is that these changes should not be very persistent.[2] From here, it is easy to derive a rule that guarantees the constancy of the external debt to GDP ratio, *d*.

$$TB = (i - g)\,d$$

where *g* is the growth rate of the economy. We argue that these relationships are in most analysts' minds and explain why people worry about the external position of the US. In fact, this is the rationale that we followed in the third paragraph of this paper, only to find out that it lead to a very large inconsistency. The problem comes from the fact that given the standard accounting rules the capital gains can be very substantial and persistent making the relationship between the current account and the change in net foreign assets quite weak. To make things add up, the current methodology needs an ever expanding set of Ptolemaic epicycles, like the 1.6 trillion dollars in capital gains.

We propose a different set of accounting rules, a system that rescues the relationship between our definition of the current account and the change in net foreign assets. First we adopt a rule for valuing assets. We start by assuming that if an asset consistently pays more than another asset, then it is worth more, even if they both have the same historical cost or "book value". We choose to value the assets on the basis of their returns. This is just like valuing a company by calculating its earnings and multiplying by some price-earnings ratio, or valuing a property based on its rental value. As we know from the corporate finance literature for an individual company, the earnings of any given year may give us an unreliable measure of its true earning potential, but if we average over an economy as large and diversified as the US and look at trends over a couple of years, this simple methodology

---

[2] See for example, Caves et al discussion of "statistical discrepancies" in the payments accounts.

delivers reasonable results. Of course, this opens the question as to what exactly this price earning ratio should be. We will come back to this at length below. For the purpose of illustrating the implications let us use here an arbitrary 5% rate, which implies a price-earnings ratio of 20.

If we do so we can provide a back of the envelope estimate of US net foreign assets. We know that the US net income on its financial portfolio is 30 billion dollars. This is a 5 percent return on an asset of 600 billion dollars. So we would say that the US is a net creditor for about 600 billion dollars or about 5 percent of its GDP.

Secondly, we will define the current account deficit as the change in the net foreign asset position as just defined. Since the income flow has remained fairly stable over the last 25 years, we would say that so have the US net foreign assets and by implication, the current account has been broadly in balance. That is why it is still a net creditor.

To put is succinctly we define the current account as the difference in the capitalized value of the service flow

$$CA = \frac{SF_{t+1}}{r} - \frac{SF_t}{r} = \frac{SF_{t+1}}{r} - A_t^o \tag{1}$$

Where the last equality derives from the assumption that initially assets were properly measured and earned the return r. Either because assets are mismeasured or earn a different rate the service flow in period $t+1$, (1) can be written as

$$CA = \frac{r \, A_{t+1}^o + \Delta A}{r} - A_t^o = A_{t+1}^0 - A_t^o + \frac{\Delta A}{r} = CA^o + \frac{\Delta A}{r} \tag{2}$$

where $A_{t+1}^o = A_t^o + CA^o$, i,e the value of assets that the economy would have had if assets evolved according to the official current account. ΔA is then the difference between the service flow in period $t+1$ and the service flow that should have occurred if assets had been properly measured and continued to yield the same rate. The ΔA term, capitalized, which we add to the official current account, reflects the fact that there are uncaptured returns that show up in the income accounts (in fact it should be added to GNP and savings as well). From equation (2) we trivially have

$$DarkMatter = \frac{\Delta A}{r} = CA - CA^o,$$

which shows that these capitalized unexplained returns are equal to the difference between our version of the current account and the official measure. It is this difference what we call *dark matter* because it corresponds to assets that we know exist, since they generate revenue, but cannot be seen (or, better said, cannot be properly measured). 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.

How does our accounting change the way we describe the well known fact that US assets abroad provide a higher return than foreign assets in the US? To illustrate this consider an asset that the US holds abroad that earns a rate of return r^h which is higher than our fixed and arbitrary benchmark rate of 5%[3] and a liability earning r^l which is lower than our benchmark rate. If A and L represent the market value of the asset and liabilities we would measure assets and liabilities as

$$A^* = \frac{r^h A}{r} > A = \frac{r^h A}{r} + \frac{(r - r^h)A}{r},$$

which implies that

$$A^* = A + \frac{(r^h - r)}{r}A.$$

The second term, the capitalized value of the return differential of this investment, which represents the superior ability of US assets to command a return, is what we call exports of dark matter. Notice that by capitalizing this we are implicitly assuming that this return differential will hold, something to which we will come back below. We will also argue below that it is correct to consider this as an asset even when this interest rate differential compensates for the higher riskiness of the flow.

Likewise, for liabilities we have that our measure of liabilities L* can be written as

$$L^* = \frac{r^l L}{r} < L = \frac{r^l L}{r} + \frac{(r - r^l)L}{r},$$

which implies that

$$L^* = L - \frac{(r - r^l)L}{L}.$$

If the interest rate paid by the US is lower than our benchmark the second term shows a reduction in liabilities equal to the capitalized value of that interest differential. We believe the ability of the US to charge lower rates is an asset (a negative liability), the value of which is measured in the second term in the previous equation. The value of this asset is also an export of dark matter.

It will be clear by now that our difference with Gourinchas and Rey is that we capitalized the service flow differential and add it to the current account. It is the fact that we consider this as an asset what makes our description of the current account dynamics so different from the standard renditions. Of course the reader will wonder to what extent these exports of

---

[3] None of our results depends on the particular rate chosen. In fact using the US treasury rate we would get basically the same story.

dark matter are sustainable or not, particularly taking into account that we consider their capitalized value, which, implicitly assumes that the return differential will remain forever. If they are not stable or average out to zero, then our accounting will not mean much, nor change significantly the conclusions obtained from conventional analysis. But if these exports of dark matter are constant and stable then they can change our interpretation of the facts.

For the US this seems to be the case. Figure 2 shows by how much the two measures differ. On the one hand it shows the cumulative current account deficits according to official statistics, which as was already mentioned, add up to the 4.5 trillion that the US has overspent between 1980 and 2004. The other line shows the cumulative change in net foreign assets according to our methodology. The fact that the curve shows no meaningful trend (upwards or downward) is simply indicating that the total service flow obtained from foreign assets held by US residents (and thus our measure of the amount of those assets) has virtually not changed. In terms of equation (2) it means that the US has consistently exported dark matter. In fact, the exports of dark matter have been quite similar to the reported deficits making the actual deficit close to zero throughout this period and this is why our measure of cumulative current accounts adds up to virtually zero.

There is a large difference between our view of the US as a net creditor with assets of about 600 billion US dollars and BEA's view of the US as a net debtor with total net debt of 2.5 trillion. The difference between these two equally arbitrary stock measures is the cumulative amount of dark matter, According to our numbers the US owns about 3.1 trillion of unaccounted net foreign assets. Given the size of the discrepancy it is difficult to contest the existence of dark matter. Though we will plunge into methodological discussions right away, it seems clear that no methodological minutiae will reconcile the facts with the statistics.

We can also measure how much dark matter is exported or imported in any given period. For example, the official story tells us that in the five year period between 2000 and 2004, the US accumulated a current account deficit equal to 2.5 trillion dollars. We find that the net assets of the US went up by over 300 billion dollars. Hence, the country exported some 2.8 trillion dollars of dark matter in this period or about 5.3 percent of GDP annually.

The existence of dark matter opens up several important questions. First and foremost what is behind dark matter? What are the economic reasons for its existence? Answering these questions will provide the first clues as to the stability of dark matter and whether we should expect it to be a lasting source for compensating measured imbalances. This is all the more relevant because if the US has maintained its net asset position as a result of accumulating dark matter, is this to be trusted as a source for compensating the measured trade imbalance of the US in the future? This will lead us to an analysis of the statistical properties of dark matter. We deal with both these questions in the next section.

Section III. Sources of dark matter

We believe that there are at least three factors that account for the accumulation of dark matter. They all involve a persistent return differential between US assets and liabilities. This difference in returns is the result of three factors: a return differential for US FDI

investments, the sale of insurance, and the provision of liquidity services. The first channel involves the superior return of US FDI investments abroad. This arises because FDI investors purchase assets in order to invest, but also bring with them a blueprint, a product and a business know-how that is usually poorly accounted for. Because of the difficulties in tracking the international operations of American corporations it is likely that the BEA numbers underestimate their worth. The second channel may arise because the underlying stability of the US economy allows it to sell some of this stability to the rest of world, akin to the sale of insurance. The third channel is related to the provision of liquidity services, basically through the use of the dollar or the lower return on deeply liquid financial markets. The different stories can be seen as an interpretation of what Caballero, et al (2005) call the "US's better ability of generating financial assets." Let us discuss each in turn.[4]

Foreign Direct Investment

The US Department of Commerce (1990) reports that "The international investment position should be interpreted with caution because it is only a rough indicator, not a precise measure. On the one hand, US assets abroad probably are understated because direct investment is carried at book values…" (p. 21) While the BEA has introduced a market value alternative to the original measure, that delivers higher values for FDI, it does not affect dramatically the value of the net position as both FDI abroad and foreign FDI in the US get revalued by similar amounts[5]. At any rate, it is book value to which equity adjustments are done, so that if initial valuations are incorrect, over the long run this can deliver a significant undervaluation. Lane and Milessi Ferreti attempt to correct this but their exchange rate adjustment turns out to be only marginal.

The fact that book value misrepresents the value of firms is well known from the corporate finance literature. Because this is used to construct the series or used to obtain initial values that are then increased by equity prices, this may lead to underestimation. In the market value alternative, BEA also uses, quite reasonably, host countries equity markets to do such valuation adjustments. But notice that if US investments abroad carry the earning potential of US firms, it could be argued, that at least partially they should be updated by the value of US stock markets that better capture this earning potential.

Taking an extreme view to figure out if this could lead to underestimation we gross up the stock of FDI every year by that year's increase or decline in stock values, and then add the change in the reported stock of FDI (this difference should include new flows net of depreciation). According to BEA's International Investment position the US has FDI abroad for anything between 2.3 trillion (book value) and 3.3 trillion (market value). But if FDI assets are increased by the value of the US stock market we obtain a value of 7.8 trillion.[6] Obviously, it is not justifiable to increase the value of US investment abroad fully by the value at which investments appreciated in the US, but it is equally difficult to justify increasing them only by the value of foreign stock markets, thus we conclude that FDI could be seriously undervalued even in the BEA's market estimate.

---

[4] See also Cooper (2005) who mentions most of these channels.
[5] For a careful (and official) description of the two methodologies see Kozlow (2002).
[6] We include in addition to FDI, U.S. claims on unaffiliated foreigners reported by U.S. nonbanking concerns and U.S. claims reported by U.S. banks, not included elsewhere.

This mismeasurement is far from irrelevant. To the extent that there are unreported capital gains, these should be included in the current account in US's national account, increasing the savings rate and national income. As per the exercise above, the amount of mismeasurement can be significant.

Caballero et al (2005) suggest that the US together with a few other countries have a superior ability to issue financial claims. We see this as the possibility of issuing not only better financial instruments but also of deploying abroad the business ideas that were developed for their home markets. Not surprisingly below we will show that the countries with the largest discrepancy between reported assets and official numbers are the US, the UK, Germany and Switzerland, all countries which export the business ideas developed at home through FDI investment.

Let us illustrate how this channel works. Imagine the construction of a foreign operation the value of which stems mostly from the know how that investors bring along. For the sake of the argument let's assume that the cost of setting the operation is 100 million and that this is what is written down in the books. Imagine also, for the sake of the argument that these resources were borrowed abroad at, say, a 5% rate of return. Once the operation is running it yields 20 cents on the dollar in operational revenue. Once financial costs are taken into account, this investment generates a net income flow of 15 cents on the dollar even though BEA would say that the net foreign assets position is equal to zero (since the BEA measures the value of foreign direct investment at book value). By contrast, we would say that the assets abroad in reality are not worth 100 million (what BEA would value it) but four times that (the capitalized value at our 5% rate of the 20 million per year that it earns). Why can this firm earn such a return? Because the investment comes with a substantial amount of know-how, brand value, expertise, better financial structure, and better legal protection, all of which generate earning potential. These are sources of dark matter and explains why US residents (and the UK as will be shown below) can earn more on their assets than they pay on their liabilities and why foreigners cannot do the same.

Another way to describe the same facts is to say that the US exported 300 million in dark matter and is making a 5 percent return on it. The point is that in the accounting of FDI, the know-how that makes investments particularly productive is poorly accounted for.

Insurance

Another possible reason why US assets abroad command a higher return is the fact that the US actually sells "insurance" to the rest of the world. This interpretation (as opposed to a valuation effect caused by exchange rate moves) indicates that to the extent that the US economy remains relatively more stable than the rest of the world the return differential is bound to remain. In fact, if anything, it seems that the value of this insurance has increased together with the globalization of international financial markets. One way the sale of insurance shows as dark matter is in the returns to bonds. In BEA's accounting, debt is measured at market value. Suppose the US invests in a portfolio of emerging market bonds that yield on average 300 basis points over treasuries. And suppose that it funds this operation by issuing an equivalent amount of debt at the rate paid by the US Treasury. The BEA would say that the net asset position has not changed. And yet there is a net income

caused by the 300 basis-point spread. Where does this income come from? It is compensation for the fact that the emerging market portfolio is riskier than the liabilities issued by the US. This spread has two components. Part of it is the ex ante premium required by a risk neutral investor to compensate him for the expected defaults. Another part has to do with compensating the investor for his aversion towards risk. The first component should tend to average zero over a sufficiently long period of time, as the ex ante compensation should on average cover ex post losses. The second component should have a positive mean, the same way insurance companies make money on average. In any case, both concepts involve compensation for the exchange of risk between countries. It is an unaccounted asset that we would classify as dark matter.[7]

A risk premium in favor of the US would appear in equilibrium in a world characterized by financial integration if the US is a more stable economy than the rest of the world. US assets would command a higher price because they would be demanded by foreigners to lower their risk.

To see this consider a two country world with uncertainty and with a full array of Arrow-Debreu contingent securities that can be used to hedge risks. We will consider a one period model, with S potential state of natures each with probability $\pi(s)$, and therefore $p(S)$ prices for contingent securities. Global equilibrium requires supply and demand in the S contingent markets to balance, i.e.

$$C(s) + C^*(s) = Y(s) + Y^*(s) \qquad (3)$$

for each state s, where the star refers, as usual, to the foreign country. $C(s)$ refers to consumption in state s and $Y(s)$ is endowment in such a state. With CRRA utility of the standard form $C^{1-\rho}/(1-\rho)$ the standard Euler equation for the maximization of expected utility implies the standard price relation of state contingent claims:

$$\left(\frac{C(s_1)}{C(s_2)}\right)^{-\rho} = \frac{p_1 \pi_2}{p_2 \pi_1} \qquad (4)$$

and likewise for the other country. Substituting the equilibrium conditions (3), in (4), implies that

$$\frac{p_1 \pi_2}{p_2 \pi_1} = \left(\frac{Y^W(s_2)}{Y^W(s_1)}\right)^{\rho} \qquad (5)$$

---

[7] Klingen, Weder and Zettlemeyer (2005) find that emerging market debt has ex-post delivered a rate of return of about 1% above equivalent US securities.

where the superscript W indicates world output in that state. Using the standard normalization that $\sum_s p(s) = 1$, equation (5) can be used to solve for the equilibrium price of contingent securities

$$p(s) = \frac{\pi_s \left(Y^W(s)\right)^{-\rho}}{\sum_S \pi_s \left(Y^W(s)\right)^{-\rho}}. \tag{6}$$

The fact that all countries face the same asset prices implies the celebrated relations

$$\frac{C(s_1)}{C(s_2)} = \frac{C^*(s_1)}{C^*(s_2)} = \frac{Y^W(s_1)}{Y^W(s_2)}$$

And

$$\frac{C(s_1)}{Y^W(s_1)} = \frac{C(s_2)}{Y^W(s_2)} = \mu$$

while

$$\frac{C^*(s_1)}{Y^W(s_1)} = \frac{C^*(s_2)}{Y^W(s_2)} = (1-\mu),$$

where μ is the share of the home country in world consumption. The value of μ derives naturally from the budget constraint and equals the share of the country's output relative to world output measured at the Arrow Debreu equilibrium prices. Solving for this value after substituting for the equilibrium prices we find that

$$\mu = \frac{\sum_S \pi_s Y(s) \left[Y^W(s)\right]^{-\rho}}{\sum_S \pi_s \left[Y^W(s)\right]^{1-\rho}}. \tag{7}$$

The country share in equation (7) is our object of interest because it indicates how much of world's wealth the home economy will command. To the extent that an economy has a more stable output profile than the rest of the world, it will be selling insurance to the rest of the world and obtaining an expected payment in return. In short the world would be giving up some income to swap, at actuarially disadvantageous terms, local output for the home economy's output. Equation (5) shows that when there is aggregate uncertainty, prices will not be actuarially fair, i.e. the markets will price in a risk premium to reduce its risk.

To illustrate the concept imagine that the home country (purportedly the US) is more stable than the rest of the world. Without loss of generality and just to illustrate the intuition consider the case in which output is constant across states of nature in the home economy and volatile abroad. In short we assume that $Y(s) = \bar{Y}$, for all states at home. Output in the

rest of the world, on the other hand is assumed, without any loss of generality to be described by $Y^W(s) = \phi(s)\overline{Y}^W$. We also assume the probability of all states to be the same. In this case we can see that (7) easily simplifies to

$$\mu = \frac{\overline{Y}}{\overline{Y}^W} \frac{\sum_s [\phi(s)]^{-\rho}}{\sum_s [\phi(s)]^{1-\rho}} \quad . \tag{8}$$

Notice that if ϱ=0, which implies linear utility, ie. no risk aversion, μ equals the country's share in world income. On the other hand when $\rho \to \infty$, which is the case with infinite risk aversion, indifference curves become Leontieff so it is easy to show that

$$\mu = \frac{\overline{Y}}{\min \phi(s)\overline{Y}^W} \, , \tag{9}$$

with intermediate cases in between. Notice that in this extreme case, if the foreign country has output states with extremely low income, then the home economy virtually consumes the whole of world output! The intuition for this case is that with infinite risk aversion the foreign country is willing to give up everything to improve its consumption in its worst scenario. The difference between expected income in autarky and with access to international markets is the insurance premium that the country charges every period. In a world of complete securities this payment is fixed and certain, the higher the risk in the world, the higher the payment (and the higher the ex post profile of consumption).

The situation is illustrated in Figure 3. In figure 3a home country has a stable income profile while the rest of the world has a strongly skewed income stream. After trading in Arrow Debreu securities the world economy will operate at the diagonal. Notice that if the probability of both states is not the same, equation (5) indicates that the price of output in the high income state is lower than that of the low income state. So for transferring income to the rest of the world in this state the home economy obtains a compensation that is positive in expected value. This is a way to visualize the insurance premium that creates dark matter.[8] Figure 3b illustrates the case of infinite risk aversion. In this case the horizontal move for the home economy represents the gain in income from its smoothing services.

To the extent that the US economy has a permanently more stable output this value should be expected to remain, or to grow with the ability of other countries to participate in world financial markets. The capitalized value of the flows that compensate for this insurance would appear as dark matter.

What are the sources of the enhanced stability of the US economy? Shiller (1993), for example, computes the value of claims to output for different countries and finds that the volatility of these claims is substantially smaller for the US (see Obstfeld and Rogoff, 1996) .

---

[8] The case of infinite risk aversion implies that the indifference curve becomes flat immediately away from the 45% degree line.

Given that Arrow Debreu securities do not exist, one way the exchange of risks takes place is by exchanging debt, as explained above. Consider a country subject to large output shocks and therefore to default risk. These countries may be willing to exchange US debt yielding a steady return in exchange for their risky assets. The difference between the two rates of return includes the compensation for the expected default but also will include an insurance premium for the increased risk. It is this extra premium that will be captured ex post in the factor income data.

Finally, FDI may be the vehicle for diversifying risk in this manner. Countries may buy the more stable US equities or directly invest in the US while the US may use the resources to invest abroad. Foreign operations will carry an "excess" return that will compensate for their instability. This excess return is the compensation for the export of insurance services and will be captured in our framework as dark matter.

Liquidity

Our third source of dark matter is the unaccounted value of the liquidity services provided by the US. People all around the world need liquid assets and choose to hold dollars either in (non-interest-bearing) cash or in interest bearing instruments that have inordinately deep liquid markets. The US can use the proceeds from printing this money or issuing these securities to buy assets that generate a larger income and make a return. Again, the BEA would say that such a transaction causes no change in the asset position. We would say that the US has exported dark matter in the form of liquidity services and is making a return on it. This concept which involves both seignorage and a negative premium on the dollar-denominated reserve assets constitutes an unmeasured provision of liquidity services which our accounting method would capture as dark matter.

Measuring Dark Matter

As stated above in order to estimate the value of US net foreign assets we propose to capitalize the value of the flow of US financial income into a stock measure. To do so we need to address the issue of which discount rate should be used and whether domestic and foreign flows should be discounted at the same rate.

If the world was populated by risk neutral investors or if there were a complete set of contingent claims, as above, then it is trivial that the service flow should be discounted by some risk free rate of return. Here we follow this procedure and discount all our flows at an arbitrary constant interest rate of 5%. We have several reasons for choosing this approach. First, in the global economy each financial claim appears twice: as an asset in one country and a liability in another. We should value that claim equally in both countries. Hence, it is important that we use the same interest rate. It would be problematic if we applied different interest rates for what is in fact the same asset. Second, we choose a constant rate so that changes in our measure of assets depend only on changes in the income flow of the assets and not on variations in the price-earnings ratios. This allows a cleaner visualization of the evolution of flows. In fact, the level of the interest rate we choose is irrelevant for our story and similar results would obtain if we used an interest rate computed from market rates. Third, our interest is not to capture the market price at which assets trade ex ante in markets, but to track the changes in a country's debt service burden. Our accounting convention

better captures this, even though it is different from either valuing an asset at book value or at market value, two procedures that are used simultaneously and inconsistently in current practice.

One potential criticism of our approach is that it may lead to an overestimation of US's foreign assets to the extent that it discounts the flows obtained from riskier investments abroad at the same risk free rate that the US charges on its liabilities. In doing so, we would increase the value of US assets relative to its liabilities. However, while it makes sense to discount an *ex ante* stream of income at a higher rate because of the risk of non-payment due to expropriation or default risk, when working with *ex post* data it is standard to discount at the risk free rate since the negative contingencies will have already occurred (see Jorgenson and Sachs, 1989). If the higher premium arises from the fact that there is a world with risk averse investors in which non diversifiable risks carry a premium, then to the extent that this premium is consistently paid (as is any insurance premium and as in our example above), our measure of the assets will actually include the capitalized value of this premium. In other words, in our framework, the net risk premium that countries would collect on account of the fact that investors that are not risk neutral are willing to pay for non-diversifiable risks should be considered an assets and will be counted as an export of dark matter in our methodology.

In figure 2 we presented our calculation of US net foreign assets, as the result of capitalizing at a constant rate of 5% the US service flow. Defining dark matter as the difference between our measure of the net foreign capital asset position and the implicit asset position suggested by the accumulation of current accounts, we can estimate both the stock of dark matter as well as the yearly exports of dark matter. In figure 4 both are expressed as percentage of US GDP.

Looking at the empirical evidence

We have argued that there are at least three theoretical reasons for the presence of dark matter in the US: the country is a net provider of knowledge, liquidity and insurance. It is difficult to identify the source of dark matter coming from each source as FDI may operate both as a vehicle for export of know how as well as a means for providing insurance. Debt instruments, in turn, may both be instruments to export insurance but also liquidity services.

Figure 5 bears on this point by showing the net income arising from three sources as presented in official figures: net income from foreign direct investment, net payments by the US government and other net private income. The figure shows the rising cost of the interest payments on the growing US public debt, which has been increasingly held by foreigners. However, this is compensated by an even faster rise in the income generated by FDI. Other net income flows appear to be small. At first view, this suggests that the bulk of the dark matter is in the excess returns on FDI.

To get a better idea of this, we take each one of the three income flows categories and then scale it up by multiplying by our earnings ratio of 20. We can then calculate the difference in our valuation of each of these assets vis a vis BEA´s valuation and hence the amount of dark matter corresponding to each asset class. This is shown in Figure 6. As can be seen, there is dark matter in each asset class. While FDI is the largest long-run source, the public debt

shows the biggest turnaround reflecting the low interest rates on US Treasuries of the last few years. Barro (2005) provides a model in which the equity premium puzzle is explained by the possibility of unusual but large negative effects. Thus in his model, the return on bonds falls substantially once these large events are a possibility. His model can be used to explain why the value of insurance provided by the US has dramatically increased starting in 1998 when following the Asian crisis we observed the Russian default crisis. This insurance value may have been compounded by the uncertainty deriving from 9/11.

Our understanding of the nature of dark matter is relevant to assess the fragility of the US current account position. If exports of dark matter are compensating the large trade deficits in the US, can it be trusted as a way of keeping the net asset position of the US stable in the future? In other words, is dark matter sufficiently stable to hold the world together and avoid global financial markets from running into a crisis? This will depend, ultimately, on how steady is the earning power of the assets that make up dark matter. If dark matter just reflects capital gains associated say, with exchange rate or interest rate fluctuations, it would be quite unreliable, as pointed out by Lane and Milessi Ferretti. On the other hand if it is the know-how deployed abroad by US corporations, or an insurance premium based on the stability of US output, it can be expected to be fairly resilient.

Figure 4 showed the evolution of accumulated stock of dark matter by the US. The stock stands now at over 40 percent of GDP. Since 1980 it has fallen only in 6 years and the largest drop, which took place in 1985, was barely to 1.9% 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. On average the US has exported about 2% of GDP per year of dark matter with a standard deviation of about half a percentage point[9]. The reasons for the stability of dark matter are several-fold. To the extent that FDI assets abroad continue to rise and to generate excess returns then we should expect to measure a continued export of dark matter. If the ability of the US to provide insurance and liquidity services to the rest of the world is based on size and a more stable economy, to the extent that these features persist into the future, the US will increase, not decrease its sales of dark matter. In short US exports of dark matter have good reasons to show the robust pattern they have shown to date in the data.

Section IV. A new look at global imbalances

With a better understanding of what dark matter is, we take our exercise to the whole world. In order to have a working benchmark Figure 7a presents the official evolution of the net asset position of major global players both in US dollars as a share of each entity's GDP. It shows a world that is increasingly unbalanced with Japan and the rest of the world financing Europe and (more importantly) the US, which appears accumulating a growing external debt. In these graphs the rest of the world is calculated as a residual to make things add up to zero.

---

[9] Even though the exports of dark matter are consistently of about 2%, they show very little autocorrelation across years.

Figure 7b presents the alternative view, which we construct by capitalizing the net income that each country makes on its asset position. As can readily be inferred, the world looks quite different once dark matter is taken into account. First and foremost, the US does not appear as a net debtor but as a net creditor and, as mentioned above, its net foreign asset position has remained stable over the last 20 years. Japan, consistent with official data, is a growing creditor, while the European Union and the rest of world are net debtors.

Perhaps the most striking feature of Figure 7b is that it shows a world that is surprisingly balanced. Net asset positions of all major regions are fairly small – under 10 percent of GDP – except for Japan which has a surplus of some over 30 percent and the rest of world that only recently has increased its indebtedness slightly.

Figure 8 replicates Figure 2 in Lane and Milessi Ferreti, by showing the net foreign assets of a group of countries as percentage of global GDP. The comparison permits to highlight the similarities and differences in the analysis (though some groups of countries do not coincide exactly due to data availability). The results are mostly identical for Japan (with steady net foreign assets at about 4% of world GDP), the Euro zone (an increasing debtor currently with net foreign debt of about 3% of GDP), and for the Switzerland and Nordic countries groups (with net foreign assets equivalent to about 1% of GDP). Our numbers show the same trend throughout the last two decades but larger net liabilities for Emerging Asia indicating that they are net importers of dark matter and are only approaching balance in recent years. The difference is largest in the case of the US. While Lane and Milessi Ferreti see the US as a debtor for about 7% of world GDP for us it is a net creditor for somewhat more the 1% of world GDP. In short the comparison shows that our methodology provides quite similar results but for the case of the US (and concomitantly for the rest of the world).

Figure 9 shows the evolution of China. It shows first, that China is still a net debtor. However China has reduced its debt considerably in recent years as it has moved its net foreign debt from about 1.2% of world GDP to only 0.4%. This reduction in 0.8% of GDP is in itself large. The improvement is not as large as is suggested by the official statistics because China remains an important importer of dark matter.

Figure 10 shows Europe´s net foreign assets, again as percent of world GDP. Prior to the launching of the euro both European Union and the Euro countries moved basically in the same fashion. But they have dramatically diverged in recent years, with the UK increasing very significantly its exports of dark matter.

While the above illustrates our measure for some selected countries, of course our analysis allows us to replicate it for any country in the world. This is what is done in Table 1 that shows the results for the last five years for the countries for which we have data. Table 2 calculates the correlation between the official numbers and our measure. It confirms that the difference between the two methodologies is indeed important as the correlations are low. However, part of the reason comes from the fact that the US and the UK are large exporters of dark matter. When these two countries are excluded, the correlation becomes positive and relatively large. However, the correlations are often far from unity, indicating that the standard presumption that the current account balance is closely related to the evolution of the net asset position is not warranted for many countries.

Exporters and importers of Dark Matter

In order to obtain a better intuition of the movements of dark matter Table 3 ranks the exporters of dark matter for the 2000-2004 period. Given that some countries do not have data for 2004 we have chosen to rank the countries according to their data for 2003. The volatility in year to year values of the service flow is large and so are exports and imports of dark matter. We therefore present the average values for the 2000-2004 period. We also present only those countries with exports or imports of dark matter above 1 billion, i.e. those that to some extent are relevant to explain global imbalances. The table underscores the unique role of the US and the UK in explaining the flows of dark matter. The next country in the list (Mexico) is less than one tenth of the UK number and less than one twentieth of the US number. As was mentioned about the top exporters of dark matter are those countries that provide intermediation of financial services and which transform capital inflows into effective foreign direct investment. The US, the UK, Germany, Switzerland, and to a lesser extent Mexico and Korea all play this role (the latter two on a regional basis).[10]

On the import side, six countries buy at least 30 billion of dark matter per year over the last five years. With the exception of France, these countries are FDI havens or oil producers. Both fit our pattern, particularly oil countries for which the increase in the price of oil has increased the income of the assets foreigners hold in these countries thus increasing the value of their liabilities above and beyond what would be captured by their current account deficits measured according to official statistics. Similarly, countries like Ireland and Singapore import significant quantities of dark matter, reflecting the successful returns of FDI in these countries.

Section IV. Conclusions and future research

In a nut shell our story is very simple. The income generated by a country's financial position is a good measure of the true value of its foreign assets. Once assets are valued accordingly the data seems to indicate a large amount of US net foreign assets that are unaccounted for. Since the US has a net income on its foreign asset position it is a net creditor, not a net debtor and its net foreign asset position appears to have been fairly stable over the last 20 years. The difference with the official story probably comes from a combination of mismeasurment, the 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 last three factors relate explicitly to characteristics of the US that cannot be easily replicated elsewhere, and explains why the US looks like a consistently smarter investor, making more money on its assets than it pays on its liabilities and why the rest of the world cannot wise up. In addition, the value of this dark matter seems to be rather stable, indicating that it is likely to continue to compensate at least partially for the measured trade deficit.

Dark matter also sheds a different light on the often discussed savings puzzle. According to the official statistics, the US appears as a profligate consumer with dismal savings. However,

---

[10] The role of Switzerland as a provider of insurance services, particularly after WWI, is discussed in Kugler and Weder (2004 and 2005).

these numbers understate the US savings rate by the amount of dark matter it exports and overstates the savings of the rest of the world by the amount of dark matter it imports.

Our computation of dark matter leaves open several interesting areas of research. As a starter, it is important to improve on the estimates of factor income accounting in the balance of payments and its underlying determinants. This account is an important element that affects the long-run sustainability of current balances. With more complete data, it should be feasible to test whether dark matter effectively relates to the know how embodied in FDI or to the risk properties of the US economy, or the depth of its financial markets, thus testing directly the relevance of each explanation. 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. Likewise while we have somewhat looked into the evolution of dark matter for the US, the stories for other countries are likely to be different and equally interesting. In addition, it should be important to study the stochastic properties of dark matter over time and across countries.

To the extent that current account surpluses have to match deficits somewhere else, studying dark matter in some countries can provide clues for adjustments elsewhere. Oil prices, for example, may be an important driver of investment returns in some countries and thus lead to important transfers of dark matter.

Globalization and financial integration has 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. As we've seen, flows of dark matter are a very significant part of the story., As a result traditional measures of current account balances will paint an increasingly distorted picture of reality. In particular, they currently point towards imbalances that are not really there, making analysts predict crises that, for good reason, remain elusive.

References

Barro, Robert (2005), "Rare Disasters and Asset Markets in the Twentieth Century", Mimeo Harvard University.

Blanchard, O., F. Giavazzi and F. Sa (2005) "The US Current Account and the Dollar", NBER Working Paper No. 11137.

Caballero, R., E. Farhi and P. O. Gourinchas. (2005) "An Equilibrium Model of "Global Imbalances" and Low Interest Rates", Mimeo MIT, September.

Cooper, Richard (2005) "Living with Global Imbalances" *IIE Policy Brief*, October.

Dooley, Michael, David Folkerts-Landau and Peter Garber (2004) "The Revised Bretton Woods System," *International Journal of Finance and Economics*, 2004, v9(4,Oct), 307-313., provide alternative stories that are compatible with dark matter.

Gourinchas P. O., and H. Rey (2006) "From World Banker to World Venture Capitalist: US External Adjustment and the Exorbitant Privilege", Clarida, R. (ed.) *G7 Current Account Imbalances: Sustainability and Adjustment,* The University of Chicago Press, forthcoming.

Jorgensen, Erika, and Jeffrey Sachs, (1989), "Default and Renegotiation of Latin American Foreign Bonds in the Interwar Period," in *International Debt Crisis in Historical Perspective*, pp. 48–83.

Kingen, C., B. Weder and J. Zettelmeyer (2004) "How Private Creditors fared in Emerging Debt Markets, 1970-2000", IMF Working Paper No. 04 /13.

Kozlow, R. (2002) "Valuing the Direct Investment Position in US Economic Accounts" available at http://www.bea.gov/bea/papers/Kozlow-Val.pdf

Kugler, P. and B. Weder (2004) "International Portfolio Holdings and Swiss Franc Returns", Mimeo University of Mainz.

Kugler, P. and B. Weder (2005) "Why are Returns on Swiss Franc Assets so Low? Rare Events May solve the Puzzle, *Applied Economics Quarterly*.

Lane P. and G. M. Milessi Ferreti (2001), "The Wealth of Nations" *Journal of International Economics*.

Lane P. and G. M. Milessi Ferreti (2005), "A Global Perspective on External Positions", NBER Working Paper 11589, September.

Obstfeld, M. (2004) "External Adjustment", *Review of World Economics*, Vol. 140 (4).

Obstfeld, M. and K. Rogoff (2000) "Perspectives on OECD Economic Integration: Implications for US Current Account Adjustment" in Federal Reserve Bank of Kansas City, *Global Economic Integration: Opportunities and Challenges*, March, pp. 169-208.

Obstfeld, M. and K. Rogoff (2005) The Unsustainable US current account revisited, NBER Working Paper 10864, NBER, Cambridge, MA.

Obstfeld, M. and K. Rogoff (2005) "Global Current Account Imbalances and Exchange Rate Adjustments" *Brookings Papers on Economic Activity*, Vol. 1, pp. 67-123.

Roubini Nouriel and Brad Setser (2004) "The US as a net debtor: The Sustainability of the US External Imbalances" (http://pages.stern.nyu.edu/~nroubini/papers/Roubini-Setser-US-External-Imbalances.pdf)

Shiller, R. (1993) "*Macro Markets: Creating Institutions to manage Society's largest economic risks*". Oxford University Press.

Wolf, Martin (2004) "America on the comfortable path to ruin, Financial Times, August 17.

**Figure 1. The US Current Account and it´s International Investment Position
(in billions of US dollars)**
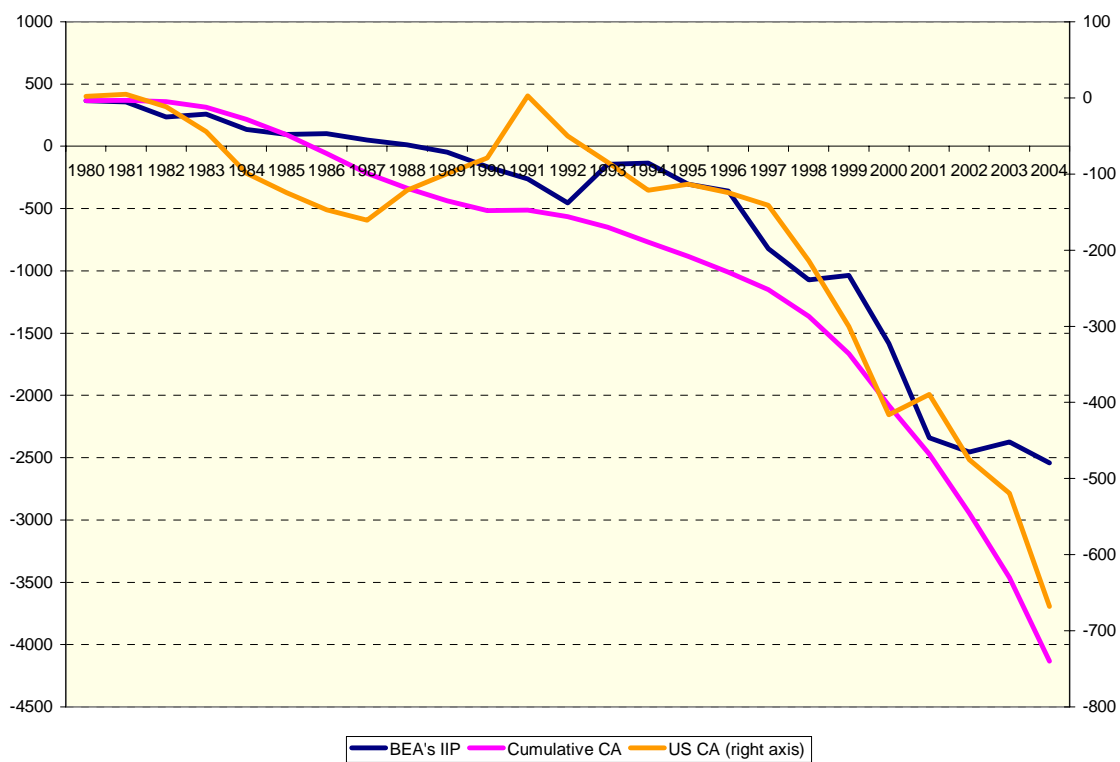
Source: BEA

Figure 2. Cumulative Current Accounts with official statistics and with Dark Matter (in billions of dollars)
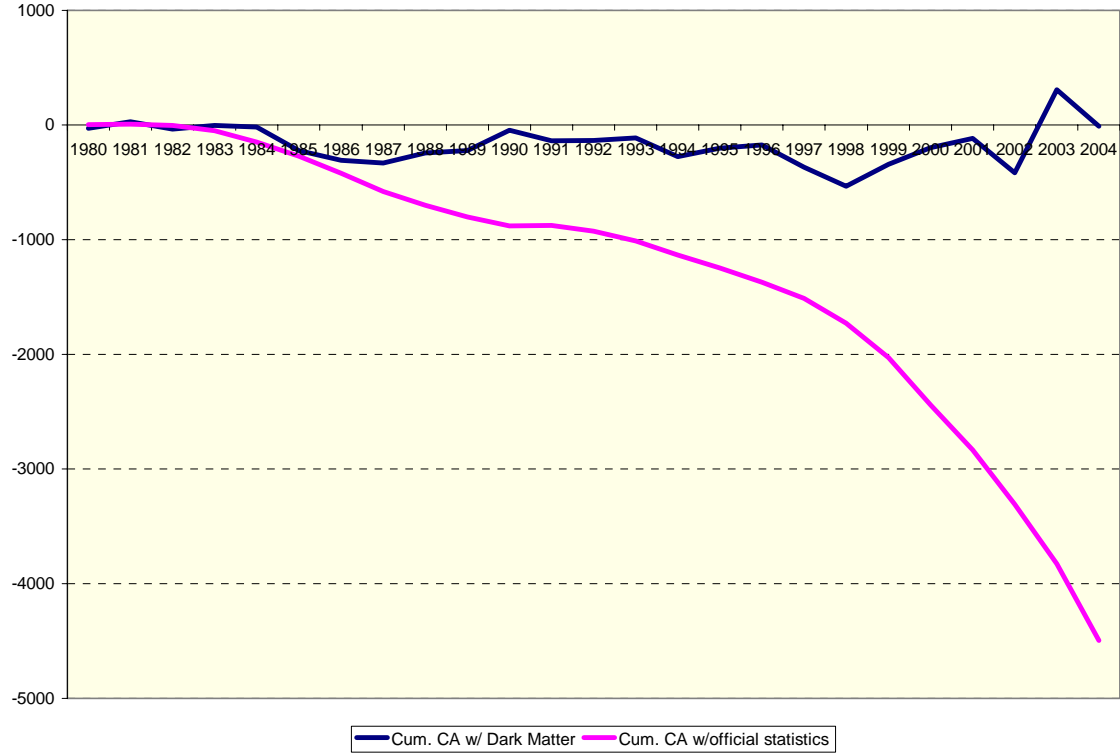
Source: BEA and International Financial Statistics

Figure 3a. Trading in Contingent assets
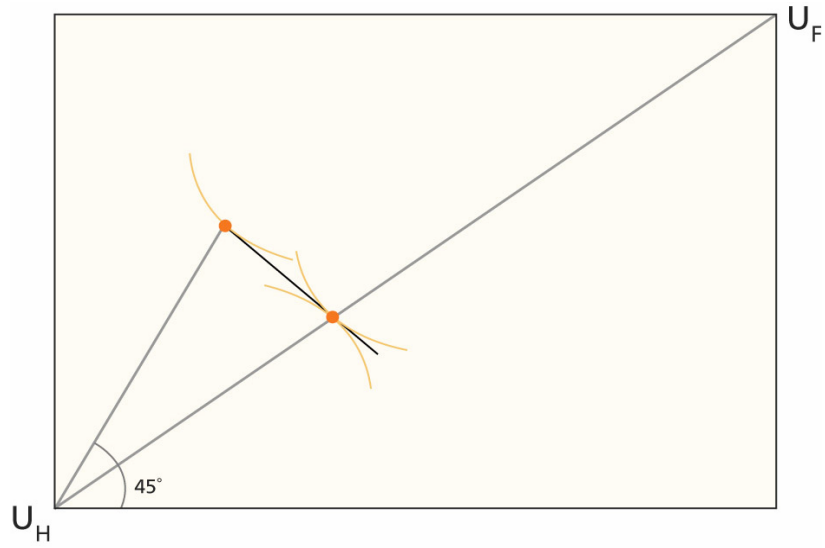
Figure 3b. The infinite risk aversion case
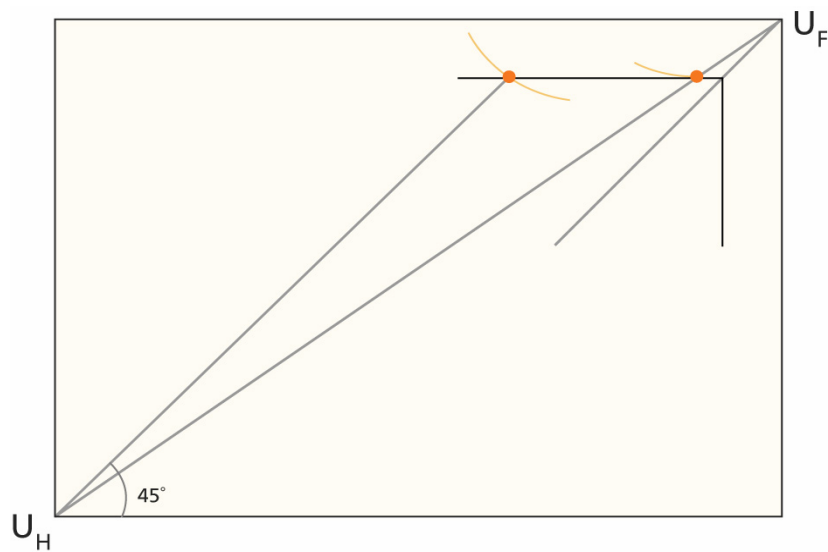
Figure 4. US dark matter assets and yearly exports of dark matter (percent of US GDP)
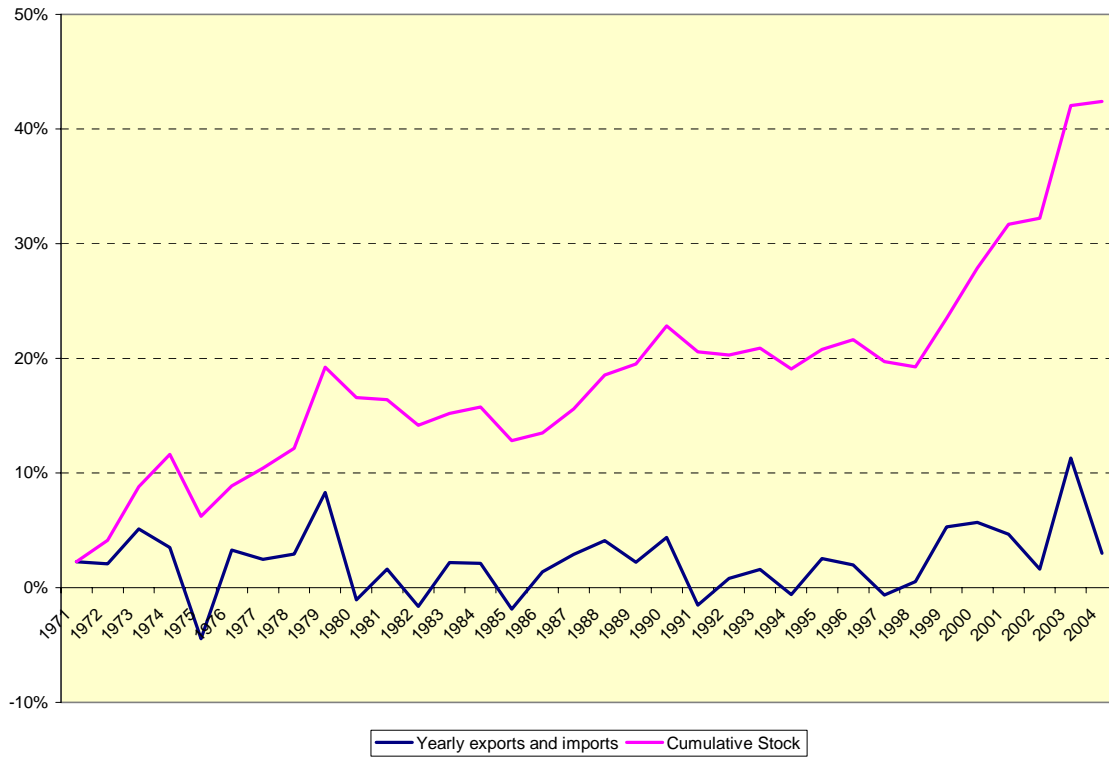
Source: BEA

Figure 5. Sources of US Foreign Income
(in billions of US dollars)
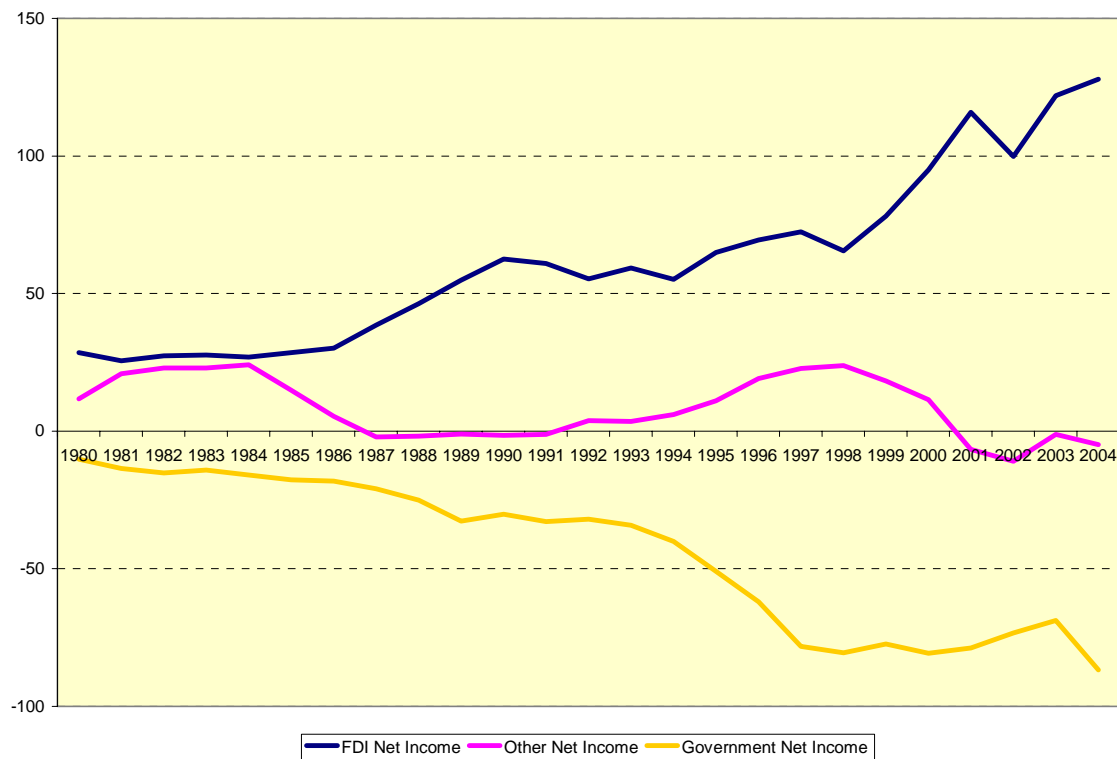
Source: BEA

Figure 6. Dark matter by source
(in millions of dollars)
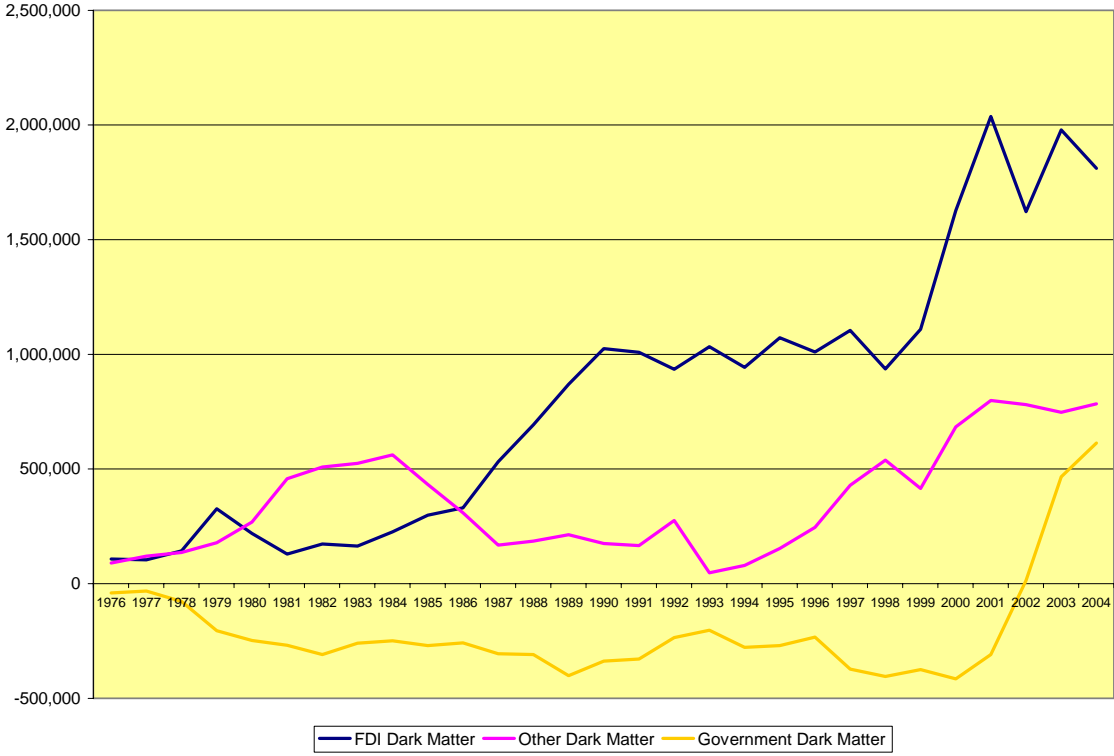
Source: BEA

**Figure 7a. Net Foreign Assets in the World according to Official Figures
(as % of each entity's GDP)**
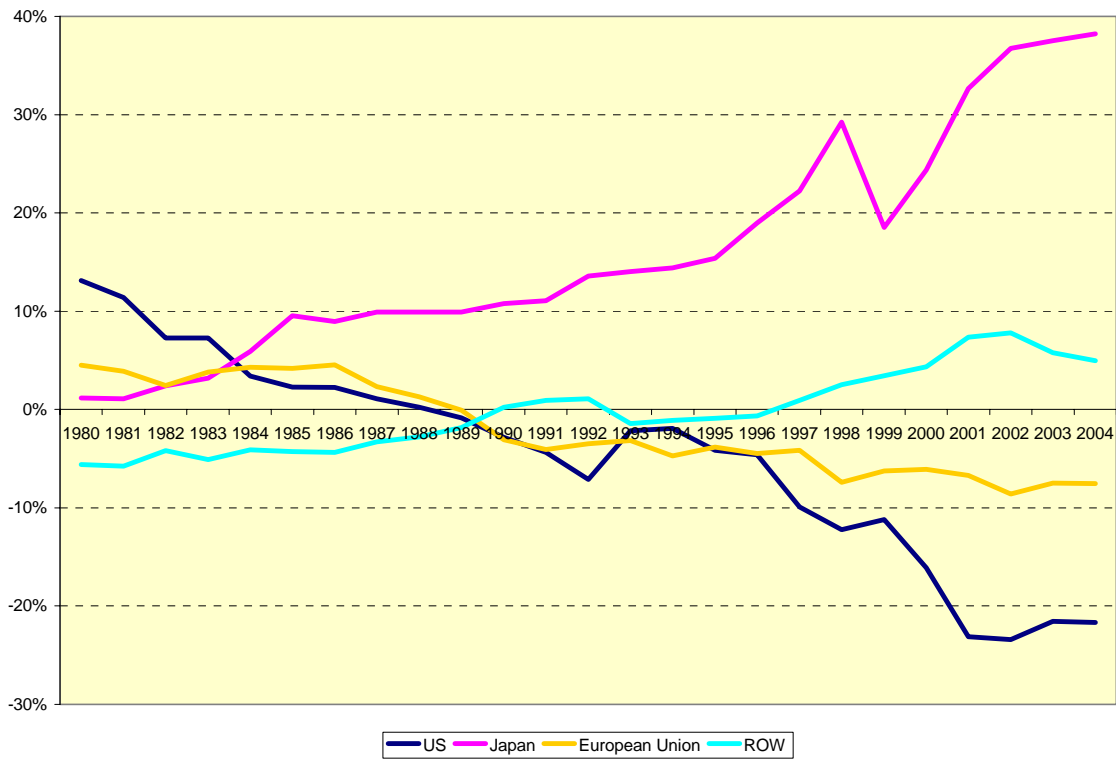
Source: International Financial Statistics

**Figure 7b. Net Foreign Assets taking into account Dark Matter
(as % of each entity's GDP)**
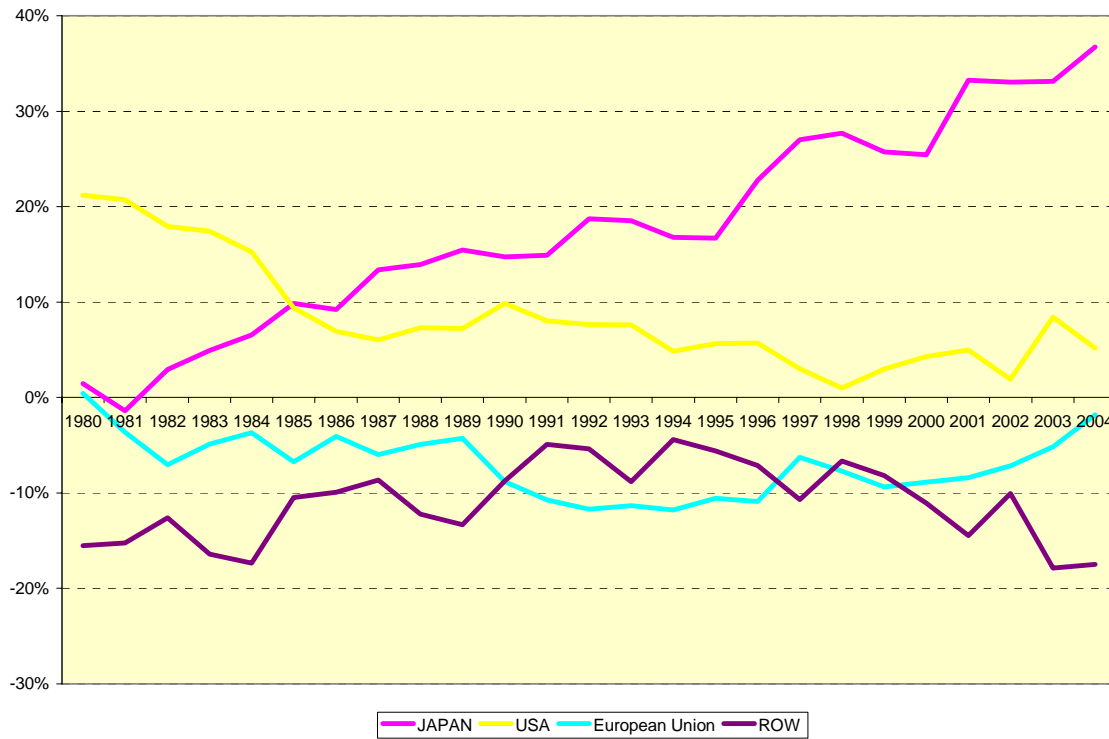
Source: authors´ computations on International Financial Statistics data

Figure 8. Net foreign assets of major regions
(as percent of World GDP)
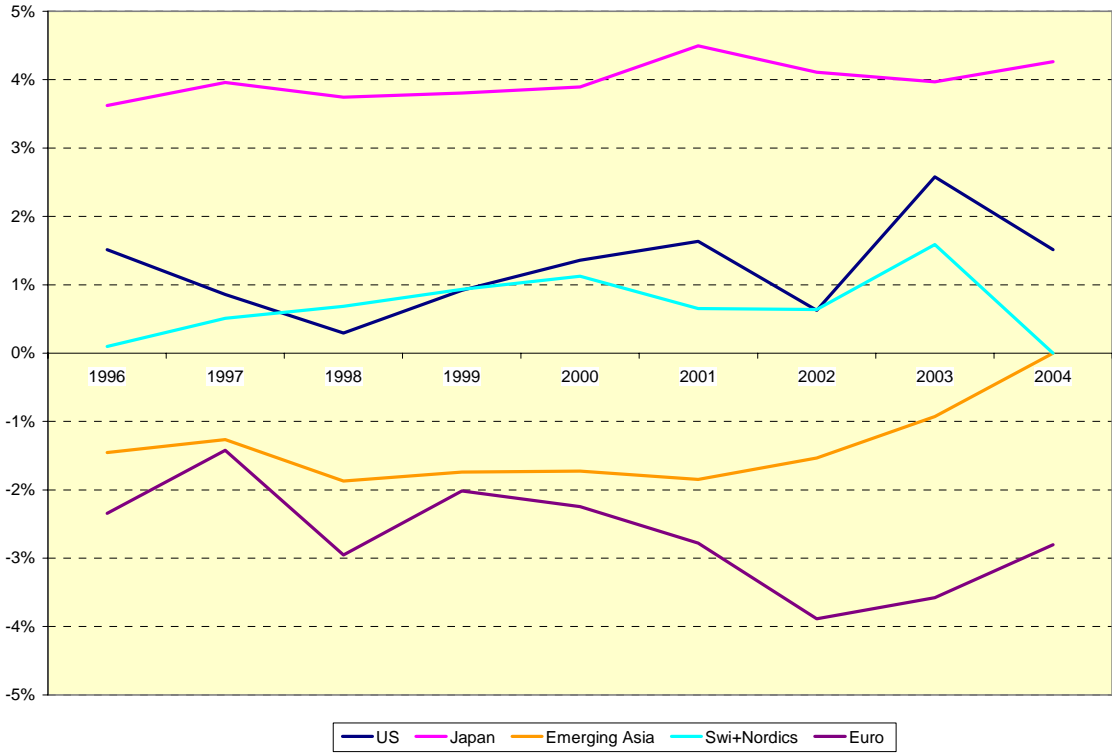
Source: authors´ computations on International Financial Statistics data

**Figure 9. China's net foreign assets
(as percent of world GDP)**

Source: authors´ computations on International Financial Statistics data

Figure 10. European Union and Eurozone net foreign assets
(as % of world GDP)

Source: authors´ computations on International Financial Statistics data

Table 1. CA with official numbers and with Dark Matter

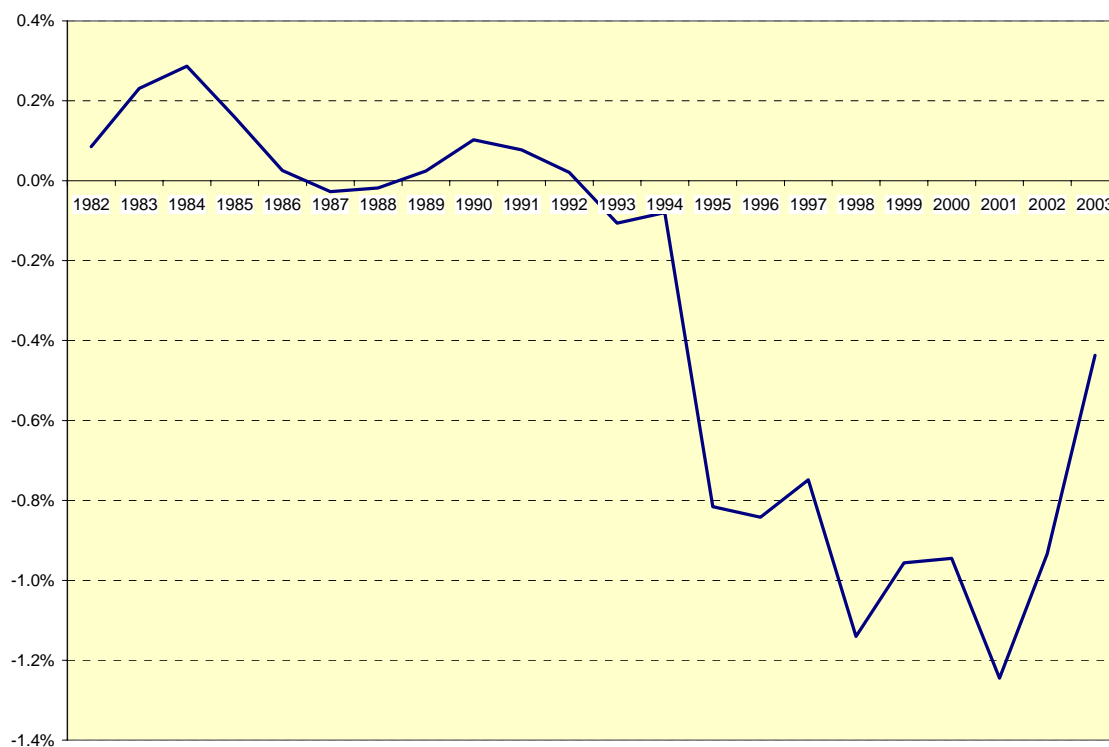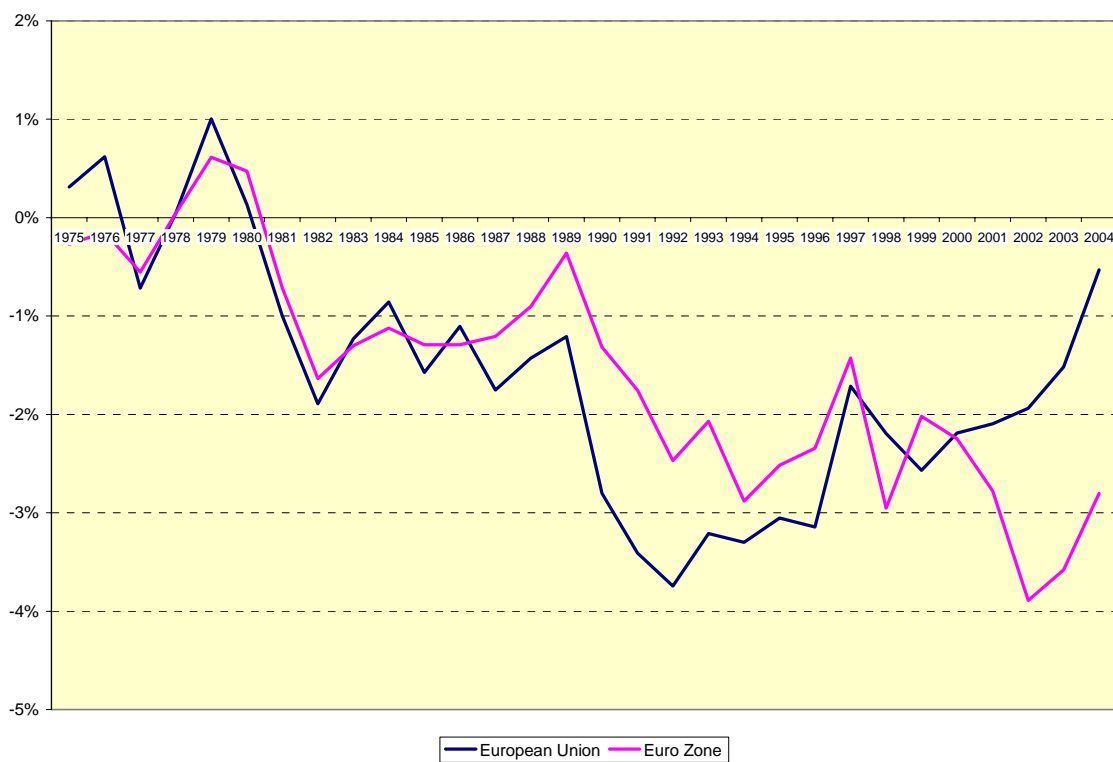| Country	IFS CA (Official) Billion Dollars					DM´s CA (Change NAS) Billion Dollars				
	2000	2001	2002	2003	2004	2000	2001	2002	2003	2004
AFGHANISTAN, I.S. OF	-	-	-	-	-	-	-	-	-	-
ALBANIA	-0.2	-0.2	-0.4	-0.4	-	0.6	0.8	-0.4	0.9	-
ALGERIA	-	-	-	-	-	-	-	-	-	-
ANGOLA	0.8	-1.4	-0.2	-0.7	0.7	-6.2	2.4	-1.5	-1.8	-15.1
ANGUILLA	-0.1	0.0	0.0	-	-	0.0	0.0	0.0	-	-
ANTIGUA AND BARBUDA	-0.1	-0.1	-0.1	-	-	-0.4	0.5	-0.3	-	-
ARGENTINA	-9.0	-3.3	8.7	7.7	3.4	-1.3	5.7	-4.9	-9.7	-18.3
ARMENIA	-0.3	-0.2	-0.1	-0.2	-0.2	0.2	0.0	0.7	0.6	2.9
ARUBA	0.2	0.3	-0.3	-0.1	0.0	0.4	-0.7	-1.5	1.7	-0.3
AUSTRALIA	-15.4	-8.4	-16.8	-30.4	-40.0	16.0	18.9	-23.2	-69.7	-125.4
AUSTRIA	-4.9	-3.6	0.6	-0.6	0.8	8.3	-12.3	29.8	8.0	-21.0
AZERBAIJAN, REP. OF	-0.2	-0.1	-0.8	-2.0	-2.6	-5.8	-0.6	-0.4	-1.1	-5.2
BAHAMAS, THE	-0.5	-0.6	-0.3	-0.4	-	-0.7	-0.1	-0.6	0.9	-
BAHRAIN, KINGDOM OF	0.8	0.2	-0.1	0.2	0.4	0.9	-2.0	-4.1	0.6	-1.6
BANGLADESH	-0.3	-0.5	0.7	0.1	-	-2.0	-0.4	0.4	-0.8	-
BARBADOS	-0.1	-0.1	-0.2	-0.2	-	-0.2	-0.2	-0.2	-0.1	-
BELARUS	-0.3	-0.4	-0.3	-0.4	-1.0	-0.1	0.1	0.3	1.1	0.0
BELGIUM	-	-	14.0	13.8	14.0	-	-	-	6.4	-5.4
BELIZE	-0.1	-0.2	-0.2	-0.2	-	-0.2	-0.4	0.0	-0.4	-
BENIN	-0.1	-0.2	-	-	-	0.0	0.0	-	-	-
BOLIVIA	-0.4	-0.3	-0.4	0.1	0.3	-0.6	0.3	0.1	-2.0	-1.6
BOSNIA & HERZEGOVINA	-0.5	-0.8	-1.3	-1.7	-1.9	-2.7	-0.8	-0.6	0.4	-1.7
BOTSWANA	0.5	0.6	0.2	-	-	-1.7	4.3	-11.2	-	-
BRAZIL	-24.2	-23.2	-7.6	4.2	11.7	19.2	-37.1	31.1	-7.2	-39.4
BULGARIA	-0.7	-1.0	-0.8	-1.7	-1.8	-2.8	0.4	0.9	-4.6	1.3
BURKINA FASO	-0.4	-0.4	-	-	-	-	-0.1	-	-	-
BURUNDI	-0.1	0.0	0.0	0.0	-	-0.1	0.0	0.0	-0.1	-
CAMBODIA	-0.5	-0.6	-0.1	-0.2	-0.2	-0.5	-0.3	-0.8	-0.6	-0.7
CAMEROON	-	-	-	-	-	-	-	-	-	-
CANADA	19.6	16.3	13.5	13.4	22.0	6.6	-62.5	133.6	-21.0	12.3
CAPE VERDE	-0.1	-0.1	-0.1	-0.1	-	-0.1	0.2	-0.1	-0.1	-
CENTRAL AFRICAN REP.	-	-	-	-	-	-	-	-	-	-
CHAD	-	-	-	-	-	-	-	-	-	-
CHILE	-0.9	-1.1	-0.6	-1.1	1.4	-12.4	6.6	-6.4	-35.2	-69.9
CHINA,P.R.: MAINLAND	20.5	17.4	35.4	45.9	-	-3.9	-90.2	84.6	142.1	-
CHINA,P.R.:HONG KONG	7.0	9.8	12.4	16.5	16.4	-41.3	50.7	-58.7	58.6	-3.3
COLOMBIA	0.8	-1.1	-1.3	-1.0	-1.0	-18.6	-6.6	-4.7	-12.0	-14.9
COMOROS	-	-	-	-	-	-	-	-	-	-
CONGO, REPUBLIC OF	0.6	0.0	0.0	0.0	-	-5.3	2.5	-3.6	6.3	-
COSTA RICA	-0.7	-0.7	-0.9	-0.9	-0.8	11.4	9.5	5.2	-6.6	6.6
COTE D IVOIRE	-0.2	-0.1	0.8	0.3	0.3	2.1	1.3	-0.9	-0.6	-0.9
CROATIA	-0.5	-0.7	-1.9	-2.1	-1.7	-0.6	-3.0	0.4	-13.8	9.1
CYPRUS	-0.5	-0.3	-0.5	-0.4	-0.9	-3.8	0.4	1.1	1.6	-2.8
CZECH REPUBLIC	-2.7	-3.3	-4.3	-5.8	-5.6	-0.4	-16.4	-27.8	-14.1	-23.0
CZECHOSLOVAKIA	-	-	-	-	-	-	-	-	-	-
DENMARK	2.3	4.8	3.5	7.0	5.9	-31.4	20.2	-10.6	18.5	5.7
DJIBOUTI	-	-	-	-	-	-	-	-	-	-
DOMINICA	-0.1	0.0	0.0	-	-	-0.1	0.2	0.0	-	-
DOMINICAN REPUBLIC	-1.0	-0.7	-0.8	1.0	1.4	-1.3	-1.0	-1.2	-4.8	1.2
ECUADOR	0.9	-0.7	-1.4	-0.5	-	-2.0	0.8	1.2	-3.2	-
EGYPT	-1.0	-0.4	0.6	3.7	3.9	2.9	-6.1	-17.0	0.3	0.1
EL SALVADOR	-0.4	-0.2	-0.4	-0.8	-0.6	0.6	-0.3	-1.2	-2.0	-0.7
EQUATORIAL GUINEA	-	-	-	-	-	-	-	-	-	-
ERITREA	-0.1	-	-	-	-	-0.2	-	-	-	-
ESTONIA	-0.3	-0.3	-0.7	-1.1	-1.4	-2.0	-1.6	-0.9	-4.2	-3.6

Table 1. CA with official numbers and with Dark Matter (cont.)

Country	IFS CA (Official) Billion Dollars					DM´s CA (Change NAS) Billion Dollars				
	2000	2001	2002	2003	2004	2000	2001	2002	2003	2004
ETHIOPIA	0.0	-0.4	-0.2	-0.2	-	0.0	0.1	0.2	0.0	-
FIJI	-	-	-	-	-	-	-	-	-	-
FINLAND	9.0	8.7	10.1	6.5	7.5	6.5	14.4	8.1	-53.9	38.6
FRANCE	18.6	28.8	11.0	11.8	-4.8	-68.9	-10.4	-289.2	226.5	3.0
GABON	1.0	0.5	0.3	0.6	-	-4.2	3.0	3.0	-4.7	-
GAMBIA, THE	-	-	-	-	-	-	-	-	-	-
GEORGIA	-0.3	-0.2	-0.2	-0.4	-0.4	-0.6	-1.7	0.0	0.0	1.3
GERMANY	-29.6	3.1	45.6	51.4	103.4	97.3	-35.1	-108.2	-31.5	314.2
GHANA	-0.4	-0.3	0.0	0.3	-0.2	0.5	0.0	-1.3	0.4	-0.8
GREECE	-9.8	-9.4	-9.6	-12.6	-13.1	-4.3	-17.6	-3.8	-46.0	-16.9
GRENADA	-0.1	-0.1	-0.1	-	-	-0.1	-0.1	-0.1	-	-
GUATEMALA	-1.0	-1.3	-1.2	-1.0	-1.2	-0.1	2.5	-4.7	0.0	0.0
GUINEA	-0.2	-0.1	-0.2	-0.2	-0.2	0.1	-0.5	1.1	-1.3	1.7
GUINEA-BISSAU	-	0.0	0.0	0.0	-	-	-	0.1	0.0	-
GUYANA	-0.1	-0.1	-0.1	-0.1	-	0.1	-0.1	0.1	0.1	-
HAITI	-0.1	-0.1	0.0	0.0	-	0.1	0.0	-0.1	0.0	-
HONDURAS	-0.3	-0.3	-0.3	-0.3	-0.4	0.4	-0.7	-0.5	-1.2	-0.5
HUNGARY	-4.0	-3.2	-4.7	-7.2	-8.8	6.3	-5.5	-15.7	-10.8	-39.1
ICELAND	-0.8	-0.3	0.1	-0.5	-1.1	-1.4	-0.4	4.6	-3.0	-2.4
INDIA	-4.7	1.3	7.0	6.7	-	-23.7	15.0	4.7	-10.8	-
INDONESIA	8.0	6.9	7.8	7.3	-	11.1	30.2	-2.2	16.6	-
IRAN, I.R. OF	12.6	-	-	-	-	1.8	-	-	-	-
IRELAND	-0.5	-0.7	-1.1	0.1	-1.4	4.0	-56.1	-119.3	-49.4	-89.7
ISRAEL	-1.2	-1.6	-1.3	0.8	1.5	-46.5	46.0	13.7	1.2	-3.4
ITALY	-5.8	-0.7	-9.4	-19.4	-15.1	-19.2	33.5	-84.3	-113.5	40.4
JAMAICA	-0.4	-0.8	-1.1	-0.8	-0.5	-0.3	-1.8	-3.4	0.7	-0.2
JAPAN	119.7	87.8	112.4	136.2	172.1	56.5	176.4	-69.1	109.4	289.3
JORDAN	0.1	0.0	0.5	1.2	0.0	2.9	1.0	-1.5	0.1	1.4
KAZAKHSTAN	0.4	-1.4	-1.0	-0.3	0.5	-15.1	0.3	2.2	-12.3	-20.7
KENYA	-0.2	-0.3	-0.1	0.1	-	0.5	0.2	-0.4	1.1	-
KOREA	12.3	8.0	5.4	11.9	27.6	54.8	24.5	32.6	-2.1	8.0
KUWAIT	14.7	8.3	4.3	9.4	18.9	31.8	-36.0	-31.2	0.3	60.9
KYRGYZ REPUBLIC	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	0.4	0.1	-0.1	-0.6
LAO PEOPLE S DEM.REP	0.0	-0.1	-	-	-	-0.3	0.4	-	-	-
LATVIA	-0.4	-0.6	-0.6	-0.9	-1.7	1.5	0.8	-0.1	-1.5	-3.9
LEBANON	-	-	-4.4	-5.5	-4.8	-	-	-	-59.3	53.7
LESOTHO	-0.2	-0.1	-0.1	-0.1	-0.1	-0.4	-1.0	0.0	1.4	1.1
LIBERIA	-	-	-	-	-	-	-	-	-	-
LIBYA	7.7	3.4	0.1	3.6	-	-14.8	-14.7	15.2	-11.8	-
LITHUANIA	-0.7	-0.6	-0.7	-1.3	-1.6	1.3	0.3	-0.1	-6.0	-0.9
LUXEMBOURG	2.6	1.7	2.4	2.2	2.7	-15.9	-7.2	-12.2	-15.0	-15.1
MACEDONIA, FYR	-0.1	-0.2	-0.4	-0.3	-	-0.1	0.1	0.2	-0.1	-
MADAGASCAR	-0.3	-0.2	-0.3	-0.4	-	0.0	-0.8	0.2	-0.1	-
MALAWI	-0.1	-0.1	-0.2	-	-	0.2	-0.3	-0.2	-	-
MALAYSIA	8.5	7.3	7.2	13.4	-	-42.2	17.3	3.0	13.3	-
MALDIVES	-0.1	-0.1	0.0	0.0	-	0.0	-0.1	0.0	0.0	-
MALI	-0.3	-0.3	-0.1	-0.3	-	-0.6	-1.4	-1.5	1.6	-
MALTA	-0.5	-0.2	0.0	-0.3	-0.5	-2.9	2.8	-0.5	0.7	-1.7
MAURITANIA	-	-	-	-	-	-	-	-	-	-
MAURITIUS	0.0	0.3	0.2	0.1	-0.1	0.0	0.6	0.0	-0.9	0.3
MEXICO	-18.6	-17.3	-13.0	-6.5	-7.4	-35.6	22.0	36.8	33.8	-16.7
MOLDOVA	-0.1	0.0	-0.1	-0.1	-0.1	-0.1	1.5	0.3	2.5	2.0
MONGOLIA	-0.2	-0.2	-0.2	-	-	-0.1	0.1	-0.1	-	-
MONTSERRAT	0.0	0.0	0.0	-	-	0.1	0.0	0.0	-	-
MOROCCO	-0.5	1.6	1.5	1.6	1.1	2.4	0.6	1.9	-1.1	2.9
MOZAMBIQUE	-0.8	-0.7	-0.9	-0.8	-0.6	-0.7	-0.9	-7.4	8.8	-2.7
MYANMAR	-0.2	-0.2	0.0	0.0	-	-2.6	-6.8	-2.4	-0.2	-
NAMIBIA	0.3	0.0	0.1	0.3	-	-2.8	-1.9	2.2	3.8	-
NEPAL	-0.3	-0.3	0.1	0.1	-	0.2	-0.5	-0.5	-0.1	-
NETHERLANDS	6.8	7.8	10.1	16.4	23.2	-119.0	-27.9	26.5	23.9	1.6

Table 1. CA with official numbers and with Dark Matter (cont.)

Country	IFS CA (Official) Billion Dollars					DM´s CA (Change NAS) Billion Dollars				
	2000	2001	2002	2003	2004	2000	2001	2002	2003	2004
NETHERLANDS ANTILLES	-0.1	-0.2	-0.1	0.0	-0.1	0.9	-0.1	-0.4	-0.2	-0.1
NEW ZEALAND	-2.5	-1.3	-2.2	-3.4	-6.2	-2.6	5.0	0.7	-18.7	-37.8
NICARAGUA	-0.8	-0.8	-0.8	-0.7	-0.8	-0.1	-0.8	0.8	0.2	0.0
NIGER	-0.1	-0.1	-0.2	-0.2	-	0.0	0.0	-0.2	0.0	-
NIGERIA	-	-	-	-	-	-	-	-	-	-
NORWAY	25.9	26.2	24.5	28.3	34.4	5.2	9.1	36.3	13.1	5.1
OMAN	4.0	2.9	2.7	2.5	1.9	13.0	1.2	0.5	1.2	-0.2
PAKISTAN	-0.1	1.9	3.9	3.6	-0.8	-7.6	2.8	-4.2	1.2	-2.8
PANAMA	-0.7	-0.2	-0.1	-0.4	-1.1	2.6	-0.6	6.4	-11.0	-4.4
PAPUA NEW GUINEA	0.3	0.3	-	-	-	1.2	-0.4	-	-	-
PARAGUAY	-0.2	-0.3	0.1	0.1	0.0	0.1	-0.1	0.5	-1.0	-0.5
PERU	-1.5	-1.1	-1.1	-0.9	0.0	-6.0	6.2	-7.1	-13.7	-25.5
PHILIPPINES	6.3	1.3	4.4	1.4	2.1	-0.5	-15.4	16.4	-94.3	7.5
POLAND	-10.0	-5.4	-5.0	-4.6	-3.6	-9.0	1.4	-10.0	-35.0	-19.1
PORTUGAL	-11.1	-11.1	-9.1	-7.9	-12.7	-15.3	-16.4	18.6	13.4	-26.8
ROMANIA	-1.4	-2.2	-1.5	-3.3	-5.6	2.5	0.1	-3.5	-4.9	-21.2
RUSSIA	46.8	33.8	29.1	35.4	59.9	19.6	50.0	-46.9	-131.8	3.4
RWANDA	-0.1	-0.1	-0.1	-	-	-0.1	-0.1	0.0	-	-
SAMOA	-	-	-	-	-	-	-	-	-	-
SAO TOME & PRINCIPE	0.0	0.0	0.0	-	-	-	-	-	-	-
SAUDI ARABIA	14.3	9.4	11.9	28.0	51.5	-48.8	-20.0	6.2	-21.8	20.8
SENEGAL	-0.3	-0.2	-0.3	-0.4	-	0.2	0.1	-0.5	-0.1	-
SEYCHELLES	-0.1	-0.1	-0.1	-	-	-0.5	0.1	-1.0	-	-
SIERRA LEONE	-0.1	-0.1	-0.1	-0.1	-	0.1	-0.1	0.2	-0.2	-
SINGAPORE	11.9	14.4	15.7	27.0	27.9	-49.8	14.8	-42.6	13.6	-24.9
SLOVAK REPUBLIC	-0.7	-	-2.0	-0.3	-	-1.1	-	-	6.6	-
SLOVENIA	-0.5	0.0	0.3	-0.1	-0.3	-0.8	-0.1	-3.1	-1.0	1.7
SOLOMON ISLANDS	-	-	-	-	-	-	-	-	-	-
SOMALIA	-	-	-	-	-	-	-	-	-	-
SOUTH AFRICA	-0.2	0.2	0.7	-2.6	-7.0	0.5	-12.0	19.8	-35.6	4.7
SPAIN	-19.2	-16.4	-16.0	-23.7	-49.2	24.0	-29.9	-18.8	-24.6	-79.6
SRI LANKA	-1.0	-0.2	-0.3	-0.2	-	-0.9	0.7	0.3	1.2	-
ST. KITTS AND NEVIS	-0.1	-0.1	-0.1	-	-	0.0	-0.1	-0.1	-	-
ST. LUCIA	-0.1	-0.1	-0.1	-	-	-0.1	0.0	0.0	-	-
ST. VINCENT & GRENS.	0.0	0.0	0.0	-	-	0.0	0.1	0.0	-	-
SUDAN	-0.6	-0.6	-1.0	-1.0	-0.9	-9.4	0.4	-1.1	-5.2	-4.9
SURINAME	0.0	-0.1	-0.1	-0.2	-0.1	0.1	-2.3	1.3	-0.1	-0.3
SWAZILAND	-0.1	-0.1	0.0	-	-	-0.9	0.3	-0.1	-	-
SWEDEN	6.6	6.7	12.8	22.8	-	27.1	-15.8	36.5	26.4	-
SWITZERLAND	33.4	22.5	24.6	44.7	60.2	34.5	-141.1	-69.9	326.0	80.7
SYRIAN ARAB REPUBLIC	1.1	1.2	1.4	0.7	0.2	-6.7	1.9	-2.8	1.4	2.6
TAJIKISTAN	-	-	0.0	0.0	-0.1	-	-	-	-0.6	0.3
TANZANIA	-0.5	-0.5	-0.3	-	-	-0.5	0.9	1.4	-	-
THAILAND	9.3	6.2	7.0	8.0	7.1	32.2	0.3	0.5	-9.0	-4.6
TOGO	-0.1	-0.2	-0.1	-0.2	-	0.2	0.0	0.2	0.0	-
TONGA	-	-10.8	-3.3	-	-	-	-	-11.8	-	-
TRINIDAD AND TOBAGO	0.5	0.4	0.1	-	-	-4.6	1.8	1.2	-	-
TUNISIA	-0.8	-0.8	-0.7	-0.7	-0.6	-1.1	0.0	-0.9	-2.2	-4.1
TURKEY	-9.8	3.4	-1.5	-7.9	-15.5	-9.3	-20.0	8.9	-17.5	-1.8
TURKMENISTAN	-	-	-	-	-	-	-	-	-	-
UGANDA	-0.8	-0.4	-0.4	-0.4	-0.2	0.3	-1.1	0.8	-0.4	-0.6
UKRAINE	1.5	1.4	3.2	2.9	6.8	-1.5	5.5	1.3	0.5	-1.3
UNITED KINGDOM	-36.7	-31.8	-24.6	-27.5	-41.9	188.3	187.7	388.6	70.8	173.4
UNITED STATES	-416.0	-389.5	-475.2	-519.7	-668.1	143.3	82.5	-303.3	725.7	-317.3
URUGUAY	-0.6	-0.5	0.3	0.1	-	1.7	-0.1	2.2	-8.2	-
VANUATU	0.0	0.0	0.0	0.0	-	-0.2	0.2	0.0	-0.1	-
VENEZUELA, REP. BOL.	11.9	2.0	7.6	11.4	13.8	1.3	-12.6	-14.7	6.9	-29.5
VIETNAM	1.1	0.7	-0.6	-	-	-0.4	-0.5	-4.9	-	-
YEMEN, REPUBLIC OF	1.3	0.7	0.5	0.1	0.2	-1.6	1.7	-1.5	-2.9	-8.7
ZAMBIA	-0.6	-	-	-	-	0.3	-	-	-	-

Table 2. Correlations between CA with and without Dark Matter

	2000	2001	2002	2003	2004
Correlation	-0.4	-0.2	0.4	-0.7	0.7
Correlation without US & UK	0.1	0.4	-0.2	0.4	0.8

Source: authors´ computations on International Financial Statistics data

Table 3. Exporters and Importers of Dark Matter

	in US billions	in % of GDP		in US billions	in % of GDP
UNITED STATES	559.9	5.3%	PAKISTAN	-3.8	-5.7%
UNITED KINGDOM	234.3	14.6%	DENMARK	-4.2	-2.9%
MEXICO	20.6	3.2%	ANGOLA	-4.3	-27.0%
GERMANY	12.6	0.3%	EGYPT	-5.3	-6.3%
KOREA	10.5	2.3%	FINLAND	-5.7	-3.9%
SWITZERLAND	9.0	-1.2%	KUWAIT	-5.9	-25.0%
INDONESIA	6.4	3.7%	INDIA	-6.3	-1.2%
SWEDEN	6.3	2.3%	GREECE	-6.8	-3.8%
COSTA RICA	6.0	36.5%	ARGENTINA	-7.2	-7.1%
PORTUGAL	5.1	4.0%	HUNGARY	-7.4	-6.8%
AUSTRIA	4.1	2.5%	NEW ZEALAND	-7.6	-7.1%
CHINA,P.R.: MAINLAND	3.4	-0.2%	PERU	-8.3	-12.8%
SLOVAK REPUBLIC	3.2	9.5%	TONGA	-8.5	-57.0%
ISRAEL	2.6	2.7%	POLAND	-8.6	-3.9%
LEBANON	2.3	0.6%	KAZAKHSTAN	-8.8	-31.0%
MOLDOVA	1.3	69.0%	LIBYA	-10.3	-28.3%
BRAZIL	1.1	0.4%	COLOMBIA	-10.6	-12.5%
ARMENIA	1.1	36.4%	IRAN, I.R. OF	-10.8	-11.2%
TANZANIA	1.0	10.4%	CHINA,P.R.:HONG KONG	-11.2	-6.7%
GABON	-1.3	-20.6%	MALAYSIA	-11.2	-12.3%
DOMINICAN REPUBLIC	-1.4	-8.4%	CZECH REPUBLIC	-12.0	-15.0%
AZERBAIJAN, REP. OF	-1.5	-25.7%	JAPAN	-13.1	-0.4%
BAHRAIN, KINGDOM OF	-1.5	-17.7%	BELGIUM	-13.4	-4.0%
TURKEY	-1.6	-1.7%	NORWAY	-14.1	-7.0%
SYRIAN ARAB REPUBLIC	-1.7	-9.1%	AUSTRALIA	-14.5	-1.4%
ESTONIA	-1.7	-21.7%	LUXEMBOURG	-15.4	-65.3%
UKRAINE	-2.3	-4.1%	ITALY	-18.5	-1.5%
VIETNAM	-2.3	-6.9%	VENEZUELA, REP. BOL.	-19.1	-18.1%
ROMANIA	-2.6	-2.6%	PHILIPPINES	-20.3	-26.6%
SOUTH AFRICA	-2.8	-1.4%	CHILE	-23.0	-27.2%
MYANMAR	-2.9	-35.0%	NETHERLANDS	-31.8	-8.3%
CANADA	-3.1	-0.3%	SAUDI ARABIA	-35.7	-17.6%
YEMEN, REPUBLIC OF	-3.2	-27.4%	SINGAPORE	-37.1	-39.2%
SUDAN	-3.2	-21.7%	FRANCE	-40.9	-3.6%
BOTSWANA	-3.3	-60.4%	IRELAND	-61.4	-45.5%
THAILAND	-3.6	-2.1%	RUSSIA	-62.1	-15.2%

Avearage over the period 2000-2004

Source: authors´ computations on International Financial Statistics data