Global Imbalances and Foreign Asset Expansion by Developing-Economy Central Banks

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Abstract

Over the past 10 years, central banks and governments throughout the developing world have accumulated foreign exchange reserves and other official assets at an unprecedented rate. This paper shows that this official asset accumulation has driven a substantial portion of the recent large global current account imbalances. These net official capital flows have become large relative to the size of the industrial economies, and they are a significant factor contributing to the weakness of the economic recovery in the major industrial economies.

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I. Introduction

Over the past 10 years, central banks and governments throughout the developing world have accumulated foreign exchange reserves and other official assets at an unprecedented rate. This paper shows that this official asset accumulation has driven a substantial portion of the recent large global current account imbalances. Somewhat surprisingly, most recent studies of the determinants of current accounts have ignored these official policies that seem expressly designed to engender or sustain current account imbalances.

Net official capital flows from developing economies have become large relative to the size of the industrial economies, and they are a significant factor contributing to the weakness of the economic recovery in the major industrial economies.

II. The Evolution of Imbalances: Time Series Evidence

Figure 1 displays the evolution of net official flows and current account balances of the world divided into five developing regions and the industrial economies.[2] Official flows include purchases and sales of foreign exchange reserves, external borrowing and repayment by the government and the central bank, and purchases and sales of foreign assets by sovereign wealth funds.[3] The net flow is positive when purchases of foreign assets exceed sales; this is also known as a net outflow.

The coherence of net official flows and current account balances is very strong in Asia-Pacific, Sub-Saharan Africa, and Middle East and North Africa (MENA). The coherence of net official flows and current account balances is moderate in Central and Eastern Europe and

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[2] This paper employs the older IMF classification of industrial and developing economies, rather than advanced, emerging, and developing economies. See Appendix 2 for a definition of the regions. With respect to official flows and current account balances, the newly advanced economies of Asia and Europe (plus Israel) are more similar to their emerging and developing neighbors than they are to most of the industrial economies.

[3] Official flows in Figure 1 differ from those reported by the IMF because they include an estimate of sovereign wealth fund flows for countries that do not include such assets in their foreign exchange reserves. For a detailed description of the data and sources, see Appendix 2.

Commonwealth of Independent States (CEE & CIS) and Latin America. In all of the developing regions, there are pronounced spikes in net official flows and the current account balance just before the global financial crisis of 2008-09. In each region, the spike in net official flows exceeded the run-up in the current account. The difference between the two lines indicates that net private financial flows were negative on balance in 2006-07. As shown in equation (1), the current account is the sum of net official flows, net private flows, and errors and omissions. (The latter are relatively small for most economies.) Overall, it appears that the sharp rise in net official flows is associated with an increase in the current account and a decrease in (more negative) net private flows.

(1) Current Account = Net Official Flow + Net Private Flow + Errors and Omissions

In principle, the sum of all countries' current accounts is zero, so that surpluses in some countries must be matched by deficits in other countries. However, no such adding up constraint is applied to net official flows and net private flows. The definition of official flows for each country includes only the assets held or liabilities owed by its own government in foreign markets and not those of foreign governments in its own market. For the industrial economies as a group, net official flows are very small, as these economies generally do not hold reserve assets in the developing economies, do not engage in much external public borrowing or lending, and have few large sovereign wealth funds.[4] Of greater interest, however, are the imputed net official flows from developing economies to the industrial economies. These data are displayed here under the assumption that all official flows in developing economies are directed toward the

[4] Norway is an exception. Government pension funds as defined in Truman (2011, Table 1) are not included in net official flows in this paper because they are presumed to behave in a manner similar to private pension funds.

industrial economies. Some of these official assets may be held in financial institutions in developing-economy financial centers such as the Cayman Islands, Hong Kong, and Singapore, but data suggest that financial institutions in these centers funnel the bulk of this investment to the industrial economies.[5]

As shown in the bottom right panel of Figure 1, the imputed net official flows of the developing economies into the industrial economies reached $1.5 trillion in 2007. The dashed line is the current account surplus recorded in the industrial economies. The dotted line is -1 times the current account surplus of the developing economies. The difference between the dashed and dotted lines is the sum of all economies' current accounts, which equals zero in principle, and is also known as the global current account discrepancy. Although, the current account discrepancy is not actually zero, the movements in the dashed and dotted lines are broadly similar. After several decades with a current account close to zero, the industrial economies moved into a large deficit in the middle of the last decade.

The correlation of net official flows and the current account in each region strongly suggests a causal mechanism. However, the direction of causality is not clear. Other things equal, an official decision to purchase foreign assets is likely to depreciate the exchange rate and boost the trade and current account surpluses. On the other hand, an increase in foreign demand for exports causes the current account to increase and it tends to appreciate the exchange rate. Governments may decide to resist this currency appreciation by purchasing foreign exchange reserves, thereby increasing net official flows. So net official flows may be driving the current account or the current account may be driving net official flows.

However, the current account cannot drive net official flows without an official policy decision to resist exchange rate adjustment. And, to the extent that this policy is successful in

[5] See, for example, the BIS's *Locational Banking Statistics* and the IMF's *Coordinated Portfolio Investment Survey*.

delaying exchange rate adjustment, it will also enable the current account imbalance to persist. Thus, in a deeper sense, the correlation is ultimately caused by an official policy choice. It is in this sense that we can say that official flows are important drivers of current account imbalances.

III. The Causes of Imbalances: Cross-Country Evidence

A number of studies have examined the medium-term structural factors that are exogenous drivers of current account imbalances.[6] The papers use four-year or five-year averages of the data to minimize the influence of business cycles, transitory factors, and adjustment lags. The studies use a panel approach to combine data from dozens of industrial and developing economies over the past three or four decades. The studies agree on three important factors behind current account imbalances: fiscal balances, net foreign assets, and net oil (or net energy) exports. Importantly, the studies do not include measures of the real exchange rate or terms of trade because these are viewed as endogenous to the underlying factors driving current accounts.

The role of the fiscal balance is motivated by the following accounting identity, which is based on the broadest definition of the fiscal balance, general government net lending:

(2) Current Account = Gov't Net Lending + Private Net Lending + Statistical Discrepancy

In principle, the current account equals an economy's overall net lending to the rest of the world. Causality can flow in both directions in equation 2. The fiscal balance can affect domestic demand and the exchange rate, both of which influence the current account. But the current account can affect economic activity, which in turn has both direct and indirect (through macroeconomic policy) effects on the fiscal balance. The effect of economic activity on the

[6] See Chinn and Prasad (2003), Gruber and Kamin (2007, 2009), Chinn and Ito (2008), Lee et al. (2008), Cheung, Furceri, and Rusticelli (2010), Abiad et al. (2011), Chinn, Eichengreen, and Ito (2011), and Gagnon (2011).

fiscal balance should average out over the business cycle, whereas the effect of the fiscal balance on the current account is longer-lasting. Taking multi-year averages of the data thus helps to identify the effect of the fiscal balance on the current account while minimizing the bias associated with causality in the opposite direction.[7] The coefficient on the fiscal balance should be positive; a value of 1 would indicate that private net lending is not influenced by government net lending. However, if government borrowing crowds out private borrowing, the coefficient should be less than 1.

The roles of net energy exports and net foreign assets are motivated by the following identity:

(3) Current Account = Trade Balance + Net Factor Income + Unilateral Transfers

Energy prices and energy exports are widely seen as exogenous with respect to the current account.[8] The net energy exports coefficient will be less than 1 when fluctuations in energy exports have a positive effect on consumption and thus imports. Factor income is income earned on capital and labor abroad, of which capital income is by far the most important. Because capital income responds to the current account and to other factors that influence the current account, previous studies have used the lagged value of net foreign assets, which are the base for net capital income. In steady state, the coefficient on net foreign assets will equal the rate of return on assets.

[7] Abiad et al. (2011) identify the fiscal effect by using a subjective analysis of fiscal policy intentions. They obtain a fiscal coefficient near 0.5 but they do not allow for any effect of official financial flows. The 10-year averaged data in this paper substantially reduce the bias in the fiscal effect compared to the four-year and five-year averages used in previous work. As shown in Table 2, when official flows are not included in the regression, the coefficient on the fiscal balance is near 0.5, much higher than in previous work except for Abiad et al.

[8] Indeed, it might be preferable to use a measure of net natural resource exports, if one were available.

Previous studies also examined a range of other candidate factors, some of which will be used here, but none of these is robustly significant. In particular, the correlations between current account imbalances and institutional factors (such as financial market depth or quality of governance) are highly sensitive to the economies and time periods included in the analysis. These institutional factors are not explored in this paper.

An important factor that was not considered by previous studies, except by Gagnon (2011), is the official policy of the government toward its exchange rate and foreign assets, sometimes referred to as external financial policy. Indeed, it is remarkable that so many studies have ignored this obviously important factor. For many—perhaps most—countries, the real exchange rate is not a useful measure of external financial policy. Rather, it is endogenous to factors influencing the current account, including trade barriers and local tastes and techonologies. The central insight of Gagnon (2011) is that net official purchases of foreign assets *are* a useful measure of official policy for analysis of current accounts. Figure 1 shows that net official flows appear to be an important driving factor behind current account imbalances over time. This section focuses on the cross-country determinants of current account imbalances.

If the government's holdings of foreign assets are exogenous, regressing the current account on net official flows provides an unbiased estimate of the effect on the current account of a given movement in net official flows. If the government's holdings of foreign assets react endogenously to pressures on the exchange rate, the coefficient may be a biased estimate of the effect of a hypothetical exogenous purchase. As shown in Appendix 1, the direction of the bias depends on which shocks are most important. If the shocks are primarily to the official exchange rate target, there is no bias. If the shocks are primarily to the trade balance, the bias is upward.

If the shocks are primarily to domestic demand or private capital flows, the bias is downward. Regardless of which shocks dominate, the bias is downward when the real exchange rate is close to a random walk and it is small when private financial flows do not respond much to the real interest rate.

The evidence suggests that the bias is likely to be downward but small. Chinn (2006) shows that most studies find that real exchange rates are close to random walks. For the developing economies, Ostry et al. (2010) document widespread use of capital controls, particularly for the short-term debt flows that are most sensitive to interest differentials. Much of the capital flowing to developing economies is in the form of equity and foreign direct investment, which are mainly motivated by long-term development opportunities rather than the real interest rate. Gagnon (2011) showed that the coefficient on net official flows is not sensitive to the exchange rate regime. Indeed, the coefficient on net official flows is more stable and robust than any other coefficient explored in the literature.

There is a significant amount of collinearity between net official flows and fiscal balances. Governments that are accumulating foreign assets often have fiscal surpluses, and external borrowing is one way to finance a fiscal deficit. But, as will be discussed below, net official flows are more strongly correlated with current account imbalances than fiscal balances are. This result suggests that private agents do not view assets in different economies as close substitutes, perhaps because of legal restrictions, tax treatment, exchange rate volatility, or differences in financial market soundness or sophistication. In an environment of perfect capital mobility (asset substitutability), the fiscal balance would affect the current account and official flows would not. In an environment of zero private capital mobility, only official flows can affect the current account and nothing else matters (see equation 1). In between these extremes,

the following interpretation of the coefficients applies: the coefficient on official flows captures the effect of government borrowing in local currency to purchase foreign assets whereas the coefficient on the fiscal balance captures the effect of a budget surplus invested in local-currency assets (or repayment of local-currency debt).[9] The effect of a budget surplus that is invested entirely in foreign assets would be the sum of the two coefficients.

Table 1 displays regressions on the two main policy variables and on other variables commonly used in the literature. To minimize temporary and cyclical influences on the current account, the data are expressed as non-overlapping 10-year averages except for net foreign assets, which are levels in the year before each 10-year period. To minimize the importance of small (often poor) economies with noisy data, the regressions are weighted by each economy's share of world nominal GDP. This is equivalent to running the regression on all variables as a share of world GDP instead of a share of national GDP.[10]

Note that most variables are missing at least some observations, and thus adding more variables comes at the cost of losing observations—in some cases many observations. The most statistically significant and robust alternative variables are the initial stock of net foreign assets and the change in the old-age dependency ratio. These two variables also contribute a lot to the explanatory power of the regression and their coefficients are economically large. The coefficient on net foreign assets in column 2 implies that an increase in net foreign assets of $100 is associated with an increase in a country's current account of more than $7. This is a plausible estimate, considering that the coefficient is motivated as a rate of return on net foreign assets.

[9] Official flows are defined according to the location of the assets and not the currency in which they are denominated. However, essentially all official assets and liabilities are denominated in foreign currency and it is the currency denomination that likely plays the key role in differentiating the effect of net official flows from that of the fiscal balance.

[10] Independent variables that are not expressed as a share of national GDP would need to be multiplied by national GDP as a share of world GDP.

The coefficient on the change in the elderly dependency ratio in column 4 implies that a rate of increase in the ratio of elderly to working age people of 1 percentage point per year would increase the current account by nearly 5 percent of GDP. This effect presumably works through an increase in desired saving for retirement. Other demographic variables, including the change in youth dependency and the levels of both elderly dependency and youth dependency were not statistically significant.

The other variables contribute relatively less to the explanatory power. The coefficients on energy exports, GDP growth, and relative PPP GDP per capita are economically small. The coefficient on population growth is fairly large, but it is not significant when GDP growth is not included in the regression. Note that the coefficient on relative PPP GDP per capita changes sign when other variables are included. It is expected to have a positive coefficient because private capital should flow from richer to poorer economies, and thus richer economies should have current account surpluses.

Overall, column 8 seems the preferred specification, with nearly as high an R^2 as column 7 with only half the variables, plausible coefficient values, and fewer lost observations. However, it is apparent in Table 1 that the coefficient estimates are sensitive to the sample and to the inclusion of other independent variables.

Table 2 examines the sensitivity of the results for the main variables to econometric specification and sample selection. Column 2 displays an unweighted regression, which leads to coefficients on official flows and fiscal balance of comparable size, though official flows contribute significantly more than the fiscal balance to the overall fit of the regression.[11] Columns 3-5 run each decade separately as a pure cross-section. Column 6 uses a version of

[11] An unweighted regression of the current account on official flows yields an R^2 of .23 versus .18 for an unweighted regression of the current account on the fiscal balance.

official flows that does not allocate developing-economy reserve accumulation as a negative official flow for industrial economies and does not include estimated sovereign wealth fund flows into developing-economy flows.[12] Columns 7-8 present univariate regressions, which show that official flows explain much more of current account imbalances than fiscal balances. The overall conclusion is that the official flows coefficient is strongly robust and the fiscal balance coefficient is moderately robust.

The second set of results in Table 2 conducts further exploration on the sensitivity of results to different groups of economies. Columns 9-11 show that the change in elderly ratio and the initial level of net foreign assets are very important for industrial economies, with essentially no lost observations, but much less important for developing economies, with many lost observations. Columns 12-16 show that the two main policy variables are fairly robustly related to current account balances across different regions, but the official flows variable is more consistently important. Differences in the coefficient estimates across regions are often economically, and sometimes statistically, significant. Sensitivity of the coefficient estimates to the countries and time periods included is a hallmark of this literature and it is even more pronounced for other regressors than official flows and the fiscal balance. This sensitivity may reflect differences across countries and over time in policy regimes, stages of development, and mobility of goods and capital.

Figure 2 displays an example of the correlation that drives these results. Across major Asian economies, accumulation of substantial quantities of foreign official assets is strongly associated with current account surpluses. This is true for the decade on average and does not merely reflect temporary fluctuations in official flows related to exchange-rate smoothing.

[12] Note that sovereign wealth fund flows and non-reserve official flows are not allocated to specific industrial economies in any of the regression data because there is no information on the proportions going to each destination. In Figure 1, however, they are allocated to the aggregate for industrial economies.

IV. Macroeconomic Implications of the Imbalances

According to the IMF's Fall 2011 *World Economic Outlook* (p. 9),

> "The continued expansion of the global economy has come with increasing cyclical diversity. The picture is one of excess capacity in advanced economies and signs of overheating in emerging and developing economies."

Could the current account imbalances of the developing economies and the official flows that drive them be an important factor behind this two-speed recovery?

The IMF projects that net official financial flows from developing economies will be around $1.2 trillion in both 2011 and 2012.[13] The vast majority of these flows likely were destined for Europe and the United States. $1.2 trillion represents roughly 4 percent of combined EU and US GDP. This is a large flow of capital in net terms. Average net national saving over the past 20 years was about 3 percent of GDP in the United States and 6 percent of GDP in the euro area.[14] The official flow from developing economies means that financial markets in Europe and the United States need to find a productive use for almost double the amount of net new capital that they would otherwise need to allocate.

Based on the regression results of Tables 1 and 2, roughly one-third of these net official flows may be funneled back to developing economies in the form of increased private financial inflows. About two-thirds are likely to be associated with a higher current account surplus of developing economies, representing a significant net drag on aggregate demand in the industrial economies. This assessment is consistent with the IMF's forecast of developing-economy

[13] Projections are from the Fall 2011 IMF *World Economic Outlook* database. These projections do not include flows from most sovereign wealth funds in developing economies or from the new advanced economies of Hong Kong, Israel, Korea, Singapore, and Taiwan, which also have large current account surpluses and positive net official flows. On the other hand, net official flows appear to have eased in the final months of 2011 after the forecast was released.

[14] Data are from the US Bureau of Economic Analysis and Eurostat.

current account surpluses of about $550 billion in 2011 and 2012. Based on previous trends, the developing economies likely would have had a current account deficit of $200-300 billion in the absence of their massive net official financial outflows. So the net effect of the official flows may have been to increase the current account balance of the developing economies by around $800 billion, which is two-thirds of projected net official flows from developing economies in 2011 and 2012.

A reduction in the current account balance of the industrial economies of $800 billion represents a loss of aggregate demand of roughly 2 percent of GDP. According to the IMF, the output gap in the industrial economies in 2011 was around 4 percent of GDP, so the policy-driven imbalances of the developing economies are an important factor behind slow growth in the industrial economies, but not the only factor.

Federal Reserve Chairman Bernanke (2011) apparently concurs with the conclusion that developing-economy currency policies are an important factor behind slow industrial-economy recoveries. In response to a question on Chinese currency policy, he recently said the following, but his remarks apply more broadly to developing-economy policies in the aggregate.

> "I think right now a concern is that the Chinese currency policy is blocking what might be a more normal recovery process in the global economy. In particular, we have now a two-speed recovery, where advanced industrial countries like the United States and Europe are growing very, very slowly; where emerging-market economies are growing quite quickly. In a more normal recovery, a more balanced recovery would have some more demand being shifted away from the emerging markets toward the industrial economies. The Chinese currency policy is blocking that process. And so it is to some extent hurting the recovery

process."

V. Conclusions

Studies of the causes of current account imbalances in developing economies that do not include official financial flows or some other measure of external financial, or exchange rate, policy are like Hamlet without the prince. By far the most important factor behind current accounts in developing economies is the official policy of the government toward the exchange rate, the current account, and/or official holdings of foreign assets. Governments in many economies appear to have sought current account surpluses through massive purchases of foreign assets.

Official financial flows explain less of the pattern of current accounts across industrial economies, probably reflecting the much greater mobility of private capital between industrial economies as compared to developing economies.

Aggregate net official financial flows from the developing economies to the industrial economies are conservatively projected at $1.2 trillion in 2011 and 2012. These flows cause a serious net drag on aggregate demand in the industrial economies and they are a major contributing factor to weak recovery in Europe and the United States.

Table 1. Alternative Factors behind Current Account Balances, 1981-2010
(Pooled cross-country regression on decade averages with decade dummies)
(weighted by country share of world nominal GDP)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Official Flows	0.67**	0.62**	0.66**	0.61**	0.74**	0.74**	0.42**	0.59**
	(.11)	(.10)	(.11)	(.07)	(.11)	(.12)	(.10)	(.07)
Fiscal Balance	0.24*	0.24*	0.23	0.36**	0.28**	0.21	0.35**	0.33**
	(.11)	(.10)	(.12)	(.09)	(.09)	(.11)	(.09)	(.09)
Net For. Assets (× 100)		7.23**					5.92**	5.25**
		(1.40)					(1.38)	(1.29)
Energy Exports			0.02				0.09**	
			(.04)				(.03)	
Change in Elderly Ratio				4.86**			3.08**	3.64**
				(.79)			(1.01)	(.90)
GDP Growth					-0.24		-0.12	
					(.13)		(.16)	
Population Growth					-1.31**		-1.05*	
					(.40)		(.47)	
PPP GDP per capita (rel. to US)						0.53*	-0.97**	
						(.26)	(.36)	
R^2	.42	.51	.42	.55	.50	. 43	.63	. 59
No. Obs.	397	300	296	387	391	387	256	300

Note: This table presents panel regressions using non-overlapping 10-year periods. There are 158 countries and 3 time periods. Some data are missing for some countries, especially in the earlier time periods. A full set of time effects is included. No country effects are included. Current accounts, official flows, fiscal balance, net foreign assets, and energy exports are in percent of GDP. Net foreign assets are measured in the year before the start of each period. Change in elderly ratio is the average annual change in the ratio of persons aged 65 and older to those aged 16 to 64, in percentage points. GDP growth and population growth are in percent average annual rates. PPP GDP per capita is measured as the logarithm of the ratio to US GDP per capita. (The raw ratio was consistently less statistically significant.) Robust standard errors are shown in parentheses. * and ** denote significance at 5 and 1 percent levels.

Table 2. Major Factors behind Current Account Balances, 1981-2010
(Pooled cross-country regression on decade averages with decade dummies)
(weighted by country share of world nominal GDP)

	(1)	Un-weighted (2)	1981-1990 (3)	1991-2000 (4)	2001-2010 (5)	Unadj. Official[1] (6)	Official Only (7)	Fiscal Only (8)
Official Flows	0.67**	0.40**	0.38	0.56*	0.71**	0.67**	0.76**	
	(.11)	(.11)	(.21)	(.26)	(.17)	(.13)	(.10)	
Fiscal Balance	0.24*	0.44**	0.26	-0.04	0.32	0.41**		0.56**
	(.11)	(.13)	(.13)	(.13)	(.26)	(.13)		(.14)
R^2	.42	.28	.21	.16	.56	.34	.39	.19
No. Obs.	397	397	108	131	158	399	430	441

	Ind. Econ. (9)	Devel. Econ. (10)	Devel. Econ. (11)	Devel. Asia (12)	Africa (13)	MENA (14)	Latin America (15)	CEE & CIS (16)
Official Flows	0.69**	0.54**	0.62**	0.73**	0.51**	0.44	0.38**	0.99*
	(.21)	(.08)	(.11)	(.10)	(.17)	(.29)	(.10)	(.38)
Fiscal Balance	0.40**	0.27**	0.32**	0.23**	0.49*	0.55**	-0.13	0.76*
	(.15)	(.09)	(.09)	(.07)	(.23)	(.20)	(.11)	(.30)
Change in Elderly Ratio	3.59**	-2.15	-0.66					
	(1.27)	(2.04)	(1.80)					
Net Foreign Assets (x100)	6.93**	3.85**						
	(1.92)	(1.20)						
R^2	.62	.59	.61	.75	.27	.78	.25	.75
No. Obs.	65	235	321	67	103	40	90	31

Note: This table presents panel regressions using non-overlapping 10-year averages of all data. There are 158 countries and 3 time periods. For a complete country list with regional breakdowns, see Appendix 2. Some data are missing for some countries, especially in the earlier time periods. A full set of time effects is included. No country effects are included. Variables are in percent of GDP, except for elderly dependency ratio. Net foreign assets are measured in the year before the start of each decade. Change in elderly ratio is the average annual change in the ratio of persons aged 65 and older to those aged 16 to 64, in percentage points. Robust standard errors are shown in parentheses. * and ** denote significance at 5 and 1 percent levels.

[1] In this regression, global reserve accumulation is not allocated to recipient countries as negative official flows and no adjustment is made for estimated flows from sovereign wealth funds.

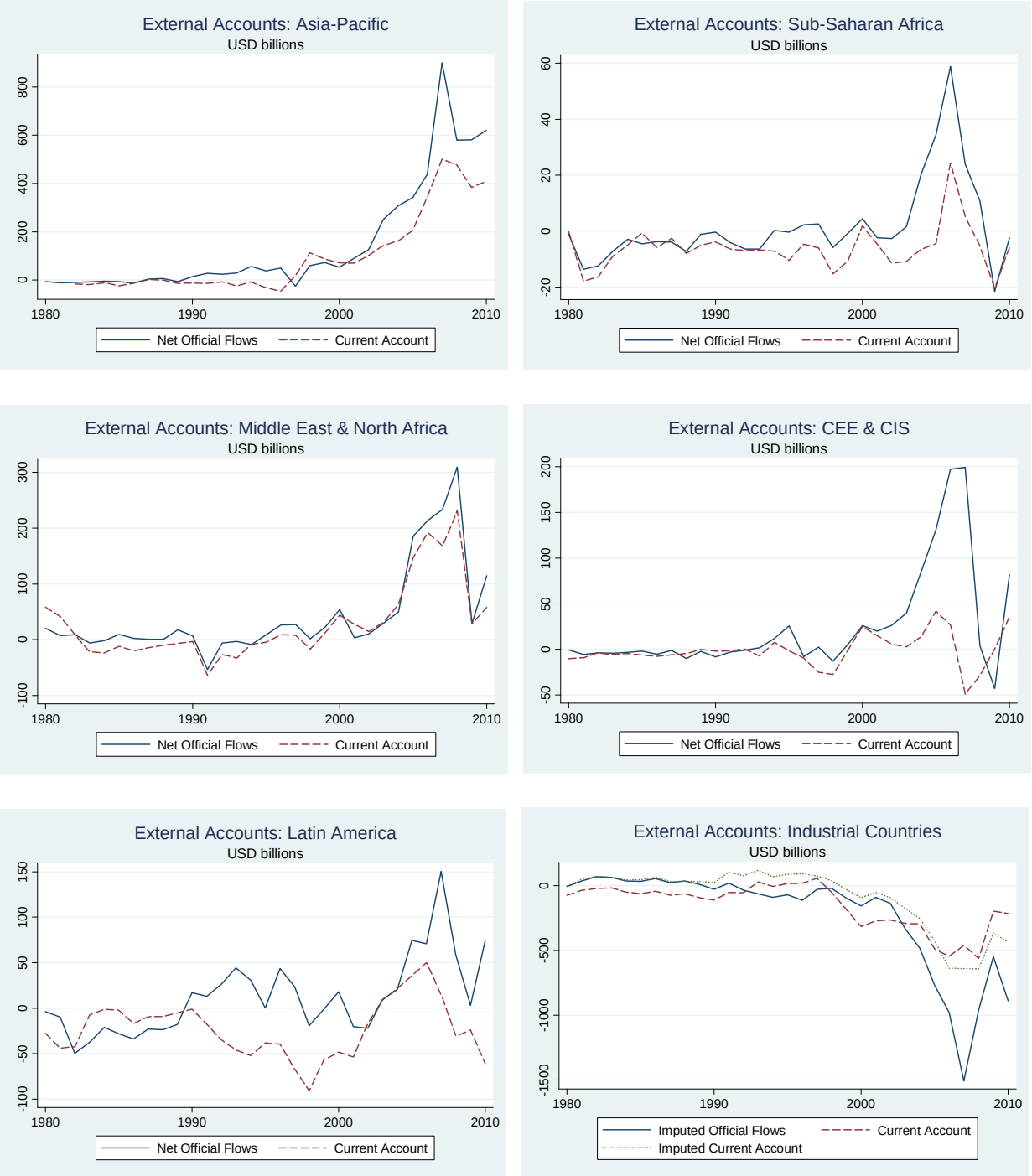

Figure 1. Net Official Flows and Current Account Balances by Global Region

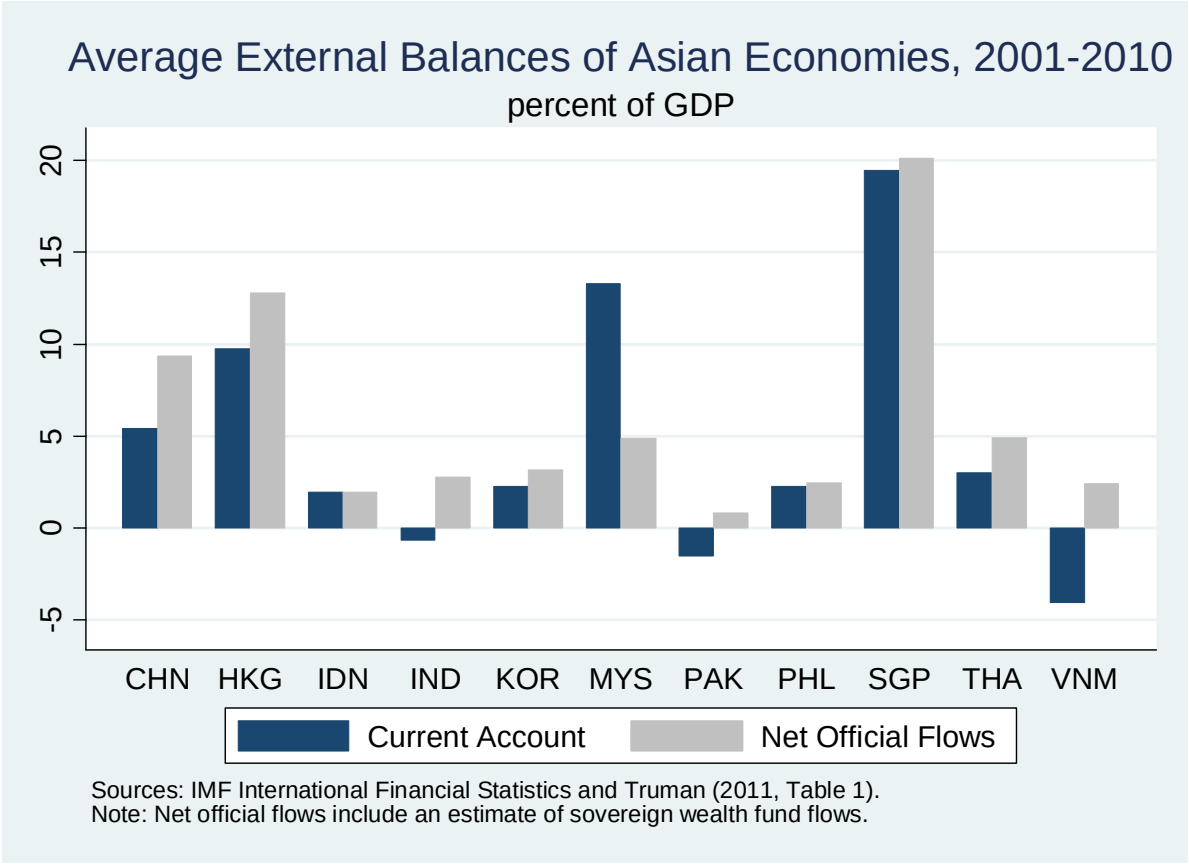
Average External Balances of Asian Economies, 2001-2010
percent of GDP
20
15
10
5
0
-5
CHN
HKG
IDN
IND
KOR
MYS
PAK
PHL
SGP
THA
VNM
Current Account
Net Official Flows
Sources: IMF International Financial Statistics and Truman (2011, Table 1).
Note: Net official flows include an estimate of sovereign wealth fund flows.

Figure 2.

Appendix 1. Coefficient Bias in a Simple Model of the Current Account

The following model abstracts from cyclical factors and dynamics, consistent with the 10-year averaged data used in Tables 1 and 2. Economic variables are denoted in capital letters; unobserved shocks are denoted by lower case letters; parameters are denoted by Greek letters.

1) $CAB = \alpha\, RER + u, \quad \alpha > 0$

2) $RR = \beta\, CAB + v, \quad \beta > 0$

3) $PFF = \gamma\,(RR^* - RR - \rho\, RER) + w, \quad \gamma \geq 0, \quad \rho \geq 0$

4) $CAB = OFF + PFF$

5a) Floating Exchange Rate: $OFF = z$

5b) Fixed Exchange Rate: $RER = z$

The current account balance (CAB) responds positively to the real exchange rate (RER), which is defined so that an increase is a real depreciation. The real rate of interest (RR) responds positively to the CAB because monetary policy tightens to restrain domestic demand and stabilize output when the CAB increases. Private financial flows (PFF) respond positively to the difference between foreign and domestic real rates of interest (RR*-RR). An increase in PFF is an outflow of capital. PFF may respond negatively to the RER to the extent that a depreciated exchange rate is expected to appreciate in the future, as in the standard overshooting model of exchange rates. The case in which $\rho = 0$ corresponds to random-walk expectations in which the future RER is expected to remain at its present value. The CAB equals PFF plus official financial flows (OFF) by identity.

Equations (5a) and (5b) represent external financial policy. In a pure floating exchange rate regime, OFF is an exogenous policy choice. In a pure fixed exchange rate regime, the RER is an exogenous policy choice. In the real world, it is possible to have an intermediate regime,

such as a managed float, but analyzing the two extreme cases will provide natural benchmarks that should encompass intermediate behavior.

This model assumes that prices are sticky, which allows the central bank to affect the real interest rate and the real exchange rate. For simplicity, prices are not modeled explicitly. It is assumed that the central bank's response to output fluctuations (β) is sufficiently strong to be consistent with well-behaved inflation. The central bank has independent control of interest rates and the exchange rate because of its control over official financial flows, as long as private capital is not perfectly mobile ($\gamma < \infty$).

Shocks to the CAB (u) include explicit and implicit trade barriers, natural resource discoveries, global commodity prices, and a country's relative productivity in tradables versus nontradables. Shocks to the RR (v) include monetary and fiscal policy and animal spirits of consumers and businesses. Shocks to PFF (w) reflect poorly understood risk premiums in financial markets (including currency markets) and perceived excess returns on direct investment flows. Shocks to external financial policy (z) include building war chests of foreign exchange reserves, official development lending, and changes in the target exchange rate.

In general, it can be shown that all variables respond to all shocks in the model.[15] The standard approach has been to regress the CAB on observable variables that are elements of the shocks and that are plausibly viewed as exogenous to the CAB. Thus, the fiscal balance, the demographic ratios, per capita income, and growth are elements of the shock v. Net exports of oil and per capita income (through the Balassa-Samuelson effect) are elements of the shock u. In the pure floating exchange rate regime, OFF is exogenous and equal to the shock z. In this case, regressing the CAB on OFF is appropriate for identifying the effect of a shock to external

[15] Regressing the CAB on the RER yields a biased estimate of α because RER responds endogenously to u except under a pure fixed exchange rate regime. Cross-country studies typically do not use RER as a regressor because of the difficulty of finding valid instruments.

financial policy.

Table A.1 displays the asymptotic values of the coefficient of a regression of the CAB on OFF under both floating and fixed exchange rate regimes. These asymptotic values are bounded strictly between 0 and 1. The term σ_u^2 denotes the variance of u; the variances of the other shocks are denoted similarly. Under a floating exchange rate, the asymptotic coefficient does not depend on the relative variances of the shocks. Under a fixed exchange rate, the asymptotic coefficient does depend on the relative variances of the shocks. When the CAB shocks (u) are large (technically, as the ratios of σ_u^2 to the variances of all the other shocks approach infinity) then the asymptotic coefficient under a fixed exchange is in general greater than that under a floating rate (row 2).[16] However, this difference shrinks to zero in the case of random-walk exchange rate expectations ($\rho=0$) which are an implication of a credible fixed exchange rate regime. When the policy shocks (z) are large (row 3), the asymptotic coefficients are identical under both fixed and floating exchange rates. When any of the other shocks dominate (row 4), the asymptotic coefficient under a fixed rate is zero, and thus is smaller than under a floating rate.

The fifth row of the table presents the asymptotic coefficients when PFF does not respond to the interest rate differential ($\gamma=0$). In this case, the asymptotic coefficient under fixed exchange rates is always less than or equal to that under floating rates. The combination of very low values of γ and σ_w^2 describes circumstances of very low capital mobility. As shown in the sixth row of the table, when these parameters equal zero the asymptotic coefficient equals 1 under either floating or fixed exchange rates. Finally, in the case of perfect capital mobility ($\gamma=\infty$), the asymptotic coefficient equals 0 under either floating or fixed exchange rates.

[16] This result is calculated by setting all variances equal to zero except σ_u^2.

Table A.1. Asymptotic Regression Coefficients for CAB on OFF

	Floating: Equation (5a)	Fixed: Equation (5b)
1. general case	$\frac{1}{1+\frac{\gamma\rho}{\alpha}+\beta\gamma}$	$\frac{(1+\beta\gamma)\sigma_u^2+\alpha(\alpha+\gamma\rho+\alpha\beta\gamma)\sigma_z^2}{(1+\beta\gamma)^2\sigma_u^2+(\alpha+\gamma\rho+\alpha\beta\gamma)^2\sigma_z^2+\gamma^2\sigma_v^2+\sigma_w^2+\gamma^2\sigma_{RR^*}^2}$
2. σ_u^2 large	$\frac{1}{1+\frac{\gamma\rho}{\alpha}+\beta\gamma}$	$\frac{1}{1+\beta\gamma}$
3. σ_z^2 large	$\frac{1}{1+\frac{\gamma\rho}{\alpha}+\beta\gamma}$	$\frac{1}{1+\frac{\gamma\rho}{\alpha}+\beta\gamma}$
4. σ_v^2, σ_w^2, $\sigma_{RR^*}^2$ large	$\frac{1}{1+\frac{\gamma\rho}{\alpha}+\beta\gamma}$	0
5. PFF unresponsive to RR*-RR: (γ=0)	1	$\frac{\sigma_u^2+\alpha^2\sigma_z^2}{\sigma_u^2+\alpha^2\sigma_z^2+\sigma_w^2}$
6. No capital mobility: (γ=0 and σ_w^2=0)	1	1
7. Perfect capital mobility: (γ=∞)	0	0

Under a pure floating exchange rate regime, the coefficient in a regression of the CAB on OFF is an unbiased estimate of the effect of an exogenous policy change in OFF on the CAB. Under a managed float or fixed exchange rate, this coefficient may be biased, but under most plausible circumstances the bias will be downward. In other words, the coefficient will be a conservative estimate of the effect of an exogenous policy change in OFF on the CAB.

The coefficient will be biased upward under a fixed exchange rate only if direct shocks to the current account (u) are very large relative to other shocks, capital is highly mobile (γ is large), and expectations of the future real exchange rate are mean reverting (ρ>0). With random-

walk expectations of real exchange rates, which are an implication of a credible fixed exchange rate regime, the bias is never upward for any combination of shocks and parameters.

Appendix 2. Data Definitions and Sources

Where available, data are from the IMF's *World Economic Outlook* (WEO) database (September 2011 version). Missing observations are filled in by the IMF's *International Financial Statistics* (IFS) database and the World Bank's *World Development Indicators* (WDI) database in that order. Data are expressed in percent of GDP except as follows: Change in elderly ratio is the annual change in the ratio of persons aged 65 and older to those aged 16 to 64, in percentage points. GDP growth and population growth are in percent annual rates. PPP GDP per capita is expressed as the logarithm of the ratio to US GDP per capita.

Official flows are the sum of balance of payments flow data for reserves and related items, other assets of monetary authorities, other assets of government, other liabilities of monetary authorities, and other liabilities of government, from IFS. The total of world reserve flows (but not the flows of other assets) is subtracted from the industrial economies in the following percentages, roughly consistent with the IMF's *Composition of Official Foreign Exchange Reserves* data on average over the past decade: 65 percent United States; 10 percent Germany; 5 percent each France, Japan, and United Kingdom; 2 percent each Italy and Netherlands; 1 percent each Australia, Belgium, Sweden, and Switzerland. Estimated sovereign wealth fund flows were added to those economies with sovereign wealth funds as listed in Table 1 of Truman (2011). The Truman estimates for the stock of sovereign wealth assets in 2010 were allocated into flows in proportion to each economy's current account surpluses since the establishment of the fund. For China, the total amount was allocated to the year of establishment as reports suggest that China has not been adding to its sovereign wealth fund since then. For Mexico, which had current account deficits, the total amount was allocated in proportion to energy exports. No attempt was made to allocate developing-economy sovereign wealth fund

flows to specific industrial economies. However, in Figure 1, sovereign wealth fund and all official flows from developing economies are labeled as imputed official flows to the industrial economies in aggregate. Foreign assets of government pension funds as defined in Truman (2011, Table 1) are not treated as official assets because it is assumed that they operate similarly to private pension funds.

The fiscal balance is general government net lending. Net foreign assets are the difference between international investment position assets and liabilities from IFS. Missing historical data for the fiscal balance are filled in with older vintage WEO data graciously provided by Menzie Chinn and Hiro Ito. Missing historical data for net foreign assets are filled in with data from Lane and Milesi-Ferretti (2007) provided that the Lane and Milesi-Ferretti data do not deviate from the IFS data by more than 20 percentage points of GDP in the first year of overlap.

Energy data were reported in terms of tons of oil equivalents. They were converted to US dollars using the price of Brent oil. Energy exports are the difference between energy production and energy use.

The data in Figure 1 are annual. The data used in Tables 1 and 2 and Figure 2 are 10-year non-overlapping averages (except for net foreign assets, which are values from the year before each 10-year period.) For a few observations, the 10-year average data are based on only 9 years when either the first or last year of the decade was missing.

The industrial economies are IFS codes 101 through 196 except for 186 (Turkey). Middle East and North Africa (MENA) is defined to include IFS codes 401-499 plus 186 (Turkey), 612 (Algeria), 672 (Libya), 686 (Morocco), and 744 (Tunisia). Sub-Saharan Africa is defined as IFS codes 199 (South Africa) and 601-799 except for those countries included in

MENA. Asia-Pacific is defined as IFS codes 501-599 and 801-899 plus 924 (China) and 948 (Mongolia). Latin America is defined as IFS codes 201-399. Central and Eastern Europe and the Commonwealth of Independent States (CEE & CIS) is defined as IFS codes 901-999 except 924 (China) and 948 (Mongolia).

References

Abbas, S.M. Ali, Jacques Bouhga-Hagbe, Antonio Fatas, Paolo Mauro, and Ricardo Velloso. 2010. Fiscal Policy and the Current Account. IMF Working Paper No. WP/10/121. Washington: International Monetary Fund.

Abiad, Abdul, John Bluedorn, Jaime Guajardo, Michael Kumhof, and Daniel Leigh. 2011. Separated at Birth? The Twin Budget and Trade Balances. Chapter 4 in *World Economic Outlook* (September 2011). Washington: International Monetary Fund.

Bernanke, Ben. 2011. Response to Senator Casey at Senate Banking Committee hearings on October 4. Available at www.c-spanvideo.org.

Cheung, Calista, Davide Furceri, and Elena Rusticelli. 2010. Structural and Cyclical Factors Behind Current Account Balances. OECD Economics Department Working Paper No. 775. Paris: Organization for Economic Cooperation and Development.

Chinn, Menzie. 2006. The (Partial) Rehabilitation of Interest Rate Parity in the Floating Rate Era: Longer Horizons, Alternative Expectations, and Emerging Markets. *Journal of International Money and Finance* 25: 7-21.

Chinn, Menzie, Barry Eichengreen, and Hiro Ito. 2011. A Forensic Analysis of Global Imbalances. Manuscript, University of Wisconsin at Madison, March.

Chinn, Menzie, and Hiro Ito. 2008. Global Current Account Imbalances: American Fiscal Policy versus East Asian Savings. *Review of International Economics* 16, no. 3: 479-98.

Chinn, Menzie, and Eswar Prasad. 2003. Medium-term Determinants of Current Accounts in Industrial and Developing Countries: An Empirical Exploration. *Journal of International Economics* 59: 47-76.

Gagnon, Joseph. 2011. Current Account Imbalances Coming Back. Working Paper WP 11-1. Washington: Peterson Institute for International Economics.

Gruber, Joseph, and Steven Kamin. 2007. Explaining the Global Pattern of Current Account Imbalances. *Journal of International Money and Finance* 26: 500-22.

Gruber, Joseph, and Steven Kamin. 2009. Do Differences in Financial Development Explain the Global Pattern of Current Account Imbalances? *Review of International Economics* 17, no. 4: 667-88.

Lane, Philip, and Gian-Maria Milesi-Ferretti. 2007. The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970-2004. *Journal of International Economics* 73: 223-50.

Lee, Jaewoo, Gian-Maria Milesi-Ferretti, Jonathan Ostry, Alessandro Prati, and Luca Ricci.

2008. Exchange Rate Assessments: CGER Methodologies. Occasional Paper 261. Washington: International Monetary Fund.

Ostry, Jonathan, Atish Ghosh, Karl Habermeier, Marcos Chamon, Mahvash Qureshi, and Dennis Reinhardt. 2010. Capital Inflows: The Role of Controls. IMF Staff Position Note SPN/10/04. Washington: International Monetary Fund.

Truman, Edwin. 2011. Sovereign Wealth Funds: Is Asia Different? Working Paper WP 11-12. Washington: Peterson Institute for International Economics.