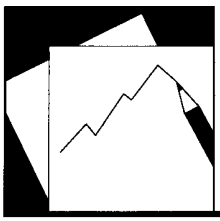
WP/09/221



IMF Working Paper

External Balance in Low Income Countries

Lone Christiansen, Alessandro Prati,
Luca Antonio Ricci, and Thierry Tressel

INTERNATIONAL MONETARY FUND

© 2009 International Monetary Fund WP/09/221

IMF Working Paper

RESEARCH DEPARTMENT

External Balance in Low Income Countries

Prepared by Lone Christiansen, Alessandro Prati, Luca Antonio Ricci, and Thierry Tressel [1]

Authorized for distribution by Jonathan D. Ostry

October 2009

Abstract

This Working Paper should not be reported as representing the views of the IMF.
The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

This paper offers a coherent empirical analysis of the determinants of the real exchange rate, the current account, and the net foreign assets position in low income countries. The paper focuses on indicators specific to low income countries, such as the quality of policies and institutions, the special access to official external financing, and the role of shocks. In addition to more standard factors, we find that domestic financial liberalization is associated with higher current account balances and net foreign asset positions, while capital account liberalization is associated with lower current account balances and net foreign asset positions and with more appreciated real exchange rates. Negative exogenous shocks tend to raise (reduce) the current account in countries with closed (opened) capital accounts. Finally, foreign aid is progressively absorbed over time through net imports, and is associated with a more depreciated real exchange rate in the long-run.

JEL Classification Numbers: F31, F32, F21, F34, F35

Keywords: current account, real exchange rate, net foreign assets, developing countries.

Author's E-Mail Address: lchristiansen@imf.org; lricci@imf.org; ttressel@imf.org

[1] The paper is forthcoming in the NBER volume *International Seminar on Macroeconomics* 2009, edited by Lucrezia Reichlin and Kenneth West. It is based on a project of the IMF Research Department on external performance in low income countries (LICs). The team for the project comprised also Stephen Tokarick, to whom the authors are greatly indebted and thankful. Peter Pedroni has been an impressive consultant for the project and the authors are very grateful for the invaluable help he offered via extensive support, discussions, and advice. The authors are also very grateful to Oya Celaysun for her views on issues related to the net foreign assets in LICs, and benefited from comments from Andy Berg, Olivier Blanchard, Nicolas Courdacier, Atish Ghosh, Michael Klein, Nelson Mark, Peter Montiel, Jonathan Ostry, Antonio Spilimbergo, Kenneth West, other colleagues at the IMF, and participants in the 2009 NBER International Seminar on Macroeconomics. Freddy Cama and Murad Omoev offered excellent and patient research assistance. Alessandro Prati passed away on June 21, 2009. His intellectual depth was and will remain a vast source of inspiration to all of us.

Contents Page

I. Introduction 3

II. Determinants of External Balance....6

III. Empirical Results....12
A. Data....12
B. Analysis of Medium-Term Current Accounts....13
C. Empirical Analysis of the Real Exchange Rate....18
D. Empirical Analysis of the Net Foreign Asset Position....21

IV. Conclusions....23

I. INTRODUCTION

This paper investigates empirically the external balance of low income countries, by offering a coherent analysis of determinants of medium-to-long-term real exchange rates, current accounts, and net foreign assets, and highlighting factors that are more likely to be specific to these countries. The rise and persistence of large external imbalances in recent years have renewed interest in this area from an empirical and theoretical perspective, and have also highlighted the need for a multi-pronged approach to the analysis of external balances based on multiple indicators. In this paper, the simultaneous analysis of the three aforementioned indicators of external balance allows us to check the consistency of the results across indicators, an effort generally absent in the literature. The focus on low income countries aims at filling another gap. Although the literature on the determinants of the real exchange rate and of the current account is very vast, very few contributions focus specifically on low income countries, or account for features that are quite specific to—or more important for—this set of countries. Our analysis emphasizes factors such as structural policy and institutional distortions, access to special external financing, and a larger macroeconomic sensitivity to exogenous shocks. For the purpose of the empirical analysis, extensive efforts were required to create a wide database, which is unique in terms of the set of indicators and countries covered.

A large literature has based the analysis of medium term determinants of current accounts (CA) on the standard intertemporal approach to the current account emphasizing saving and investment decisions (see for instance Chinn and Prasad (2003) and Lee et al. (2008)).[2] A more recent empirical literature has aimed at explaining the patterns of global imbalances that have widened over the past decade as function of financial crisis, financial development and distortions, and institutional variables (Gruber and Kamin (2007, 2008); Chinn and Ito (2007); and, from a theoretical perspective, Mendoza et al. (2008); Caballero et al. (2008) and Gourinchas and Jeanne (2009)). Others have illustrated the role of labor market policies and exchange rate regimes in influencing the persistence and dynamics of the current account (Ju and Wei (2007) and Chinn and Wei (2008)) and the relationship between labor market, financial frictions, and fiscal policies in shaping the optimal current account responses to shocks (Blanchard (2006)).

The literature on real exchange rates (RER) is vast and we cannot do justice to all contributions. Broad surveys are offered by Froot and Rogoff (1995), Rogoff (1996) and, for developing countries, by Edwards (1989), Hinkle and Montiel (1999), and Edwards and Savastano (2000). [3] The traditional findings of Meese and Rogoff (1983) on the

[2] This literature has been drawing from an earlier literature on the determinants of saving in advanced countries and emerging markets (Schmidt-Hebbel et al. (1992); Edwards (1995); Masson et al. (1998)) and of capital flows (e.g. Bosworth et al. (1999)).

[3] For a recent application to Central and Eastern European countries see Maeso-Fernandez, Osbat, and Schnatz (2004).

unpredictability of exchange rates at short horizons are still undisputed, and the literature has converged towards explaining the behavior of real exchange rates at medium to long-term horizons as a function of fundamentals (see for example Engel and West (2005) and Engel et al. (2007)). Empirical analysis of long-run real exchange rates are typically guided by steady-state relationships in models involving the intertemporal and intratemporal allocation of resources between tradable and nontradable sectors (Obstfeld and Rogoff (1996), Vegh (2009), Montiel (2003), and Ricci et al. (2008)).

A growing literature has uncovered the medium-term determinants of gross and net foreign assets (NFA), after the creation of the Lane and Milesi-Ferretti database of external positions (for the latest version, see Lane and Milesi-Ferretti (2006)). Lane and Milesi-Ferretti (2001) offer a theoretical and empirical discussion of long-term determinants of the net foreign asset position. Faria et al. (2007) show that more open economies with better institutions have a greater equity share in external liabilities.

Few studies have focused on low-income countries (LICs) with the notable exceptions of Edwards (1989) and Hinkle and Montiel (1999).[4] In this paper, we argue that LICs differ from other countries mainly along three broad dimensions, which simultaneously affect the current account, the real exchange rate, and the net external asset position: (i) structural policies or distortions, in particular those related to the capital account and the domestic financial system; (ii) exogenous shocks, in particular natural disasters (whose effect may depend on the degree of capital account openness) and terms of trade shocks; and (iii) official external financing (grants and concessional loans).

We believe that these factors are particularly important for our sample of countries. First, low income countries face greater distortions—some of which are policy-induced—than other countries. For example, capital account controls—which were prevalent for a large number of countries over the sample analyzed—may reduce the ability of LICs to borrow in order to bring consumption and investment forward, as required by a lower level of development or the occurrence of negative shocks. They may therefore affect domestic demand, the current account, the net foreign assets, and the real exchange rate.[5] Domestic financial liberalization, which occurred during the 1980s and the 1990s in many developing countries, may reduce borrowing constraints and boost investment, which would tend to lower the current account and the net foreign assets position, and appreciate the real exchange rate. But financial

[4] For recent contributions, see Chudik and Mongardini (2007), Delechat (2008), Di Bella, Lewis, and Martin (2007), Elbadawi (2007), Kireyev (2008), Roudet, Saxegaard, and Tsangarides (2007). The impact of fiscal and monetary policies on the real exchange rate and the current account in presence of large distortions has been explored by Edwards (1988) and Prati and Tressel (2006). Prati and Tressel (2006) and Berg et al. (2007) show in particular that aid recipient countries' absorption of foreign aid inflows is affected by policy responses, often resulting in the accumulation of foreign exchange reserves.

[5] Gourinchas and Jeanne (2009) argue that the patterns of capital flows to developing countries do not coincide with the predictions of the standard neoclassical theory, and suggest a theory based on frictions affecting saving and investment decisions. Many LICs initiated capital account liberalization during the period of analysis which gives us the possibility to test these and other theoretical predictions.

liberalization may also raise private savings, which, everything else equal, would improve the current account and the net foreign assets position, and depreciate the real exchange rate.

Second, low-income countries are in general more exposed to shocks than other countries, and may—as a result of the lack of diversification of their production structure—experience larger macroeconomic consequences associated with these shocks. [6] For example, LICs are exposed to frequent terms of trade fluctuations associated both with their exports (for example, main crop or natural resources), and with their imports (for example, oil). Such terms of trade fluctuations affect the real exchange rate and the current account through income and intra- and inter-temporal substitution effects. Moreover LICs frequently experience natural shocks, such as droughts, floods, windstorms, and earthquakes, which have larger macroeconomic consequences than in high and middle income countries—including on the external position. Finally, wars and violent political transitions between regimes have often occurred in the historical sample. Such events, by disrupting investment, consumption, and capital flows, can have a bearing on the current account and the real exchange rate at a relatively short horizon.

Lastly, capital flows are typically of a different nature in low income countries than in other countries. A large part of their foreign borrowing is in the form of official development assistance (grants or concessional loans). Such capital flows do not respond to market incentives, and often do not need to be repaid, thus contributing to financing larger trade deficits over the medium-term. Finally, aid flows have often been associated with the risk of Dutch disease as resource transfers, and are expected to lead to more appreciated real exchange rates in the short-run by increasing aggregate demand (Van Wijnbergen (1984)). In the long run, however, the effect on the real exchange rate is uncertain, depending on the relative impact on the productivity of tradables versus the one of nontradables (Torvik (2001)).

To anticipate some of results for the indicators that are more important for low income countries, we find that domestic financial liberalization is associated with higher current account balances and net foreign asset positions, suggesting a positive effect on domestic savings. Capital account liberalization tends to be associated with lower current account and net foreign asset positions, and more appreciated real exchange rates, as predicted by standard theories. Negative exogenous shocks tend to raise (respectively reduce) the current account in countries with closed (respectively opened) capital accounts pointing at the importance of capital account frictions in shaping intertemporal consumption-smoothing decisions. Finally, foreign aid is progressively absorbed over time through net imports, and is associated with a more depreciated real exchange rate in the long-run, a result that may reflect larger productivity gains in the non-tradable sector relative to the tradable one.

The paper is organized as follows. Section II reviews the theoretical literature on the determinants of the external balances. Section III presents the results of the empirical analysis. Section IV concludes.

---

[6] See for instance Easterly, Kremer, Pritchett, and Summers (1993).

II. DETERMINANTS OF EXTERNAL BALANCE

This section mainly reviews the determinants of the real effective exchange rate and of the current account, with particular emphasis on factors that are important fundamentals for LICs. Towards the end of the section we will discuss the more limited literature on the determinants of net foreign assets (which generally follows similar intuitions as the current account). The main emphasis will be on the theoretical arguments that can guide our empirical analysis, but we will also highlight the empirical contributions related to each conceptual argument, in order to ease comparison with our results. Potential determinants are grouped into 4 main groups: (i) main determinants already identified in the literature (macroeconomic policies, pre-determined characteristics, and stage of economic development); (ii) structural policies, distortions, and institutions; (iii) shocks, and (iv) external financing.

Economic theory underpins the relationship between the real exchange rate, the current account, and a number of macroeconomic variables. In principle, factors that affect the real exchange rate should also affect the current account: for example factors influencing aggregate demand will generally impact both the current account and the real effective exchange rate. However, theoretical foundations for the empirical analysis of the real exchange rate have usually been derived from long-run steady state analysis of models with tradable and nontradable goods in the presence of balanced trade.[7] At the same time, empirical analysis of the current account has been underpinned by the intertemporal approach to the current account, often in single goods models, hence without a meaningful exchange rate (Edwards (1989), Obstfeld and Rogoff (1996), Hinkle and Montiel (1999), and Vegh (2009)). In discussing the various determinants, we will highlight the possible joint effects.

Macroeconomic policies, pre-determined characteristics, and economic development

Fiscal policy. In absence of Ricardian equivalence, fiscal policy affects aggregate demand, national savings and therefore the current account balance and the real exchange rate.[8] Empirically, Chinn and Prasad (2003) and Lee et al. (2008) find that the fiscal balance is significantly and positively associated with the current account in pooled OLS regressions.[9] Fiscal policy affects also the real exchange rate through a composition effect in a multigood

[7] For a theoretical and empirical extension of the RER analysis to a setup with imperfect substitutability, see Mac Donald and Ricci (2007).

[8] Blanchard (1984) and Weil (1989) present models breaking Ricardian equivalence in infinitely lived agent models by respectively introducing a positive probability of death and successive cohorts of infinitely lived agents. In such models, a fiscal deficit (surplus) raises (reduces) the current generation's consumption and reduces (increases) the current account balance by shifting taxes to future (unborn) generations.

[9] However, with country fixed effects, the fiscal balance tends to become insignificant in a sample of advanced countries (Chinn and Prasad (2003), Chinn and Ito (2007), and Gruber and Kamin (2007)).

economy even in the presence of Ricardian equivalence (Obstfeld and Rogoff, 1999). If government spending falls relatively more on non-traded goods than on private consumption (which is often the case for government consumption), it will lead to an appreciation of the real exchange rate, as the relative price of nontraded goods must increase in order to maintain internal and external balance (Vegh (2009) and Hinkle and Montiel (1999)). Consistent with this prediction, the empirical literature tends to find a positive coefficient (see for example Ricci et al. (2008) and De Gregorio et al. (1994)).

Net foreign assets. Countries with initially higher net foreign assets can afford higher spending (above income flow)—and therefore a lower current account—while remaining solvent.[10] However, in economies with uncertain horizon, non-zero steady state current accounts are positively associated with steady-state net foreign assets (see Lane and Milesi-Ferretti (2002), Chinn and Prasad (2003), and Lee et al. (2008), for consistent empirical evidence in pooled OLS regressions).[11] Moreover, in steady-state, higher net foreign assets allow higher consumption of both tradable and non-tradable goods while remaining solvent, implying a more appreciated real exchange rate (Lane and Milesi-Ferretti (2002) and (2004) and Ricci et al. (2008)). This relationship may not hold in low-income countries experiencing debt relief: if an increase in debt is expected to benefit from debt relief in the future, lower net foreign assets resulting from the increase in debt may not be associated neither with lower consumption needed to service external liabilities through trade surplus, nor with changes in the real exchange rate. The effect of such expectations cannot be disentangled in the data and would also be reflected in the coefficient of net foreign assets in current account and real exchange rate regressions.

Demographics. Under the life-cycle hypothesis, a higher share of inactive dependent population reduces national savings and the current account balance, and therefore results in a more appreciated real exchange rate. In an overlapping generation model, a higher share of working-age agents raises national savings, thus increaseing the current account. Population growth and fertility have a negative effect on the current account and a positive one on the real exchange rate if they are correlated with the share of young inactive in the population. These predictions are confirmed empirically in the analysis of the current account (see for example, Lee et al. (2008)), of the real exchange rate (see Rose et al. (2008)) and of net foreign assets (see Lane and Milesi-Ferretti (2001)).

Stage of development and economic growth. Neoclassical theory predicts that countries at an early stage of development should import capital and borrow against their future income to finance their investment needs and smooth out consumption, given high marginal utility of

[10] Obstfeld and Rogoff (1999, Chapter 2).

[11] In a growing economy, a positive steady-state relationship between the current account and the net foreign assets would also be observed. Blanchard (1984) or Weil (1989) present models with uncertain horizon or distinct infinitely lived dynasties, where the current account does not need to be zero in steady state even with infinitely lived agents: countries with positive (negative) steady-state net foreign assets will enjoy current account surplus (deficit) in steady-state. There could also be systematic differences between debtor and creditor countries in the relationship between current account and net foreign assets (Kraay and Ventura (2000)).

consumption (Obstfeld and Rogoff (1999)). Similarly, fast growing countries with higher expected productivity gains should invest more, implying a deterioration of the current account.[12] Finally, high productivity growth in the tradable sector relative to the non-tradable should be associated with a more appreciated real exchange rate (Balassa-Samuelson effect): an increase in productivity in the tradable relative to the nontradable sector, with respect to trading partners, will lead to higher wages in the tradable sector (whose price is given in world markets if the country is small) and subsequently put upward pressures on wages and prices in the nontraded sector. Ricci et al. (2008) and Choudhri and Khan (2005) find that a 10 percent increase in the productivity of tradables relative to non-tradable tends to appreciate the real exchange rate by about 1 to 2 percent on average. Moreover, higher income will result in an upward pressure on prices of nontraded goods relative to traded goods, as traded goods are priced on the international market, leading to a real exchange rate appreciation.[13] However, a good measure of relative productivity is not easily available in low-income countries. Therefore, this paper uses real GDP per capita as a proxy variable, as in most of the literature. As this variable may not accurately capture the relative productivity effects—on the contrary, it averages out productivity in tradables and nontradables—the expected sign on this proxy is not clear.

Policy distortions and institutions

Domestic financial reforms. A more developed financial system facilitates investment and helps attract foreign capital, thereby lowering the current account balance and appreciating the real effective exchange rate.[14] A more developed financial system may also improve the current account balance and depreciate the real exchange rate if it stimulates domestic savings (Mac Kinnon (1973) and Edwards (1995)).[15] Gourinchas and Jeanne (2009) model an open economy in which both investment and saving decisions are distorted by "wedges" affecting the return to capital. Their model predicts that financial liberalization can have ambiguous effects on the external position of a developing country: a reduction of the saving distortion tends to *reduce* capital inflows by increasing domestic savings, but a reduction of the investment distortion tends to *increase* capital inflows by raising capital scarcity.[16]

[12] The effect of trend output growth on the current account can be ambiguous. In an overlapping generation model, an increase in trend output growth also raises aggregate savings by raising the wealth accumulated by the young relative to the wealth decumulated by the old (who had lower income when young). Hence such a model predicts a positive effect of trend output growth on the current account (Modigliani (1986)).

[13] The effect is more complex in the presence of non-homogeneous goods (see Mac Donald and Ricci (2007)).

[14] Greenwood and Jovanovic (1990) show that domestic financial reforms may increase investment by relaxing borrowing constraints. More broadly, a the large literature has identified theoretically and empirically the channels through which financial development affects investment and economic growth (for example, Levine (1997) and Fry (1995)).

[15] Empirical contributions found a weak link between domestic financial liberalization—measured by the real interest rate—and private saving rates in developing countries (Loayza, Schmidt-Hebbel, and Servén (2000)).

Empirical analysis has usually relied on measures of financial development as a proxy for the degree of financial liberalization, and has found at best weak effects on the current account (Gurber and Kamin (2007) and Chinn and Ito (2007)).

Capital account openness. Neoclassical theory predicts that, over the development process, capital account liberalization should be associated with a deterioration of the current account (capital inflows) and a real exchange rate appreciation in developing countries, and with an improvement of the current account (capital outflows) and a real exchange rate depreciation in advanced countries (Lucas (1988) and Edwards (1989)).[17] Moreover, a more open capital account allows countries to borrow against future income and therefore to run a lower current account balance when hit by a temporary negative income shock (Vegh (2008)). However, Kraay and Ventura (2000) show that, if the marginal unit of wealth is invested in the same way as the average unit of wealth, transitory positive income shocks will lead to a current account deficit (surplus) in countries with negative (positive) net foreign assets.

Institutions. Broad institutional characteristics such as the quality of property rights and contract enforcement can have first order effects on the current account balance and capital flows. Countries with better institutions may be more able to attract a steady flow of foreign capital as a result of lower expropriation risks, and therefore can sustain lower current account balances and net foreign asset position (Alfaro et al. (2007) and Gruber and Kamin (2007)). However, in countries with better institutions, the political process may produce exchange rate policies less likely to favor overvalued real exchange rates, and therefore result in higher current account and net foreign asset positions. The same outcome may arise from better institutions generating an environment more conducive to saving.

Trade reforms. The effect of trade reforms on the current account and the real exchange rate is theoretically ambiguous (Edwards (1990)). Trade reforms that are temporary (or perceived as temporary) may worsen the current account by reducing the price of imported goods relative to domestically produced goods (intra-temporal substitution effect). The inter-temporal effect is ambiguous: the current account should improve as a result of the income effect, but a lower price for today's consumption relative to future consumption negatively impacts the current account balance (Ostry, 1990).[18] The effect of trade liberalization on the real exchange rate depends on whether income or substitution effects dominate. As trade is liberalized, the increase in real income resulting from lower import prices tends to appreciate

---

[16] An alternative model of the effect of financial globalization on the external position is the one of Martin and Rey (2006), who show that financial liberalization can result in a crash and a reversal of the current account. To account for such effects, our empirical estimations will include dummy variables for financial crisis.

[17] Empirical evidence has not confirmed the direction of capital flows predicted by the basic neoclassical theory. See for instance Prasad, Rajan and Subramanian (2007), and Gourinchas and Jeanne (2009).

[18] Permanent liberalization may also affect the current account if perceived as temporary: if the reforms lack credibility and agents anticipate a policy reversal, agents will consume more today, and the current account would deteriorate because of intertemporal substitution effects (Calvo (1987)).

the real exchange rate.[19] However, trade liberalization may also shift demand away from nontraded to traded goods, resulting in a depreciation. A similar result would arise from the direct effect of liberalization (say tariff reduction) on the reduction of the domestic price of tradables. The evidence is generally in favor of the latter effect (see Ricci et al. (2008) and Goldfajn and Valdes (1999)).

Price controls and black market premium. Administered prices keep prices below the market level and are therefore associated with a more depreciated real exchange rate (see evidence in Ricci et al. (2008)). However, price controls may also take the form of a marketing board pushing domestic prices up, which would therefore be associated with a more appreciated real exchange rate. Finally, a black market rate that is more depreciated than the official exchange rate (i.e. a positive black market premium indicating expectations of a devaluation of the official rate) is likely to be associated with a more appreciated real exchange rate (based on the official rate, which is the prevalent basis for measuring real exchange rates) for given fundamentals.

Shocks

Terms of trade. The effect of an improvement in the terms of trade is uncertain and mainly depends on whether the substitution or the income effect dominate. An improvement in the terms of trade arising from an increase in the price of exports raises the current account, as part of the positive income shock is saved to smooth out consumption over time, and appreciates the CPI-based real exchange rate as the increase in domestic demand (associated with the income effect) bids nontraded goods prices up (Ostry (1988) and Edwards and Ostry (1992)). However, an improvement in the terms of trade arising from a decrease in the price of imports may also result in a worsening of the current account and a real depreciation if agents substitute imported goods for domestically produced goods or for future imported goods (Obstfeld and Rogoff (1999) and Vegh (2009)). If imports are used as intermediate inputs in production, the last effect on the real exchange rate would be compounded, as domestic goods produced with those imports would tend to experience a decline in price. Overall, evidence shows a positive effect on the real exchange rate from a terms of trade improvement (see Ricci et al. (2008), Cashin, Cespedes, and Sahay (2004), Chen and Rogoff (2003), and Ostry and Reinhart (1992); for an analysis of the separate effect of import and export prices, see Christiansen and Tokarick (2009)).

Natural disasters. A negative income shock positively affects the current account balance if national savings increase, or if investment falls relative to savings, as a consequence of the shock. However, the current account could worsen if the country can smooth consumption out by borrowing on international financial markets (Obstfeld and Rogoff, 1999). Thus, we expect the effect of natural disasters to depend on the degree of capital account openness.[20]

[19] Liberalization would also increase permanent income if the distortion associated with trade restrictions reduces productivity (for example because of lower availability of intermediate inputs used in a love-for-variety production function, such as a Dixit-Stiglitz one).

[20] It may also depend on the initial net foreign asset position (Kraay and Ventura (2000) and Guo and Jin (2009)).

When considering the long-run relationship between the real exchange rate and its fundamentals, we may expect shocks not to play any role, as it is likely that they have only temporary effects.

External financing

Official Aid

In the short-run, a surge in aid could push up domestic prices and induce a real exchange rate appreciation as supply has a limited ability to respond to an increase in aggregate demand financed by aid. In the long-run, however, the effect of aid on the real exchange rate is theoretically ambiguous, as aid flows may cause an increase (decrease) in the productivity of the nontraded goods sector *relative to* the productivity of the traded sector, hence leading to a real exchange rate depreciation (appreciation).[21]

To empirically estimate the impact of aid on the current account, aid must be broken down into its two main components (grants and concessional loans), given that they are accounted for in different parts of the balance of payment (the former enters the current account and the latter the financial account). Also, to the extent that aid flows are usually redistributed to private agents through government expenditures and are not intermediated by the domestic financial system, their effect on the external position is independent of the impact of domestic financial liberalization. Conceptually, and as a first order approximation, aid flows can be modeled as exogenous transfers.

Grants. Countries receiving a steady flow of grants are able to sustain a lower trade balance in the medium-term. Given that grants are accounted for in the current account section of the balance of payment, the current account should remain unchanged if a grant fully finances a deterioration of the trade balance. If, on contrary, part of the grant is saved in the form of international reserves, the current account will improve.[22]

Concessional loans. Concessional loans allow to finance a lower current account in the medium-term. Moreover, debt on concessional terms poses a measurement issue as it creates a gap between the nominal and the present market value of net foreign assets.[23] This paper

[21] Torvik (2001) shows how such ambiguity results from a model with traded and non-traded sectors, learning by doing, and spill-over effects. If aid tends to expand the size of the non-traded sector, productivity will grow faster in the non-traded sector than in the traded sector, as a result of stronger learning by doing in the non-traded sector. Hence, the real exchange rate will depreciate in the long-run as a result of a permanent aid inflow.

[22] See Berg et al. (2007) and Prati and Tressel (2006) for evidence on the relationship between aid flows, policies and current account balances in aid receiving countries, and Mongardini and Rayner (2009) for evidence on the relationship between aid flows, policies, and the real exchange rate.

[23] Extensive borrowing on concessional terms imply that net present value (NPV) calculations are crucial in order to derive realistic indicators of the net external position of LICs. New measures of net foreign assets encompassing the net present value of external debt have been constructed, which for some countries can be substantially different from the standard net foreign asset measure.

examines the effect of net foreign assets when accounting for the present value of public and publicly guaranteed debt. [24] This valuable correction has of course limitations as, given data availability, the additional effect from expected future debt relief cannot be not accounted for.

The literature on the net foreign assets is more limited, in part because the empirical analysis was impaired by the lack of good data until recently (see Lane and Milesi-Ferretti (2006) for a second edition of their dataset). Lane and Milesi-Ferretti (2001) offer a theoretical and empirical discussion of the main determinants for advanced economies and developing countries. First, public debt tends to reduce net foreign assets, similarly to the effect of budget deficits on the current account. Second, a higher share of dependent population implies the need to run down savings (and thus reduce net foreign asset), in order to consume more. Third, the relation between income and net foreign assets is more uncertain. A positive relation is suggested by the standard development model where poor countries borrow and rich countries lend, but can also be derived in models with habit formation, or nonlinearities in the utility function. However, a negative relationship with income may arise as a result of limited access to international markets or a high desire for precautionary saving in developing countries. Finally, richer countries tend to invest more in equity (see Faria et al. (2007)), which is more likely to offer a higher long term return and result in a higher net foreign assets.

III. Empirical Results

A. Data

The exercise required an extensive data gathering and cleanup exercise. We constructed a dataset containing 134 countries over the period 1980-2006 for various indicators. Countries used in the main analysis were classified based on their income group. Our LICs sample (see Appendix Table A1) comprises "low income" or "lower middle income" according to the World Bank classification, and excludes emerging markets to make the sample as homogenous as possible (China, Colombia, India, Indonesia, Pakistan and Thailand). "High income" and "higher middle income" countries (in the World Bank classification), including the 6 countries above, were mainly used as a comparator group of high income countries (HICs). A summary statistic of the main data is provided in Appendix Table A2. A description of all variables is provided in the Appendix. The number of low income countries entering the regressions varies across specifications based on data availability for the specific indicators, but the largest low income country set (used in the trading partner calculations and in regressions with standard fundamentals) includes 59 low- and lower middle-income countries.

[24] We are grateful to Ibrahim Levent and his team at the World Bank for sharing with us the net present value calculations.

B. Analysis of Medium-Term Current Accounts

This section analyzes the medium-term relationship between the current account and a set of fundamentals. Following the existing literature, the estimations consist of an unbalanced panel of non-overlapping four-year averages over the period 1981-2005 with 6 observations for most countries.

Benchmark CA regressions for low-income countries[25]

Our preferred current account regressions for our sample of LICs are reported in Table 1. In addition to country fixed effects, the regressions include traditional variables (see for example Chinn and Prasad (2003), Chinn and Ito (2007), and Lee et al. (2008)) such as the fiscal balance, demographic variables (the old age dependency ratio, population growth), the initial net foreign asset position, the oil trade balance, and variables related to the stage of development (GDP per capita relative to the US, and real per capita GDP growth). Most notably, the ratio of the fiscal balance to GDP in relation to trading partners, and population growth remain strongly significant in our sample of LICs with the expected sign.

Our set of control variables also include a measure of the terms of trade which has traditionally not been included in current account regressions. Our findings are consistent with the interpretation that income effects resulting from terms of trade fluctuations have a strong impact on the current account: a temporary improvement in the terms of trade tends to improve the current account as part of the increase in income is saved to smooth consumption over time.

Columns 1 to 7 report regressions in which we introduce—one by one or in groups—our new medium-term determinants of the current account, in addition to the previous set of medium-term determinants of the current account. Column 8 and 9 summarize our preferred results, either when maintaining standard determinants, or when using a parsimonious specification with only significant variables.

Regarding official financing, an aggregate measure of foreign aid is significantly and negatively correlated with the current account.[26] The estimated coefficient implies that, for any 1$ of aid, the current account deteriorates by about 0.1$ during the same period. Consistent with theoretical predictions of normative models (see for instance Torvik and Matsen (2004)), on average, a large share of aid is not immediately spent on net imports, and is indirectly saved as foreign exchange reserves (Berg et al. (2007) and Prati and Tressel (2006) provide consistent evidence that macroeconomic responses to aid surges may limit the short-run absorption of aid in LICs).

---

[25] Most variables in the analysis are computed in relation to trading partners, and the main results are not affected if we also remove the period sample mean from other variables.

[26] We use the aggregate measure of foreign aid adjusted for debt relief, in percent of GDP, as constructed by Roodman (2005).

As the two components of foreign aid (grants and concessional loans) are accounted for in separate parts of the balance of payments (the current account and the financial account, respectively), we present regressions separating these components in column 2, 6, 8, and 9. The estimated coefficients imply that, on average, about 80 percent of grants are fully absorbed through an increase in net imports over a 4 years period, while only 30 to 50 percent of concessional loans received are absorbed through net imports over the same horizon (see Prati and Tressel (2006) for a model of macroeconomic policy responses to aid flows).[27]

Domestic financial reforms are associated with higher current accounts, suggesting that these reforms boost domestic private savings more than investment. This interpretation is consistent with the Mc Kinnon hypothesis (initially formulated by Mc Kinnon (1973) and also conceptualized by Fry (1995)) according to which a liberalization of domestic banking systems in developing countries results in higher saving rates by raising the return on financial savings.[28] The estimated effect implies that shifting from complete financial repression to the sample average level of liberalization would lift the current account by 1.5 percent of GDP. Evidence consistent with this interpretation is shown in Appendix Table A3, which suggests that real deposit rates increase when countries liberalize their domestic financial systems.[29]

The opposite effect on the current account of concessional loans and of domestic financial liberalization may be explained by the fact that aid flows are typically *not* intermediated by the domestic financial system, as discussed in the theory section (aid flows typically finance government current expenditures and public investment). In addition, part of aid flows, by being redistributed through transfers, temporarily increase private agents disposable income, thus raising private consumption and savings.[30]

Exogenous negative income shocks (as proxied by natural disasters) have a negative impact on the current account, as predicted by standard theory, but only in countries with a fully

---

[27] The estimated effects of aid flows on the current account are generally robust to small changes in the regression sample. However, the estimated coefficient of grants reported in the specification of column (2) becomes closer to the one of columns (6), (8), and (9) when run on the same sample.

[28] Our findings are also consistent with the model of Gourinchas and Jeanne (2009), who suggest that saving wedges may be more important than investment wedges in developing countries. However, they are less consistent with Caballero, Farhi and Gourinchas (2008) and with Mendoza, Quadrini and Rios-Rull (2008) who show how the lack of financial development may result in precautionary savings, and therefore higher current account balances.

[29] Real deposit rates increased between the early 1970s and the end of the 1980s in a sample of Asian countries which moved from financial repression to financial liberalization over this period (Fry (1995)).

[30] Whether private agents partly save these windfall earnings is a subject for future research. Our aggregate estimates suggest that part of aid is saved over a 4 year horizon, which may be caused by macroeconomic policy responses, or by private agents consumption-saving decisions.

open capital account.[31] In these countries, a temporary negative income shock is associated with a deterioration of the current account and with capital inflows, which is consistent with smoothing of aggregate consumption through international borrowing.[32] Since we are already controlling for official capital flows, our estimate must be capturing the role of private capital flows.

On the contrary, natural disasters are associated with current account improvements in countries with closed capital accounts. A possible explanation is that these negative shocks trigger a procyclical increase in saving (*relative to* investment) when there is no access to international capital markets. An alternative explanation is suggested by the work of Kraay and Ventura (2000) who show that, under certain conditions, the marginal unit of savings following temporary income shocks is invested as the average one, suggesting that a positive change in savings should lead to current account surpluses in countries for which the real return on foreign assets is higher than the return on domestic assets, but would lead to deficits in countries with lower return. This implies that negative income shocks should lead to current account surpluses (deficits) in debtor (creditor) countries because domestic investment falls more (less) than savings following such shocks.[33] When interacting the natural disaster variable with the initial net foreign asset position, we obtain a negative and significant coefficient on the interaction term, which tends indeed to support the prediction of the Kraay and Ventura model, and a non-significant coefficient on the shock variable itself (column 5). Controlling for aid, however, weakens this estimated effect of the portfolio composition (column 6).

Another interpretation of this evidence is that the impact of capital account liberalization on the current account depends on income fluctuations: as discussed, when countries face negative income shocks, a more open capital account allows to borrow on international capital market, which is consistent with consumption smoothing. However, in good times, capital account liberalization seems to be associated with capital outflows in low income countries, which is consistent with the presence of financial repression during the sample (Appendix Table A3 shows that 6 out of 11 developing countries covered exhibited real deposit rates below US deposit rates in the 1980s).[34]

---

[31] The measure is defined as the frequency of negative income shocks over a 4 years period, where natural disasters include floods, droughts, earthquakes, and windstorms. Such natural events are typical, frequent, and likely to have macroeconomic implications in low income countries. Such exogenous negative income shocks are very frequent in our sample (frequency of 0.6 over the sample period).

[32] In a country with a fully liberalized capital account, a natural disaster occurring at average frequency of 0.6 during a 4 year period would be associated with a -0.7 percent of GDP deterioration of the current account.

[33] Guo and Jin (2009) show that a portfolio composition effect might dominate the income effect in past data.

[34] There was however a large dispersion of real deposit rates in developing countries over the period 1970-1990 (Gelb, 1991).

Turning to institutional factors, we find that violent political events tend to improve the current account, suggesting that political unrest may trigger significant capital flight.

Robustness

Our main baseline results are generally robust to the inclusion of various additional explanatory variables as shown in Table 2. Column 1 allows for a dynamic effect of the current account by controlling for the lagged current account.[35] In our sample of LICs, we find limited persistence of the current account beyond a 4 year horizon. Column 2 shows that trade reforms (as measured by an index of average tariffs) have no additional explanatory power. In column 3, we split the terms of trade index in his two components, and show that export prices are strongly positively correlated with the current account, while import prices are weakly and negatively correlated with the current account: a weaker correlation for the latter is consistent with income effects and substitution effects of import price movements having opposite effects on the current account. Next, as shown in column 4, the results are robust to the inclusion of emerging markets classified as lower middle income countries to the sample (these countries are China, Colombia, India, Indonesia, Pakistan and Thailand). Furthermore, our results are robust to the use of a broader measure of capital account liberalization (updated version of Quinn (1997)), as reported in column 5. In columns 6, 7, and 8, we consider alternative interaction terms with the index of capital account openness. In column 6, we control for an interaction between the fiscal balance and the capital account index, to test whether the effect of fiscal policy may depend on the capacity of private agents to offset fiscal policies by borrowing or lending in international markets. We find that, in our sample of LICs, the effect of fiscal policy on aggregate demand and on the current account is not significantly affected by the degree of capital account openness. However, the negative sign is consistent with standard theories, as it would imply a lower effect of the fiscal balance on the current account in countries with more open capital account. In column 7, we consider an interaction with population growth, but again do not find any significant effect. Still, the negative sign on the interaction term is consistent with neoclassical theories according to which countries with a younger non-active population are more able to borrow against future income when the capital account is open. The last column considers an interaction term with real per capita GDP growth; the positive sign of the interaction term, although not significant, would suggest that countries with more open capital accounts tend to run higher current account balances when growth is temporarily above its trend.[36]

[35] Controlling for lags of grant and concessional loans also does not affect our main results (regression available upon request).

[36] However, if we omit the country fixed effects to test for long-run cross-country differences, we tend to find the opposite sign on this interaction term: countries that experience faster economic growth tend to run lower current account balances when they liberalize their capital account (on the contrary, Gourinchas and Jeanne (2009) find evidence that countries with faster productivity growth tend to attract *less* foreign capital).

Are low income countries different?

We expect low income countries to differ from high income countries because of their higher exposure to shocks, greater distortions, and different sources of external financing. Tables 3a and 3b explores the extent to which various medium-term determinants of the current account have significantly different effects on the current account of low income countries on the one hand, and of high income countries on the other hand.

Among standard determinants of the current account, we find that (i) the fiscal balance; (ii) the old age dependency ratio, and (iii) initial net foreign assets have significantly different impacts on the current account in low-income countries relative to other countries. In particular, we find no significant association between the current account and the fiscal balance in high income countries, a finding consistent with Chinn and Prasad (2003) and Isard and Faruqee (1999) who did not find any significant association in industrialized countries. This result is consistent with the hypothesis that Ricardian equivalence is more likely to be a reasonable first order approximation of consumption and saving decisions in advanced countries than in other countries. The negative sign of the coefficient for the initial net foreign asset position in advanced countries is consistent with the standard intertemporal approach to the current account that predicts that initially richer countries can sustain lower current account balances in the medium-term.

Surprisingly, we seem to find a negative association between the current account and capital account openness for more developed countries when they do not experience natural disasters (column 1)—a finding seemingly inconsistent with the standard prediction of the neoclassical theory, as richer countries should experience capital outflows when opening up their capital account. Moreover, for this group of countries, we obtain a positive coefficient on the interaction term between the capital account openness variable and the natural disaster variable. It is likely that this result is due to the fact that the specification in column 1 was ideal for LICs, but not for high income countries; two possible explanations relate to the way income and capital account liberalization interact, and the role of shocks. In column 2, we introduce an interaction term between the capital account openness variable and GDP per capita as a way to test more directly the prediction of neoclassical theory that capital should flow from more developed to less developed countries. We find a positive coefficient of the interaction term, which is consistent with the prediction of this theory, and the total effect of capital account liberalization on the current account is indeed positive for the richer countries.[37] It is also possible is that the natural disasters are not relevant from a macroeconomic perspective for high income countries (see the non-significant coefficient on this variable for the higher income group). In regression 3, we drop the natural disaster variable and the interaction term, and show that the interaction of the capital account liberalization index with GDP per capita is consistent with the prediction of the standard development theory.

[37] The total effect of capital account openness on the current account turns positive at a GDP per capita of about 2/3 the US GDP per capita for countries that do not experience natural disasters, and of 1/3 that of the US for countries that experience natural disasters.

C. Empirical Analysis of the Real Exchange Rate

This section investigates the long-run relationship between the real effective exchange rate and a set of fundamentals. The estimation relies on an unbalanced panel of annual data covering 1980-2006. Panel unit root tests show the unit root nature of the variables involved in the estimation, apart from the natural shocks (see Table 4). Panel cointegration test have been performed for the benchmark regressions of interest (columns 3 in Tables 5 and 6) and reject the null of no cointegration.[38] Under the assumption of I(1) cointegrated variables, dynamic ordinary least squares (DOLS) with fixed effect provide—from the coefficients of the variables in levels—an estimate of a long-run cointegrating relationship between the real exchange rate and a set of fundamentals. As part of the DOLS specification, in addition to the variables in levels, we enter changes in right hand side variables and—given the short length of the sample—one lead and one lag of these changes.

Benchmark REER regressions for low income countries[39]

Tables 5 and 6 report the preferred specifications for LICs with two different measures of real effective exchange rate. The first is the CPI-based one offered by the IMF-INS source. The second one is constructed from the price relative with respect to the U.S. as reported in the Penn World Table, then turned into a real effective exchange rate by applying the same weights employed in the calculation of the IMF-INS real effective exchange rate. Results are virtually identical, with few exceptions discussed below. The regression specifications include traditional variables such as the net foreign assets, productivity, government consumption, terms of trade, and trade restriction, but also LIC-specific variables such as aid flows and capital account liberalization. Moreover, demographics and price controls are likely to be very relevant for low income countries, even though these factors have been shown to matter also in other samples (see Rose et al. (2008) and Ricci et al. (2008), respectively). The first column of both tables includes a dummy for natural shocks defined as before, given that low income countries are widely affected by such natural occurrences. The results would hint to a negative effect of these shocks on the real exchange rate. However, given that the econometric nature of these [0,1] indicators is uncertain (a panel unit root test rejects the unit root hypothesis), in column 2 (and subsequent regressions) we exclude this indicator.

Columns 3 drops insignificant variables and derives a benchmark regression. Consistently with the previous literature, government consumption is associated with a real exchange rate appreciation, which is usually the case under the presumption that government spending is spent on non-tradables in a higher proportion than private spending. An improvement in the

[38] Panel unit root tests are based on Pesaran (2007) to control for cross-sectional dependence. We are very grateful to Peter Pedroni for running the panel unit root tests using his RATS programs. Panel cointegration tests are based on Group mean ADF panel cointegration test (Pedroni (2004) and (1999)).

[39] The benchmark regressions are virtually unchanged if we include time dummies (available upon request), to account possible common movements in the real effective exchange rate of LICs associated, for example, with an exchange adjustment in the currencies of advanced economies.

terms of trade appreciates the real exchange rate with effects similar to those found in other sample of countries (see Ricci et al. (2008)). Fertility is associated with an appreciation of the real exchange rate, as in Rose et al. (2008). The net foreign assets position is not significant, as possible expectations of debt relief may blur the intertemporal role of this variable in our sample of LICs. Overall productivity is not significant with the IMF-INS real exchange rate and is negative with the Penn World Table one (note that for dataset consistency, the productivity indicator is based on GDP per worker from the Penn World Table dataset in the second case). One possible explanation is that, in low income countries, measures of overall productivity equally reflect both tradable and non tradable sectors' productivities, or even more the nontradable sector productivity than the productivity of the tradable one (the opposite assumption stands behind the standard presumption for using aggregate productivity as a proxy for the Balassa-Samuelson effect). Unfortunately, it was not possible to construct a better proxy for the Balassa-Samuelson effect despite extensive efforts.

Turning to variables specific to low income countries, aid inflows (from Roodman (2006)) are in the long run associated with a more depreciated exchange rate, potentially indicating a positive effect on productivity in the nontradable sector relative to the tradable sector. Aid is generally considered to push up domestic prices (especially of nontradables), thus leading to a real exchange rate appreciation (Dutch disease) in the short-run, i.e. when the supply side of the economy has not had a chance to adjust. In the long run, however, an increase in aid would be consistent with a real exchange rate depreciation if it would raise productivity of nontradables relative to the productivity of tradables (Torvik, 2001).[40]

Capital account liberalization is associated with an appreciation of the real exchange rate, suggesting that, in the long run, such liberalization promotes persistent net capital inflows. Price distortions are also somewhat significant. In particular, the presence of marketing boards (as captured by the indicator "max agric. price intervention") is likely to keep prices high and thus appreciate the real exchange rate.

The last column of Tables 5 and 6 includes the black market premium, which unfortunately halves the sample size. As real exchange rates are normally measured at official rates, the positive and significant coefficient is consistent with the standard interpretation that the presence of a black market premium usually signals an overvalued official exchange rate. Generally, in these circumstances, most public transactions are done at the official rate, while private transactions tend to occur at the black market rate, so the actual average exchange rate is likely to be between the official and the black market rates. This would correspond to a coefficient between zero and one, which is indeed what we find. However, the sample size

[40] An alternative explanation for the negative coefficient is the presence of endogeneity. In particular, countries that are experiencing depreciating exchange rates while in economic difficulties may also be aid receivers. However, such an interpretation would not be consistent with the long-run nature of the estimated cointegration relationship. Moreover, when replacing the aid measure with the ratio of aggregate aid to aggregate GDP in LICs (which is positively related to countries' aid ratios, but is not related to country specific exchange rate fluctuations) the coefficient remains negative and significant, We also checked the short run effect of aid, via the coefficients of changes in the aid measure in an error correction specification (that will be discussed below), but these are insignificant when either one, two, three, or four lags of the changes are entered.

decreases substantially, which limits the usefulness of the regressions. Measuring correctly the exchange rate is an important issue which should deserve wide attention in real exchange rate analysis—especially when focusing on low income countries which have traditionally been more prone to dual exchange rate systems and problems of measurements of price levels—and would require additional efforts in data collection.

Are low income countries different?

Low income countries differ from high income ones mainly because of the specific factors (distortions, financing, and shocks), but traditional factors do not show great difference when specific factors are included in the regression. However, neglecting the presence of the specific factors would lead to misspecifications, and even coefficients on traditional factors would appear different. Columns 1 and 2 of Table 7a present a specification typically used for high income and higher middle income countries (see for example Ricci et al., 2008), but estimated with separate coefficients for low- and lower middle-income countries (LIC) and for high- and upper middle-income countries (HICs). All coefficient appears to be significantly different (see Table 7b column 1). The next column in Table 7a show a regression equivalent to the one in Table 5 column 2—i.e. the benchmark before dropping variables that have been found relevant for a broader sample of advanced economies—but again with different slopes for LICs and HICs.

As this regressions encompasses indicators that are relevant for both set of countries, it may be the best one to assess the different roles of these indicators across sample of countries. The difference in the coefficients of the traditional variables is now insignificant in most indicators (Table 7b column2). Net foreign assets appear to play a different role in the two set of countries, which is not surprising given that a possible expectation of debt relief may reduce the relevance of this variable in LICs. The key LIC factors (apart from fertility) seem to play different a different role in the two samples, which is again not surprising given that these indicators are likely to be less relevant in high income countries. The last column of Table 7a shows the income split for a regression equivalent to the baseline in Table 5 column 3, and Table 7c present the corresponding test of equality of coefficient; results are now somewhat different, but it may be due to the fact that such regression is tailored to low income and is mispecified for the other group.

Robustness

The benchmark model for LICs is generally robust to alternative specifications. Tables 8 and 9 repeat in column 1 the benchmark derived in column 3 of Tables 5 and 6 and then explore the robustness of alternative indicators. In particular, columns 2 and 3 allow for the terms of trade (respectively in goods only or goods and services) to be split in the two components (price of exports and imports), and show that the effect is mainly due to the price of exports. This is something we would expect, and is consistent with the results for the current account regressions (Table 2): an improvement in the terms of trade from a decline in import prices may generate not only a positive income effect (increasing demand for domestic goods), but also an additional substitution effect away from domestic goods, thus with offsetting effects on the real exchange rate (see Christiansen and Tokarick (2008) for a broad theoretical and

empirical analysis of the effect of the components of the terms of trade). Results for the other variables are quite consistent with the previous regressions.

Speed of adjustment

In order to assess the speed at which the real exchange rate adjusts towards its long run cointegrating relationship, we impose the estimated cointegrating relationship in an error-correction specification. We construct the error correction term via the difference of the real exchange rate from the sum of the products of the fundamentals entering the baseline regression in Table 5 column 3 times the corresponding level coefficients. We then run changes of the real exchange rate on the lag of the error correction term as well as on lagged changes of the real exchange rate and of the other right hand side variables entering the baseline. In the four specifications derived from entering progressively from 1 up to 4 lags, the robust OLS coefficient of the lagged error correction term hovered around 0.2, suggesting that a shock to the gap would have a half life of about three years. We replicated the exercise with the alternative measure of real exchange rate (hence using Table 6 column 3) and obtained a somewhat higher speed of adjustment, in the order of 0.3, indicative of a half life of about 2 years. These results are in line with the previous literature (see Rogoff (1996) for example).

D. Empirical Analysis of the Net Foreign Asset Position

This section investigates empirically the net foreign asset position of LICs. The estimation relies on an unbalanced panel of annual data covering 1980-2006. Again, panel unit root tests confirm the unit root nature of the variables involved in the estimation (see Table 4); and panel cointegration tests performed for the benchmark regressions (Table 10 column 1) reject the null hypothesis of no cointegration (see discussion of these tests in the previous section). Similarly to the RER regressions, the panel cointegration estimation is based on dynamic ordinary least squares with fixed effects. In addition to determinants identified in the literature (public debt, demographics, and income per capita), we analyze the role of policy distortions (capital account and domestic financial liberalization) and of the quality of institutions.

Benchmark NFA regressions for low-income countries

Table 10 reports our preferred regression of the net foreign assets to trade ratio (column 1). [41] Results are broadly consistent with those obtained in the analysis of the current account.

[41] We prefer the ratio of net foreign assets to trade to the one to GDP, as the latter is more sensitive to fluctuations in the exchange rate, which we know is correlated with the right hand side variables. The public debt data is from Jaimovich and Panizza (2006); as the availability of public debt data for LICs is limited, the variable is spliced with external debt (mostly public in LICs) for a few countries. Time dummies might be appropriate to absorb common movements in the net foreign asset position of LICs arising from, for example, exchange rate fluctuations that may cause valuations effects; results are virtually identical (available upon request). The net foreign asset regressions drop Nicaragua from the sample, due to extreme values of both debt and net foreign assets which would increase the coefficient of debt substantially (almost to 1, i.e. the double).

Starting with the less common indicators, let's first note that domestic financial liberalization is associated with higher net foreign assets, again an indication (as discussed in sections II and III.B) that domestic financial reforms have a significantly larger positive effect on aggregate savings than on aggregate investment. Second, the relationship with capital account liberalization is negative in low income countries (Table 10) and positive in high income ones (Table 11), a result which is consistent with the current account regressions and with the standard neoclassical theory according to which developing countries should experience capital inflows when opening up to foreign capital. Finally, countries with better institutional characteristics also have higher net foreign assets, which may be explained by the argument that better institutions may facilitate the saving process, resulting in higher net foreign assets.[42]

Regarding the standard variables, we confirm a strong link between net foreign assets and public debt, demographic factors, and income. In the long run, half of the increase in public debt is reflected in a reduction of net foreign assets. The effect is close to the one estimated by Lane and Milesi-Ferretti (2001) for developing countries in the order of 0.5-0.8. The effect of public debt on net foreign assets is somewhat larger than the one of fiscal balance on the current account presented in Section III.B.[43] A higher share of dependent population is associated with lower savings and net foreign asset, a result that is also consistent with theoretical intuition and past evidence. The positive association of income per capita with net foreign assets in low income countries is in line with the standard development model where poor countries borrow (note, however, that Lane and Milesi-Ferretti (2001) find the opposite result).

Robustness

Robustness exercises are presented in the subsequent columns of Table 10. The results are robust to using alternative measures of net foreign assets with matching alternative debt indicators (net foreign assets and public debt to GDP in column 2, or net foreign assets and external debt both adjusted for the net present value of external debt in column 3), as well as alternative measures of demographics, capital account liberalization, and relative income or productivity (columns 3-7). Terms of trade shocks or other policy distortions like trade restrictions and price controls in the agricultural sector do not seem to matter after controlling for other determinants (columns 8-10).

[42] An alternative explanation is related to the high correlation of these indicators with the level of development, which may affect savings as discussed above and may be only imperfectly captured by income percapita.

[43] This result could be due to deficits being more monetized in low income countries than in high income ones: deficits financed by money creation would be less likely to result in external debt, while deficits financed by public debt would be more likely to result in external debt. Hence, the lower effect of the fiscal balance on the current account may simply reflect the average of two effects, while the one of debt on net foreign assets would capture only one of them.

Are low income countries different?

Table 11 presents the benchmark net foreign asset regression (Table 10 column 1) for high and low income in columns 1 and 2, as well as the test of equality of coefficients in column 3. The high income group appears quite different for about half of the indicators and not too different for the other half. As mentioned, the most interesting result is the opposite coefficient for capital account liberation, consistent with the fact that rich countries lend and poor borrow. Debt appears insignificant for the high income sample, which is in line with the range of 0 to 0.2 found by Lane and Milesi-Ferretti (2001) for this group of countries. A possible interpretation is that public debt is less likely to be foreign financed in higher income countries than in low income countries, possibly because of much deeper financial markets in more developed countries. The role of demographics, domestic financial liberalization, and institutions seem to follow the same economic patter for both set of countries, although the size maybe somewhat different.

Speed of adjustment

As in the real exchange rate analysis, we implement an error correction specification in order to gauge the speed of adjustment of the net foreign asset position. An error correction term was derived via the difference of the net foreign assets from the sum of the products of the fundamentals entering the baseline regression in Table 10 column 1 times the corresponding level coefficients. Error correction regressions equivalent to the specification discussed above deliver robust OLS coefficients of the lagged error correction term of around 0.25, suggesting that shocks to the gap between the net foreign asset and its long run relationship have a half life of about two and a half years.

IV. CONCLUSIONS

This paper offers estimates of the relationship between the real effective exchange rate, the current account, and the net external asset position of low income countries with respect to a set of fundamentals in the medium to long-term. We find that the same broad set of economic fundamentals explain coherently the three indicators. The focus on low income countries is motivated by the limited attention in the literature towards this set of countries and relies on factors that more closely characterize these countries, such as policies and distortions in the financial sector, the access to official external financing, and a higher sensitivity to exogenous shocks. The lack of attention paid to these countries has often been justified by data limitations, which led us to build a large database, unique in terms of the set of indicators and of countries that are covered.

We find that medium-term determinants of LICs external balance are somewhat different from standard determinants found in the literature. In addition to standard determinants, aid flows (grants and concessional loans), domestic financial liberalization, the removal of capital account controls, the quality of institutions, shocks (terms of trade, natural disasters), and demographic measures have a significant impact on the indicators of external balance of low-income countries. The results are generally coherent across methodologies, and—for standard economic indicators—are mainly in line with the existing literature.

Regarding policy distortions, domestic financial reforms are associated with an improvement of the current account and of the net foreign assets, suggesting a larger positive effect on saving than on investment. Capital account liberalization allows countries to borrow against disasters (lower current account), and allows lower income countries in general to borrow from higher income countries. Consistent with this result, capital account liberalization is associated with a more appreciated real exchange rate, in the long run, possibly due to the effect of capital inflows on absorption. Moreover, the quality of institutions is generally positively associated with a larger external wealth in the long run.

Regarding shocks, a positive terms of trade shock tends to improve the current account and appreciate the real exchange rate, but mainly if it arises from a change in the export price (which is consistent with the fact that import prices are associated with an additional substitution effect working in the opposite direction than the income effect common to both the export and import pries). Natural disasters tend to be associated with an improvement of the current account, unless the country has an open capital account. Moreover, some preliminary evidence suggests the effect of income shocks on the current account may depend on the initial net foreign asset position.

Regarding external financing, an increase in aid arising from concessional loans or grants progressively results in higher imports, but the evidence suggests that part of aid flows are saved in the short-run. In the long run, an increase in aid is associated with a deterioration of the real effective exchange rate. The latter result may be surprising in light of the standard Dutch disease argument, but is consistent with more general theories of Dutch disease with learning by doing in both tradable and non-tradable sectors (Torvik, 2001). While aid may cause an appreciation of the real exchange rate in the short run (as expenditure on non tradables increase relative to supply), it may also be associated with a long run depreciation if it is channeled to improve the productivity of nontradables relative to the productivity of tradables.

While we hope to have provided a coherent and comprehensive analysis of the current account, the real exchange rate, and the net foreign asset position in low income countries, there is certainly scope for further research. A first priority is to improve the quality and the extent of data coverage. Several key indicators (not only black market premium, but also the structural and financing indicators) are generally missing for numerous countries, an issue that would impair a proper economic assessment of their external balance. A deeper understanding of the nonlinearities underlying the relationship under investigation is certainly important. For example, the analysis interaction between capital account liberalization and income, and between these two factors and other determinants, lags behind the wealth of theoretical hypothesis that have been put forward.

References

Abdul Abiad, Enrica Detragiache, and Thierry Tressel (2008), "A New Database of Financial Reforms", IMF Working Paper No. 08/266.

Alfaro, Laura, Sebnem Kalemli-Ozcan and Vadym Volosovych (2007) "Capital Flows in a Globalized World: The Role of Policies and Institutions", in *Capital Controls and Capital Flows in Emerging Economies: Policies, Practices, and Consequences*, edited by Sebastian Edwards, National Bureau of Economic Research. University of Chicago Press. (Also NBER Working Paper No. 11696.)

Berg, Andrew, Shekhar Aiyar, Mumtaz Hussain, Shaun K. Roache, Tokhir N. Mirzoev, Amber Mahone (2007), *The Macroeconomics of Scaling Up Aid: Lessons from Recent Experience.* Occasional Paper No. 253 ,April 12, 2007.

Blanchard, Olivier (1985), "Debt, deficit and finite horizons", *Journal of Political Economy* 93 (April): 223-47.

Bosworth, B., Collins, S.M. (1999), "Capital Flows to Developing Countries: Implications for Saving and Investment", *Brookings Papers on Economic Activity* vol. 1, 143-180.

Caballero, R., Farhi E., and P.O. Gourinchas (2008), "An Equilibrium Model of 'Global Imbalances' and Low Interest Rates", *American Economic Review* 2008, 98:1, 358-393.

Calvo, Guillermo (1987), "Balance of Payments Crises in a Cash in Advance Economy", *Journal of Money, Credit and Banking* 19, Feb., 19-31.

Cashin, Paul, Luis F. Céspedes, and Ratna Sahay (2004), "Commodity Currencies and The Real Exchange Rate," *Journal of Development Economics,* Vol. 75, pp. 239–68.

Chen, Yu-Chin and Kenneth Rogoff (2003), "Commodity Currencies," *Journal of International Economics,* Vol. 60 (May), pp. 133–60.

Chinn, M., and E. Prasad (2003), "Medium-term determinants of current accounts in industrial and developing countries: an empirical exploration", *Journal of International Economics*, 59, 47-76.

Chinn, M., and S. J. Wei (2008), "A Faith-based Initiative: Does a Flexible Exchange Rate Regime Really Facilitate Current Account Adjustment?", NBER Working Paper 14420.

Chinn M. and H. Ito (2007), "Current Account Balances, Financial Development and Institutions: Assaying the World 'Saving Glut'", *Journal of International Money and Finance*, 26, 546-569.

Christiansen Lone and Stephen Tokarick (2009), "Real Exchange Rates and Fundamentals: Some Theory and Evidence", International Monetary Fund, mimeo.

Choudhri, E., and M. Khan (2005), "Real Exchange Rates in Developing Countries: Are Balassa-Samuelson Effects Present?", *IMF Staff Papers*, Vol. 52 (December), pp.387-409.

Chudik Alexander and Joannes Mongardini (2007) "In search of equilibrium : estimating equilibrium real exchange rates in Sub-Saharan African countries" IMF Working Paper 07/90.

Corbo, V. and K. Schmidt-Hebbel (1991): "Public Policies and Saving in Developing Countries," *Journal of Development Economics* 36 (July): 89-115.

De Gregorio, José, Alberto Giovannini, and Holger Wolf (1994), "International Evidence on Tradables and Nontradables Inflation," *European Economic Review*, Vol. 38 (June), pp. 1225–44.

Delechat, Corinne (2008) "Assessing Real Exchange Rates in Low-Income Countries", IMF, mimeo.

Di Bella, Gabriel, Mark Lewis, and Aurelie Martin (2007) "Assessing Competitiveness and Real Exchange Rate Misalignment in Low-Income Countries" IMF Working Paper 07/201.

Dimaranan, Betina V. and Robert A. McDougall, eds (2006), *Global Trade, Assistance, and Production: The GTAP 6 Data Base,* Center for Global Trade Analysis, Purdue University.

Dixit, Avinash, and Victor Norman (1980), *Theory of International Trade: A Dual General Equilibrium Approach*, (Cambridge: Cambridge University Press).

Easterly, W. M. Kremer, L. Pritchett, and L. Summers (1993), "Good Policy or Good Luck? Country Growth Performance and Temporary Shocks," J*ournal of Monetary Economics*, Vol. 32, December 1993, 459-483.

Edwards, Sebastian (1988), "Real and Monetary Determinants of Real Exchange Rate Behavior", *Journal of Development Economics*, vol. 29, pp. 311-341.

Edwards, S. (1989), *Real Exchange Rates, Devaluation, and Adjustment, Exchange Rate Policy in Developing Countries*, The MIT Press, Cambridge, Mass.

Edwards, S. (1995), "Why are Saving Rates so Different Across Countries? An International Comparative Analysis.", NBER Working Paper 5097.

Edwards, S., and J. Ostry (1992), "Terms of Trade Disturbances, Real Exchange Rates, and Welfare: The Role of Capital Controls and Labor Market Distortions", *Oxford Economic Papers*, Vol. 44, No.1, pp.20-34.

Edwards, Sebastian and Miguel Savastano (2000), "Exchange Rates in Emerging Economies: What Do We Know? What Do We Need to Know?" in *Economic Policy Reform: The Second Stage,* edited by Anne O. Krueger (Chicago: University of Chicago, Press).

Elbadawi Ibrahim (2007) "Real Exchange Rate Misalignment in Sub-Saharan Africa: How Serious? How Dangerous?" World Bank, mimeo.

Engel, Charles and Kenneth D. West (2005), "Exchange Rate and Fundamentals," *Journal of Political Economy*, vol. 113, no. 3.

Engel, Charles, Nelson C. Mark, and Kenneth D. West (2007), "Exchange Rate Models Are Not as Bad as You Think", *Macroeconomics Annual*.

Faria, A., Lane, P., Mauro, P., and G.M. Milesi-Ferretti (2007), "The Shifting Composition of External Liabilities", *Journal of the European Economic Association,* Vol. 5, no 2-3, pp. 480-490

Frankel, Jeffrey, David Parsley, and Shang-Jin Wei (2005), "Slow Pass Through Around the World: A New Import For Developing Countries?", Working Paper 11199, (Cambridge: National Bureau of Economic Research).

Froot, Kenneth A. and Kenneth Rogoff (1995), "Perspectives on PPP and Long-Run Real Exchange Rates," in *Handbook of International Economics*, Vol. 3, edited by Gene M. Grossman and Kenneth Rogoff (Amsterdam: Elsevier Science Publishers), pp. 1647–88.

Fry, Maxwell (1995), *Money, Interest, and Banking in Economic Development*, The John Hopkins University Press.

Gelb, A. (1991), "Financial Policies, Growth and Efficiency", Washington, DC: World Bank, Country Economics Department, PPR Working Paper WPS 202, June.

Gleditsch, Nils Petter, Peter Wallensteen, Mikael Eriksson, Margareta Sollenberg and Håvard Strand (2002), "Armed Conflict 1946–2001: A New Dataset", *Journal of Peace Research* vol. 39 (5), pp. 615–637.

Goldfajn, Ilan, and Rodrigo Valdes (1999), "The Aftermath of Appreciations," *Quarterly Journal of Economics,* Vol. 114 (February), pp. 229–62.

Greenwood, J., and B. Jovanovic (1990), "Financial Development, Growth, and the Distribution of Income", *Journal of Political Economy*, XCVIII, 1076-1107.

Guo, K., and K. Jin (2009), "Composition and Growth Effects of the Current Account: A Synthesized Portfolio View", Mimeo Harvard University.

Gruber, J.W., and S. B. Kamin (2007), "Explaining the Global Pattern of Current Account Imbalances", *Journal of International Money and Finance* 26, 500-522.

Hinkle Lawrence and Peter Montiel (1999), "Exchange Rate Misalignment. Concepts and Measurement for Developing Countries", A World Bank Research Publication, Oxford University Press.

Isard, Peter and Hamid Faruqee (1998), Exchange Rate Assessment – Extensions of the Macroeconomic Balance Approach, International Monetary Fund Occasional Paper 167.

Jaimovich Dany and Ugo Panizza (2006) "Public Debt around the World: A New Dataset of Central Government Debt", IDB Research Department Working Paper Nr. 561.

Jones, Ronald (1965), "The Structure of Simple General Equilibrium Models," *Journal of Political Economy*, Vol. 73, (December), pp. 557–72.

Ju, J. and S-J. Wei (2007), "Current Account Adjustment: Some New Theory and Evidence", NBER Working Paper 13388.

Kee, Haui Looi, Alessandro Nicita, and Marcelo Olarreaga (2008), "Import Demand Elasticities and Trade Distortions," *Review of Economics and Statistics*, vol. 90, no. 4, pp. 666-682.

Khan, Mohsin, and Morris Goldstein (1985), "Income and Price Effects in Foreign Trade," in *Handbook of International Economics*, volume 2, edited by Ronald Jones and Peter Kenen, New York: North Holland, pp. 1041-1105.

Kireyev, Alexei (2008), "Non-Econometric Methods for Exchange Rate Assessment in Low-Income Countries" IMF, mimeo.

Kohli, Ulrich (1991), *Technology, Duality, and Foreign Trade: The GNP Function Approach to Modeling Imports and Exports*, (Ann Arbor: University of Michigan Press).

Kraay, Aart, and Jaume Ventura (2000), "Current Accounts in Debtor and Creditor Countries", Quarterly Journal of Economics, 115, 1137-1166.

Lane, Phillip, and GianMaria Milesi-Ferretti (2002), "External Wealth, The Trade Balance, and the Real Exchange Rate", European Economic Review, Vol. 46, pp. 1049-71.

Lane, Phillip, and GianMaria Milesi-Ferretti (2006), "The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970-2004", IMF Working Paper 06/69.

Lane, Phillip, and GianMaria Milesi-Ferretti (2004), "The Transfer Problem Revisited: Net Foreign Assets and Real Exchange Rates", *The Review of Economics and Statistics*, November, 86(4), 841-857.

Lane, Phillip, and GianMaria Milesi-Ferretti (2001), "Long Term Capital Movements", *NBER Macroeconomics Annual.*

Lee, J., Milesi-Ferretti, G.M., Ostry J., Prati A., and L. Ricci (2008), *Exchange Rate Assessments: CGER Methodologies*, International Monetary Fund Occasional Paper 261.

Levine, Ross (1997), "Financial Development and Economic Growth: Views and Agenda." *Journal of Economic Literatur*e

Loayza, N., Schmidt-Hebbel, K., and L. Servén (2000), "What drives Saving across the World?", The Review of Economics and Statistics, LXXXII (2): 165-181

MacDonald, Ronald and Luca Antonio Ricci (2007), "Real Exchange Rates, Imperfect Substitutability, and Imperfect Competition", *Journal of Macroeconomics*, Vol. 29, No.4, pp. 639-664.

Martin, Philippe, and Helene Rey (2006), "Globalization and Emerging Markets: With or without rash?" *American Economic Review*, December, vol 96, n5, 1631-51

Masson, P., Bayoumi, T., Samiei, H. (1998), "International Evidence on the Determinants of Private Saving", *World Bank Economic Review* vol. 12, 483-501.

Matsen, E., and R. Torvik (2004), "Optimal Dutch disease", *Journal of Development Economic*s, 2005, 494-515.

McKinnon, R. (1973), *Money and Capital in Economic Development*, (Washington DC: Brookings Institutions).

Meese, Richard A., and Kenneth Rogoff (1983), "Empirical Exchange Rate Models of The Seventies: Do They Fit out of Sample?" *Journal of International Economics* Vol. 14, pp. 3–24.

Mendoza, E., Quadrini, V., and J-V. Rios-Rull (2008), "Financial Integration, Financial Development and Global Imbalances", forthcoming, *Journal of Political Economy*.

Modigliani, F. (1986). Life Cycle, Individual Thrift, and the Wealth of Nations. *American Economic Review* vol. 76 (3), pp. 297-313.

Mongardini, J., and B. Rayner (2009) "To Transfer or Not to Transfer: The Impact of Grants and Remittances on the Equilibrium Real Exchange Rates in Sub-Saharan Countries", IMF Working Paper 09/75.

Montiel, P. (1999), "Determinants of the Long-Run Equilibrium Real Exchange Rate: An Analytical Model", Chapter 6 in L. Hinkle & P. Montiel (eds.), *Exchange rate misalignment: concepts and measurements for developing countries*, World Bank, Washington D.C, pp. 264-290.

Obtsfeld, and Rogoff (1999), *Foundations of International Macroeconomics*, MIT Press.

Ostry, Jonathan (1988), "The Balance of Trade. The Terms of Trade, and the Real Exchange Rate:An Intertemporal Optimizing Framework," *IMF Staff Papers*, International Monetary Fund, Vol. 35, No4., pp.541-73.

Ostry, Jonathan (1990), "Tariffs and the Current Account: The Role of Initial Distortions", *Canadian Journal of Economics*, 23, 348-56.

Ostry, Jonathan D., and Carmen M. Reinhart (1992), "Private Savings and Terms of Trade Shocks: Evidence from Developing Countries," *Staff Papers*, Vol. 39, No. 3 (September), pp. 495–517 (Washington, D.C.: International Monetary Fund).

Pedroni, Peter (1999), "Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors", *Oxford Bulletin of Economics and Statistics*, Vol. 61, pp. 653-70.

Pedroni, Peter (2000), "Fully Modified OLS for Heterogenous Cointegrated Panels", *Advances in Econometrics*, Vol. 15, pp. 93-130.

Pedroni, Peter (2001), "Purchasing Power Parity Tests in Cointegrated Panels", *Review of Economics and Statistics*, Vol. 83, pp. 727-731.

Pedroni, Peter (2004), "Panel Cointegration; Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis", *Econometric Theory*, Vol. 20, pp. 597-625.

Pesaran, Hashem (2007), "A Simple Panel Unit Root Test in the Presence of Cross Sectional Dependence", *Journal of Applied Econometrics*, Vol. 22, pp.265-312.

Prasad, Eswar, Raghuram Rajan, and Arvind Subramanian (2007), "Foreign Capital and Economic Growth," *Brookings Papers on Economic Activity*, pp. 153-230.

Prati, A., and T. Tressel (2006), "Aid Volatility and Dutch Disease: Is There a Role for Macroeconomic Policies?", IMF Working Paper 06/145.

Quinn, Dennis (1997), "The Correlates of Changes in International Financial Regulation," *American Political Science Review* 91 (September), 531–51.

Razin, A., and L. Svensson (1983), "The Terms of Trade and the Current Account: The Harberger-Laursen-Metzler Effect", *Journal of Political Economy,* Vol. 91, pp. 97-125.

Reinhart, Carmen and Kenneth Rogoff (2004), "The Modern History of Exchange Rate Arrangements: A Reinterpretation", *Quarterly Journal of Economics*, Vol. CXIX, No. 1, pp. 1-48, February.

Ricci Luca Antonio, Gianmaria Milesi-Ferretti, and Jaewoo Lee (2008), "Real Exchange Rates and Fundamentals: A Cross-Country Perspective", IMF Working Paper 08/13.

Rogoff, Kenneth (1996), "The Purchasing Power Parity Puzzle," *Journal of Economic Literature,* Vol. 34 (June), pp. 647–68.

Roodman, David (2006), "An Index of Donor Performance", Center for Global Development, Working Paper Number 67, November.

Rose, A., Supaat S, and J. Braude (2008), "Fertility and the Real Exchange Rate", mimeo Berkeley.

Roudet, Stéphane, Magnus Saxegaard, and Charalambos G. Tsangarides (2007) "Estimation of equilibrium exchange rates in the WAEMU : a robustness approach." IMF Working Paper 07/194.

Sachs Jeffrey and Andrew Warner (1995), "Economic Reform and the Process of Global Integration", *Brookings Papers on Economic Activity*, No. 1, pp. 1-118.

Schmidt-Hebbel, K., Webb, S.B., Corsetti, G. (1992), "Household saving in developing countries: first cross-country evidence", *World Bank Economic Review*, Vol. 6, pp. 529-547.

Senhadji, Semlali (1997), "Time-Series of Structural Import Demand Equations—A Cross Country Analysis," IMF Working Paper 97/132.

Stern, Robert (1973), *The Balance of Payments: Theory and Economic Policy*, (New York: Aldine Publishing Company).

Stern, Robert, Francis, Jonathan, and Bruce Schumacher (1976), *Price Elasticities in International Trade—An Annotated Bibliography*, London: MacMillan.

Tornell Aaron and Phillip Lane (1998), "Are Windfalls a Curse? A Non-Representative Agent Model of the Current Account", *Journal of International Economics*, Vol. 44, pp.83-112.

Torvik, R. (2001), "Learning by Doing and the Dutch Disease", *European Economic Review*, vol. 45, pp. 285-306

Van Wijnbergen, S. (1984), "The 'Dutch Disease': A Disease After All?" *Economic Journal*, Vol. 94, No. 373, pp. 41–55.

Vegh, Carlos, *Open Economy Macroeconomics in Developing Countries*, forthcoming, MIT Press.

Wacziarg, Romain and Karen Horn Welch (2003), "Trade Liberalization and Growth: New Evidence," NBER Working Paper No. 10152 (December).

Weil, Philippe (1989), "Overlapping families of infinitely lived agents", *Journal of Public Economics,* Vol. 38 (March), pp.183-98.

Woodland, Alan (1982), *International Trade and Resource Allocation*, North Holland.

Table 1. Medium-term determinants of the current account: main results.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Controls									
Fiscal balance / GDP	0.2432**	0.2466**	0.3392**	0.3472**	0.3966***	0.3497**	0.2528**	0.3224***	0.3680***
	(0.0466)	(0.0465)	(0.0280)	(0.0150)	(0.0040)	(0.0187)	(0.0225)	(0.0095)	(0.0005)
Old age dependency ratio	-0.2673	-0.2415	-0.0140	-0.2326	-0.0324	0.0194	-0.4630	0.1425	
	(0.3881)	(0.4375)	(0.9617)	(0.4602)	(0.9174)	(0.9495)	(0.1263)	(0.6296)	
Population growth	-1.6275**	-1.4663**	-2.6210***	-2.4801***	-2.4438***	-2.1768***	-1.1773*	-1.8436***	-1.7452***
	(0.0209)	(0.0410)	(0.0009)	(0.0045)	(0.0011)	(0.0024)	(0.0715)	(0.0052)	(0.0082)
Initial net foreign assets	-0.0103	-0.0099	-0.0045	-0.0016	0.0186	0.0129	-0.0043	-0.0079	
	(0.4115)	(0.4371)	(0.7014)	(0.9022)	(0.2035)	(0.4030)	(0.7245)	(0.4899)	
Oil trade balance / GDP	0.1820	0.1892	-0.0122	0.0098	0.0451	0.0215	0.1868	-0.0004	
	(0.1467)	(0.1420)	(0.9234)	(0.9352)	(0.7103)	(0.8649)	(0.1399)	(0.9971)	
Income per capita	0.1017	0.0372	0.2680	0.1912	0.2358	0.1632	0.1110	0.1747	
(relative to US)	(0.6813)	(0.8908)	(0.2320)	(0.4052)	(0.2671)	(0.5044)	(0.6566)	(0.4729)	
Per capita real GDP growth	0.1446	0.1263	-0.0034	0.0698	-0.0252	-0.0057	0.1376	0.0916	
	(0.3078)	(0.3849)	(0.9798)	(0.5963)	(0.8490)	(0.9668)	(0.3218)	(0.4897)	
New medium-term determinants									
Terms of trade	0.0228*	0.0236*	0.0345**	0.0315**	0.0336**	0.0332**	0.0260**	0.0269**	0.0319***
	(0.0955)	(0.0905)	(0.0191)	(0.0267)	(0.0165)	(0.0263)	(0.0499)	(0.0340)	(0.0074)
Aid flows / GDP	-0.1130*								
	(0.0636)								
Concessional loans / GDP		-0.3122*				-0.4754**		-0.5565***	-0.4882**
		(0.0695)				(0.0247)		(0.0081)	(0.0127)
Net grants / GDP		-0.0282				0.2108*		0.2168*	0.1981*
		(0.7365)				(0.0616)		(0.0543)	(0.0571)
Domestic financial liberalization			0.0343**		0.0276*	0.0326**		0.0241	0.0244*
(initial)			(0.0139)		(0.0992)	(0.0433)		(0.1379)	(0.0797)
Capital account liberalization				0.0492**	0.0376*	0.0332		0.0434**	0.0435**
(initial)				(0.0156)	(0.0862)	(0.1190)		(0.0371)	(0.0289)
Natural disaster				0.0349**	0.0101	0.0032		0.0359***	0.0361***
				(0.0105)	(0.5855)	(0.8572)		(0.0064)	(0.0041)
Natural disaster*capital account				-0.0605**	-0.0566**	-0.0495*		-0.0627**	-0.0654***
(initial)				(0.0236)	(0.0385)	(0.0699)		(0.0145)	(0.0071)
Natural disaster*Initial NFA					-0.0357**	-0.0309*			
					(0.0252)	(0.0826)			
Violent political transition							0.0287***	0.0280***	0.0262***
							(0.0000)	(0.0006)	(0.0014)
Observations	223	219	143	143	143	139	223	139	139
R-squared	0.73	0.73	0.82	0.82	0.83	0.84	0.75	0.85	0.84

*** p<0.01, ** p<0.05, * p<0.1 (Robust p-values in parentheses)

Robust panel regressions of the current account to GDP ratio on country fixed effects, a set of control variables (the fiscal balance to GDP ratio, demographic variables, the initial net foreign asset to GDP, the oil trade balance to GDP ratio, income per capita relative to the US, per capita real GDP growth), and a set of medium-term deteminants of the current account including: (i) aid flows; (ii) financial and capital account liberalization; and (iii) shocks (natural disasters, terms of trade fluctuations). The dependent variable and explanatory variables are averaged over 4 year periods (except when stated otherwise) and covering 1981-2005.

Table 2: Medium-term determinants of the current account: robustness.

VARIABLES	(1)	(2)	(3)	(4) incl. EM	(5)	(6)	(7)	(8)
Fiscal balance / GDP	0.3166**	0.3083***	0.3486***	0.2568**	0.3230***	0.5104***	0.3886***	0.3597***
	(0.0141)	(0.0030)	(0.0025)	(0.0188)	(0.0047)	(0.0016)	(0.0004)	(0.0007)
Population growth	-1.4924*	-2.7107***	-1.6308**	-1.7432***	-1.8557***	-1.7513***	-1.4558**	-1.7485***
	(0.0550)	(0.0000)	(0.0173)	(0.0030)	(0.0068)	(0.0045)	(0.0228)	(0.0050)
log (terms of trade)	0.0289**	0.0352***		0.0249**	0.0327***	0.0304**	0.0278**	0.0323***
	(0.0268)	(0.0037)		(0.0460)	(0.0070)	(0.0118)	(0.0242)	(0.0058)
Concessional loans / GDP	-0.4185*	-0.4808**	-0.4343**	-0.5318***	-0.4468**	-0.4681**	-0.4340**	-0.5076**
	(0.0712)	(0.0128)	(0.0220)	(0.0074)	(0.0219)	(0.0158)	(0.0232)	(0.0116)
Net grants / GDP	0.1710	0.1154	0.1953*	0.2328**	0.1532	0.1787*	0.1754*	0.1881*
	(0.1446)	(0.2816)	(0.0552)	(0.0332)	(0.1860)	(0.0737)	(0.0933)	(0.0675)
Violent political transition	0.0265**	0.0234***	0.0272***	0.0255***	0.0269***	0.0271***	0.0244***	0.0277***
	(0.0119)	(0.0068)	(0.0009)	(0.0033)	(0.0026)	(0.0019)	(0.0036)	(0.0002)
Domestic financial liberalization	0.0317**	0.0168	0.0251*	0.0415***	0.0248*	0.0244*	0.0260*	0.0235
(initial)	(0.0355)	(0.3297)	(0.080)	(0.0073)	(0.0977)	(0.0781)	(0.0644)	(0.1512)
Capital account liberalization	0.0247	0.0390*	0.0432**	0.0331		0.0415**	0.0488**	0.0432**
(initial)	(0.2917)	(0.0621)	(0.0297)	(0.1038)		(0.0384)	(0.0198)	(0.0291)
Natural disaster	0.0350**	0.0321**	0.0355***	0.0303***	0.0329**	0.0376***	0.0380***	0.0356***
	(0.0124)	(0.0330)	(0.0036)	(0.0071)	(0.0269)	(0.0032)	(0.0027)	(0.0038)
Natural disaster*capital account	-0.0499*	-0.0594**	-0.0664***	-0.0691***		-0.0666***	-0.0646***	-0.0643***
(initial)	(0.0788)	(0.0235)	(0.0056)	(0.0041)		(0.0067)	(0.0079)	(0.0071)
lag of current account	0.0145							
	(0.8704)							
Trade liberalization index		0.0002						
(initial)		(0.9898)						
Export price index			0.0431***					
			(0.0041)					
Import price index			-0.0252*					
			(0.0679)					
Capital account liberalization					0.0345*			
(Quinn, 1997)					(0.0857)			
Natural disaster * Capital account					-0.0487*			
(Quinn, 1997)					(0.0613)			
Fiscal balance * capital account						-0.3019		
						(0.3002)		
Population growth * capital account							-1.2912	
							(0.1067)	
Economic growth * capital account								0.4167
								(0.1545)
GDP per capita growth								-0.0867
								(0.6280)
Observations	121	134	139	172	137	139	139	139
R-squared	0.86	0.84	0.85	0.80	0.84	0.85	0.85	0.85

*** p<0.01, ** p<0.05, * p<0.1 (Robust p-values in parentheses)

Robust panel regressions of the current account to GDP ratio on country fixed effects, a set of control variables (the fiscal balance to GDP ratio, demographic variables), a set of medium-term deteminants of the current account identified in Table 1. The dependent variable and explanatory variables are averaged over 4 year periods (except when stated otherwise) and covering 1981-2005. Additional control variables are added one at a time: a 4 year lag of the medium-term current account, an index of average import tariff, price indices for exports and imports, an alternative broader measure of capital account liberalization (based on an extension of Quinn, 1997), and interaction terms between the capital account liberalization index and (i) the fiscal balance; (ii) population growth; and (iii) per capital real GDP growth. Column (4) considers a broader country sample including emerging markets that are classified as lower middle income countries (China, Colombia, India, Indonesia, Pakistan and Thailand)

Table 3a. Current account regressions with different slopes for LICs and HICs.

VARIABLES	(1)		(2)		(3)	
	LICs	**HICs**	**LICs**	**HICs**	**LICs**	**HICs**
Fiscal balance / GDP	0.3224***	-0.0811	0.3176**	-0.1198	0.3173**	-0.2111
	(0.0099)	(0.6449)	(0.0147)	(0.4662)	(0.0144)	(0.2773)
Old age dependency ratio	0.1425	-1.7237**	0.0642	-1.8566***	0.0595	-2.3592***
	(0.6342)	(0.0204)	(0.8302)	(0.0094)	(0.8416)	(0.0064)
Population growth	-1.8436***	0.0618	-1.8460***	-0.4686	-1.8461***	-1.6787*
	(0.0055)	(0.9532)	(0.0075)	(0.6304)	(0.0073)	(0.0965)
NFA / GDP	-0.0079	-0.0646**	-0.0119	-0.0734***	-0.0121	-0.0811***
	(0.4956)	(0.0171)	(0.3098)	(0.0048)	(0.2972)	(0.0062)
Oil balance / GDP	-0.0004	0.0369	-0.0266	0.1145	-0.0282	0.2615
	(0.9971)	(0.8395)	(0.7997)	(0.5277)	(0.7861)	(0.1923)
Relative income per capita	0.1747	0.2427*	0.1163	0.1309	0.1127	0.1151
	(0.4787)	(0.0783)	(0.6525)	(0.2933)	(0.6612)	(0.3977)
GDP per capita growth	0.0916	-0.2543	0.1262	-0.1471	0.1283	-0.1891
	(0.4954)	(0.2536)	(0.3689)	(0.5020)	(0.3590)	(0.3929)
Violent political transition	0.0280***	0.0687***	0.0273***	0.0651***	0.0272***	0.0589***
	(0.0006)	(0.0001)	(0.0017)	(0.0001)	(0.0016)	(0.0006)
log (terms of trade)	0.0269**	0.0654*	0.0240*	0.0486	0.0238*	0.0499
	(0.0356)	(0.0698)	(0.0639)	(0.1670)	(0.0641)	(0.1348)
Concessional loans / GDP	-0.5565***	.	-0.6426***	.	-0.6479***	.
	(0.0085)	.	(0.0027)	.	(0.0023)	.
Net grants / GDP	0.2168*	.	0.2138*	.	0.2136*	.
	(0.0567)	.	(0.0649)	.	(0.0639)	.
Domestic financial liberalization (initial)	0.0241	0.0288	0.0170	0.0200	0.0166	0.0031
	(0.1424)	(0.3535)	(0.3194)	(0.5018)	(0.3294)	(0.9292)
Capital account liberalization (initial)	0.0434**	-0.1145**	0.1917***	.	0.0916***	.
	(0.0388)	(0.0197)	(0.0002)	.	(0.0016)	.
Natural disaster	0.0359***	-0.0021	0.0353**	-0.0284	0.0352**	.
	(0.0067)	(0.9465)	(0.0106)	(0.3717)	(0.0104)	.
Natural disaster*Capital account	-0.0627**	0.0853*	-0.0544**	0.1100**	-0.0539**	.
	(0.0153)	(0.0824)	(0.0460)	(0.0170)	(0.0467)	.
Capital account liberalization (initial)	.		-0.1765***		-0.0781***	
(all countries)	.		(0.0009)		(0.0021)	
Capital account liberalization * GDP per capita	.		0.2288**		0.2427**	
	.		(0.0199)		(0.0129)	
Observations	234		234		234	
R-squared	0.83		0.83		0.82	

*** p<0.01, ** p<0.05, * p<0.1 (Robust p-values in parentheses)

Robust panel regression of the current account to GDP on a set of medium-term determinants of Table1, column (8). Independent variables are interacted with dummy variables for our sample of LICs and HICs. Sample and period averages are as in Tables 1 and 2.

Table 3b. F-tests of equality (p-values) of coefficients across income groups for regressions reported in Table 3a.

VARIABLES	(1)	(2)	(3)
Fiscal balance / GDP	0.06	0.04	0.02
Old age dependency ratio	0.02	0.01	0.01
Population growth	0.13	0.24	0.89
NFA / GDP	0.05	0.03	0.03
Oil balance / GDP	0.86	0.50	0.20
Relative income per capita	0.81	0.96	0.99
GDP per capita growth	0.18	0.29	0.23
Violent political transition	0.03	0.04	0.09
log (terms of trade)	0.31	0.51	0.46
Domestic financial liberalization (initial)	0.89	0.93	0.73
Capital account liberalization (initial)	0.00	.	.
Natural disaster	0.27	0.06	.
Natural disaster*Capital account	0.01	0.00	.

Note: Ho: coeff HIC = coef LIC (p value of F test is reported).
Regressions are those reported in Table 3a

Table 4. Panel Unit Root test statistics.

Variable	Statistic 1/	
	sample A 2/	sample B 2/
Log of REER (INS)	-1.59	-1.57
Log of REER (PWT)	-1.82	-1.97
NFA to GDP	-2.02	-2.06
NFA to trade	-1.58	-1.39
NFA (w/ NPV debt) to GDP	-2.06	-2.03
NFA (w/ NPV debt) to trade	-1.83	-1.53
Relative productivity (log) #	-1.53	-1.22
Terms of trade goods (log)	-1.45	-1.36
Government Consumption to GDP #	-1.99	-2.12*
Trade restrictions #	-2.04	-1.75
Administered agric. prices #	-0.79	-1.12
Max agric. price intervention #	-1.26	-0.96
Aid to GDP #	-2.19*	-2.07
Fertility #	-0.54	-0.57
Capital account liberalization #	-1.95	-1.85
Domestic financial liberalization #	-1.5	-1.5
Natural disaster	-3.66*	-3.52*
Constraint on executive	-0.85	-0.8
Public debt to GDP	-1.52	-1.53
Public debt to trade	-1.82	-1.87
NPV of external debt to trade	n.a	-1.63

1/ Test based on Pesaran (2007).
2/ Samples A and B refer to restricting the sample to having at least 14 or 20 observations per country, respectively.
* means reject null HO of unit root at 5% one-sided
# indicates that the variable is constructed relative to the weighted average of the trading partners

Table 5. Real effective exchange rate (IMF definition) regressions.
Panel dynamic OLS with fixed effects (only long-run coefficients reported).

VARIABLES	(1)	(2)	(3)	(4)
NFA (w/ NPV debt) to trade	-0.0168	-0.0175		
	(0.2661)	(0.2511)		
Relative productivity (log) #	-0.1019	-0.0770		
	(0.3613)	(0.4869)		
Terms of trade goods (log)	0.3458***	0.3455***	0.3931***	0.4353***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Government Consumption to GDP #	1.2667*	1.1259*	2.0271***	1.9688***
	(0.0622)	(0.0910)	(0.0002)	(0.0074)
Aid to GDP #	-2.2405***	-2.1679***	-1.6187***	-1.3812***
	(0.0000)	(0.0000)	(0.0000)	(0.0016)
Capital account liberalization #	0.3152***	0.2916***	0.2978***	0.4910***
	(0.0025)	(0.0056)	(0.0011)	(0.0000)
Trade restrictions #	0.0975	0.1003		
	(0.2836)	(0.2630)		
Administered agric. prices #	-0.0004	-0.0223		
	(0.9954)	(0.7174)		
Max agric. price intervention #	0.0596	0.0691	0.0596	0.0129
	(0.2059)	(0.1368)	(0.1660)	(0.8473)
Fertility #	0.1239***	0.1221***	0.0979***	0.1512***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Natural disaster	-0.0951*			
	(0.0559)			
Black market premium (%)				0.2547***
				(0.0015)
Observations	522	522	609	338
R-squared	0.71	0.70	0.65	0.78

*** p<0.01, ** p<0.05, * p<0.1 (robust p-values in parentheses)

# indicates that the variable is constructed relative to the weighted average of the trading partners

Robust dynamic OLS panel regressions with fixed effects of the real effective exchange rate (INS source) on net foreign asset (with NPV value of external debt) to trade ratio, log of relative productivity, terms of trade if goods and services, government consumption to GDP, aid to GDP (or its components: concessional loans and grants), capital account liberalization, trade restrictions, agricultural price reforms, fertility, natural disaster, and black market premium. Unbalanced panel with annual data 1980-2006.

Table 6. Real effective exchange rate (Penn World Table) regressions. Panel dynamic OLS with fixed effects (only long-run coefficients reported).

VARIABLES	(1)	(2)	(3)	(4)
NFA (w/ NPV debt) to trade	0.0094	0.0087		
	(0.4610)	(0.5053)		
GDP per worker PWT (log)	-0.4418***	-0.4266***		
	(0.0006)	(0.0010)		
Terms of trade goods (log)	0.1634**	0.1600**	0.1970***	0.2040**
	(0.0281)	(0.0326)	(0.0077)	(0.0318)
Government Consumption to GDP #	2.0186**	1.8770*	3.3371***	5.3549***
	(0.0350)	(0.0507)	(0.0000)	(0.0000)
Aid to GDP #	-3.2405***	-3.1855***	-2.0504***	-1.3181***
	(0.0000)	(0.0000)	(0.0000)	(0.0049)
Capital account liberalization #	0.1746**	0.1520*	0.1984**	0.3048**
	(0.0418)	(0.0850)	(0.0233)	(0.0265)
Trade restrictions #	-0.0434	-0.0258		
	(0.6543)	(0.7934)		
Administered agric. prices #	-0.0299	-0.0650		
	(0.6735)	(0.3607)		
Max agric. price intervention #	0.0343	0.0530	0.1842***	0.0574
	(0.4661)	(0.2462)	(0.0002)	(0.4864)
Fertility #	0.1464***	0.1484***	0.1247***	0.1072***
	(0.0001)	(0.0001)	(0.0001)	(0.0060)
Natural disaster	-0.1549***			
	(0.0057)			
Black market premium (%)				0.4344***
				(0.0000)
Observations	522	522	622	364
R-squared	0.75	0.74	0.69	0.81

*** p<0.01, ** p<0.05, * p<0.1 (robust p-values in parentheses)

# indicates that the variable is constructed relative to the weighted average of the trading partners

Robust dynamic OLS panel regressions with fixed effects of the real effective exchange rate (Penn World Table source) on net foreign asset (with NPV value of external debt) to trade ratio, log of relative productivity, terms of trade if goods and services, government consumption to GDP, aid to GDP (or its components: concessional loans and grants), capital account liberalization, trade restrictions, agricultural price reforms, fertility, natural disaster, and black market premium. Unbalanced panel with annual data 1980-2006.

Table 7a. Real effective exchange rate (IMF definition) regressions with different slopes for LICs and HICs. Panel dynamic OLS with Fixed Effects (only long-run coefficients reported).

	(1)		(2)		(3)	
	HIC	*LIC*	*HIC*	*LIC*	*HIC*	*LIC*
NFA (w/ NPV debt) to trade	0.0276***	0.0074	0.0847***	-0.0165		
	(0.0020)	(0.6476)	(0.0000)	(0.2699)		
Relative productivity (log) #	-0.1346**	0.2087***	-0.1235	-0.1157		
	(0.0350)	(0.0028)	(0.1336)	(0.2598)		
Terms of trade goods (log)	0.1023	0.3811***	0.1745**	0.3325***	0.1564**	0.3938***
	(0.1466)	(0.0000)	(0.0262)	(0.0000)	(0.0331)	(0.0000)
Government Consumption to GDP #	1.3367***	0.1634	1.5695***	1.2225**	1.7819***	2.0246***
	(0.0015)	(0.7362)	(0.0017)	(0.0489)	(0.0004)	(0.0002)
Trade restrictions #	0.3179***	0.0474	0.2767***	0.0833		
	(0.0004)	(0.5393)	(0.0048)	(0.2646)		
Administered prices	-0.1070***					
	(0.0000)					
Administered agric. prices #			-0.2448***	0.0283		
			(0.0011)	(0.5365)		
Max agric. price intervention #			-0.1081	0.0789*	-0.0417	0.0591
			(0.1006)	(0.0558)	(0.5501)	(0.1187)
Aid to GDP #			3.3650**	-2.4081***	0.7691	-1.6192***
			(0.0373)	(0.0000)	(0.5668)	(0.0000)
Fertility #			0.1054**	0.1213***	0.1939***	0.0970***
			(0.0392)	(0.0000)	(0.0000)	(0.0000)
Capital account liberalization #			0.0283	0.2823***	0.3209***	0.2999***
			(0.7224)	(0.0046)	(0.0001)	(0.0008)
Observations	1916		1361		1471	
R-squared	0.53		0.72		0.66	

*** p<0.01, ** p<0.05, * p<0.1 (robust p-values in parentheses)

# indicates that the variable is constructed relative to the weighted average of the trading partners

Robust dynamic OLS panel regressions with fixed effects of the real effective exchange rate (INS source) on same determinants as previous two tables. Independent variables are interacted with dummy variables for LICs and HICs. First two columns present standard determinants only. Second two columns encompass determinants in columns 2 of previous two tables. Last two columns present determinants in columns 3 of previous two tables. Unbalanced panel with annual data 1980-2006.

Table 7b. F-tests of equality (p values) of coefficients across income groups for regressions reported in in Table 7a.

	(1)	(2)	(3)
NFA (w/ NPV debt) to trade	0.2710	0.0000	
Relative productivity (log) #	0.0003	0.9525	
Terms of trade goods (log)	0.0020	0.1165	0.0175
Government Consumption to GDP #	0.0678	0.6628	0.7432
Trade restrictions #	0.0221	0.1168	
Administered prices			
Administered agric. prices #		0.0019	
Max agric. price intervention #		0.0161	0.2043
Aid to GDP #		0.0006	0.0818
Fertility #		0.7801	0.0308
Capital account liberalization #		0.0465	0.8620

note: p-values for the Ho: coeff HIC = coeff LIC

Table 8. Real effective exchange rate regressions (IMF def.) regressions, robustness. Panel dynamic OLS with Fixed Effects (only long-run coefficients reported).

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Terms of trade goods (log)	0.3931***			0.2578***	0.4281***	0.3766***	0.3930***	0.3871***
	(0.0000)			(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Government Consumption to GDP #	2.0271***	1.8930***	1.6995**	1.2982*	2.6090***	1.7860***	2.3317***	2.0402***
	(0.0002)	(0.0003)	(0.0167)	(0.0871)	(0.0000)	(0.0009)	(0.0000)	(0.0004)
Aid to GDP #	-1.6187***	-1.4091***	-1.5832***	-4.6194***	-1.8067***	-1.4648***	-1.9358***	-1.6471***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Capital account liberalization #	0.2978***	0.2890***	0.2594**		0.3374***	0.2611***	0.2511***	0.2816***
	(0.0011)	(0.0011)	(0.0103)		(0.0001)	(0.0022)	(0.0057)	(0.0025)
Max agric. price intervention #	0.0596	0.0657	0.1616***	0.0886**	0.0501	-0.0295	0.0058	0.0528
	(0.1660)	(0.1223)	(0.0002)	(0.0238)	(0.2247)	(0.4794)	(0.8933)	(0.2153)
Fertility #	0.0979***	0.0821***	0.1100***	0.1490***			0.1156***	0.1013***
	(0.0000)	(0.0005)	(0.0003)	(0.0000)			(0.0000)	(0.0000)
Price of exports - goods		0.3698***						
		(0.0000)						
Price of imports - goods		-0.3754***						
		(0.0000)						
Price of exports - goods&services			0.1554*					
			(0.0921)					
Price of imports - goods&services			-0.0751					
			(0.3470)					
Capital account liberalization (other) #				0.0668				
				(0.3459)				
Infant mortality rate (UN) #					0.0052***			
					(0.0001)			
Old age dependency #						5.2828***		
						(0.0000)		
GDP per worker PWT (log)							-0.2360**	
							(0.0255)	
Relative productivity (log) #								-0.0363
								(0.6816)
Observations	609	609	609	561	609	609	555	609
R-squared	0.65	0.66	0.61	0.64	0.64	0.68	0.68	0.66

*** p<0.01, ** p<0.05, * p<0.1 (robust p-values in parentheses)

# indicates that the variable is constructed relative to the weighted average of the trading partners

Robust dynamic OLS panel regressions with fixed effects of the real effective exchange rate (INS source) on same determinants as previous two tables. Additional control encompass: splitting terms of trade in price of exports and of imports (either of goods only or of goods&services), and alternative measures of capital account liberalization, of demographics, and of productivity. Unbalanced panel with annual data 1980-2006.

TABLE 9: Real effective exchange rate (Penn World Tables) regressions robustness. Panel dynamic OLS with Fixed Effects (only long-run coefficients reported).

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Terms of trade goods (log)	0.1970***			0.1098	0.3453***	0.2593***	0.1892***	0.2023***
	(0.0077)			(0.1327)	(0.0000)	(0.0000)	(0.0092)	(0.0045)
Government Consumption to GDP #	3.3371***	3.0899***	2.8125***	2.1511**	4.0085***	2.8295***	3.4689***	4.0020***
	(0.0000)	(0.0000)	(0.0002)	(0.0230)	(0.0000)	(0.0001)	(0.0000)	(0.0000)
Aid to GDP #	-2.0504***	-1.5720***	-1.5319***	-3.9983***	-2.4248***	-1.6520***	-2.1860***	-2.6034***
	(0.0000)	(0.0002)	(0.0006)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0000)
Capital account liberalization #	0.1984**	0.1995**	0.2124**		0.3337***	0.1672**	0.1747*	0.1140
	(0.0233)	(0.0166)	(0.0167)		(0.0002)	(0.0314)	(0.0575)	(0.1836)
Max agric. price intervention #	0.1842***	0.2037***	0.1958***	0.2401***	0.1764***	0.0412	0.1770***	0.1095**
	(0.0002)	(0.0000)	(0.0000)	(0.0000)	(0.0009)	(0.3679)	(0.0003)	(0.0290)
Fertility #	0.1247***	0.1311***	0.1553***	0.1485***			0.1364***	0.1354***
	(0.0001)	(0.0000)	(0.0000)	(0.0000)			(0.0002)	(0.0001)
Price of exports - goods		0.2490***						
		(0.0012)						
Price of imports - goods		-0.0875						
		(0.3106)						
Price of exports - goods&services			0.2331***					
			(0.0060)					
Price of imports - goods&services			-0.0715					
			(0.3759)					
Capital account liberalization (other) #				0.1540*				
				(0.0883)				
Infant mortality rate (UN) #					0.0046***			
					(0.0077)			
Old age dependency #						6.3982***		
						(0.0000)		
Relative productivity (log) #							-0.0889	
							(0.4985)	
GDP per worker PWT (log)								-0.3678***
								(0.0029)
Observations	622	622	622	571	622	622	622	587
R-squared	0.69	0.70	0.70	0.74	0.63	0.70	0.69	0.70

*** p<0.01, ** p<0.05, * p<0.1 (robust p-values in parentheses)

# indicates that the variable is constructed relative to the weighted average of the trading partners

Robust dynamic OLS panel regressions with fixed effects of the real effective exchange rate (Penn World Table source) on same determinants as previous two tables. Additional control encompass: splitting terms of trade in price of exports and of imports (either of goods only or of goods&services), and alternative measures of capital account liberalization, of demographics, and of productivity. Unbalanced panel with annual data 1980-2006.

Table 10. Net foreign asset regressions. Panel dynamic OLS with Fixed Effects (only long-run coefficients reported).

VARIABLES	NFA to trade	NFA to GDP	NFA (w/ PV) to trade	NFA to trade	NFA to trade	NFA to trade	NFA to trade	NFA to trade	NFA to trade	NFA to trade
Public debt to trade	-0.4566***			-0.4240***	-0.4369***	-0.4084***	-0.4764***	-0.4840***	-0.4686***	-0.4610***
	(0.0000)			(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Fertility #	-0.3135***	-0.0531**	-0.0761		-0.2997***	-0.5563***	-0.1375	-0.3612***	-0.4913***	-0.2896**
	(0.0028)	(0.0260)	(0.1597)		(0.0035)	(0.0000)	(0.1316)	(0.0026)	(0.0001)	(0.0119)
Relative productivity (log) #	1.5867***	0.2829***	0.5295***	1.6864***	1.8451***			1.1766**	1.7841***	1.3836***
	(0.0016)	(0.0019)	(0.0050)	(0.0026)	(0.0003)			(0.0316)	(0.0008)	(0.0039)
Constraints on executive	0.2280***	0.0293**	0.0086	0.2520***	0.2221***	0.1847***	0.1944***	0.2324***	0.2504***	0.2505***
	(0.0000)	(0.0109)	(0.7005)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Domestic financial liberalization #	2.0003***	0.2081**	0.2147	2.0634***	1.6171***	1.3346***	1.6155***	1.2107**	1.8758***	2.2360***
	(0.0001)	(0.0458)	(0.4030)	(0.0000)	(0.0001)	(0.0009)	(0.0009)	(0.0223)	(0.0006)	(0.0001)
Capital account liberalization #	-1.4137***	-0.1060	-0.4333**	-1.3293***		-0.7920**	-1.6001***	-1.5802***	-1.4892***	-1.1084**
	(0.0011)	(0.1886)	(0.0436)	(0.0030)		(0.0498)	(0.0003)	(0.0004)	(0.0042)	(0.0191)
Public debt to GDP		-0.5423***								
		(0.0000)								
NPV of external debt to trade			-0.8922***							
			(0.0000)							
Old age dependency #				-16.3720**						
				(0.0192)						
Capital account liberalization (other) #					-0.4263*					
					(0.0948)					
Income per capita (relative to US)						28.0763***				
						(0.0000)				
GDP per worker PWT (log)							0.8484**			
							(0.0498)			
Terms of trade - goods&services (log)								0.3861		
								(0.1988)		
Trade restrictions #									0.5061	
									(0.1425)	
Administered prices #										0.4681
										(0.1833)
Max price of intervention #										0.4551**
										(0.0127)
Observations	610	590	612	610	653	599	610	539	554	566
R-squared	0.81	0.84	0.96	0.82	0.83	0.82	0.81	0.82	0.82	0.81

*** p<0.01, ** p<0.05, * p<0.1 (robust p-values in parentheses)

# indicates that the variable is constructed relative to the weighted average of the trading partners

Robust dynamic OLS panel regressions with fixed effects of the Net Foreign Asset to trade ratio (or NFA to GDP in column 2, or NFA adjusted for the net present value of external debt in column 3) on public debt to trade ratio, fertility, log of relative productivity, quality of institutions (constraint on executive), financial liberalization, and capital account liberalization. Additional control encompass: alternative measures of debt, demographics, capital account liberalization, relative income or productivity, terms of trade, trade restrictions, and agricultural price reforms. Unbalanced panel with annual data 1980-2006.

TABLE 11: Net foreign asset regressions with different slopes for LICs and HICs. Panel dynamic OLS with Fixed Effects (only long-run coefficients reported).

VARIABLES	NFA to trade		test of equality of coefficients (p-values)
	LICs	HICs & EM	
Public debt to trade	-0.4566***	-0.0059	0.000
	(0.0000)	(0.9141)	
Fertility #	-0.3135***	-0.2623**	0.731
	(0.0026)	(0.0136)	
Relative productivity (log) #	1.5867***	0.3129	0.030
	(0.0015)	(0.3092)	
Constraints on executive	0.2280***	0.1221***	0.074
	(0.0000)	(0.0007)	
Domestic financial liberalization #	2.0003***	0.8670***	0.059
	(0.0001)	(0.0088)	
Capital account liberalization #	-1.4137***	1.2703***	0.000
	(0.0010)	(0.0000)	
Observations	1414		
R-squared	0.87		

*** p<0.01, ** p<0.05, * p<0.1 (robust p-values in parentheses)

# indicates that the variable is constructed relative to the weighted average of the trading partners

Robust dynamic OLS panel regressions with fixed effects of the Net Foreign Asset to trade ratio on same fundamentals as in the benchmark (column 1) of previous table, interacted with dummy variables for our sample of low-income countries (LICs) and a dummy variable for richer countries, including advanced countries and emerging markets (HICs & EM). Unbalanced panel with annual data 1980-2006.

Appendix tables

Table A1: LICs country sample

1	Albania	*&	31	Macedonia, FYR	
2	Algeria	&	32	Madagascar	#*&
3	Azerbaijan, Rep. of	#*&	33	Malawi	
4	Bangladesh	#*&	34	Mali	
5	Belarus	#&	35	Morocco	#*&
6	Benin		36	Mozambique	#*&
7	Bolivia	#*&	37	Namibia	
8	Burkina Faso	#*&	38	Nepal	&
9	Cambodia		39	Nicaragua	#*
10	Cameroon	#*&	40	Niger	
11	Chad		41	Nigeria	#*&
12	Congo, Dem. Rep. of		42	Papua New Guinea	
13	Congo, Republic of		43	Paraguay	*&
14	Côte d'Ivoire	#*&	44	Peru	#*&
15	Dominican Republic	#*&	45	Philippines	#*&
16	Ecuador	#*&	46	Rwanda	
17	Egypt	&	47	Senegal	*&
18	El Salvador	#*&	48	Sierra Leone	#
19	Ethiopia	#*&	49	Sri Lanka	#*&
20	Gambia, The	#	50	Swaziland	
21	Georgia	&	51	Syrian Arab Republic	
22	Ghana	#&	52	Tanzania	#*&
23	Guatemala	#*&	53	Togo	
24	Guinea		54	Tunisia	#*&
25	Honduras	#	55	Uganda	#*&
26	Jamaica	#*&	56	Ukraine	#&
27	Jordan	#*&	57	Uzbekistan	*
28	Kenya	#*&	58	Vietnam	&
29	Kyrgyz Rep.	#&	59	Zambia	#
30	Lao People's Dem.Rep				

* countries included in CA baseline (Table 1 column 9)
# countries included in the RER baseline (Table 5 column 3)
& countries included in the NFA baseline (Table 10 column 1)

Table A2. Descriptive Statistics.

	mean	Stdev	min	max
Variable	**Mean**	**Std. Dev.**	**Min**	**Max**
Current Account to GDP	-0.0544	0.0785	-0.4721	0.2478
Fiscal Balance to GDP #	-0.0123	0.0552	-0.4710	0.3733
Old age dependency #	-0.0946	0.0304	-0.1790	0.0362
Population growth #	0.0122	0.0099	-0.0268	0.0528
NFA to GDP	-0.7162	0.7291	-10.1421	0.4170
Oil balance to GDP	-0.0063	0.0915	-0.3002	0.6143
Relative income percapita	0.0682	0.0513	0.0076	0.2671
GDP percapita growth #	-0.0104	0.0509	-0.3038	0.2800
Aid to GDP	0.0874	0.0984	-0.0369	0.8246
Concessional loans	0.0265	0.0357	-0.0889	0.4347
Net grants	0.0623	0.0733	0.0008	0.7781
Terms of trade (G&S)	4.6358	0.2763	3.7473	5.9550
Capital account liberalization (other)	0.4414	0.3366	0.0000	1.0000
Capital account liberalization	0.5082	0.2777	0.0000	1.0000
Log of REER (INS)	4.6565	0.3428	2.6794	5.8910
Log of REER (PWT)	-0.7972	0.4644	-2.2663	1.5944
NFA (w/ NPV debt) to trade	-2.5941	3.5943	-24.5817	1.0167
Government Consumption to GDP #	-0.0378	0.0568	-0.1454	0.3731
Terms of trade goods (log)	4.6677	0.3125	3.2149	6.1624
Fertility #	2.7400	1.3487	-0.5279	4.8621
GDP per worker PWT (log)	8.4248	0.8345	6.6902	10.0493
Trade restrictions #	0.1729	0.1858	-0.2463	0.8064
Administered prices #	0.0223	0.3242	-0.3087	0.9738
Max price intervention #	0.1833	0.4988	-0.5313	0.9372
Natural disaster	0.5195	0.4998	0.0000	1.0000
Violent political transition	0.0680	0.2518	0.0000	1.0000
Public debt to trade	3.2464	3.3911	0.0080	28.7196
Fertility #	2.7512	1.3558	-0.5279	4.8621
Relative productivity (log) #	-1.9131	0.6679	-3.5656	0.0631
Domestic financial liberalization #	-0.2942	0.1710	-0.6908	0.1458
Constraint on executive	3.6352	1.9312	1.0000	7.0000
NPV of external debt to trade	2.2657	2.4506	0.0323	21.4463

Note: # indicates deviation from trading partners

Table A3. Real deposit interest rates in selected Asian developing countries and in the US.

	1968-1974	1975-1981	1982-1988
Bangladesh	-7.88	-3.19	2.33
India	-2.46	0.07	1.13
Indonesia	-1.21	-5.8	7.57
Korea	1.58	-2.58	5.13
Malaysia	2.01	1.79	5.37
Nepal	-0.62	4.04	3.36
Pakistan	-2.33	-1.55	2.96
Phillipines	-4.22	-0.16	-0.32
Sri Lanka	-4.52	0.27	4.08
Taiwan	0.34	2.88	5.48
Thailand	1.24	1.52	7.67
United States	1.31	0.24	4.86

Source: Fry (1995) and authors' calculations for the US (annual average continuously compounded rates). Data for the US are from the International Financial Statistics (line 60lc and 64)

Appendix: the database

The database includes data since 1980 for all countries with a population larger than one million people. A few countries are dropped given substantial lack of data or very poor data quality. 134 countries are included in the database of which 31 are high-income countries; 26 are upper middle-income countries; 36 are lower middle-income countries; and 41 are low-income countries (based on the World Bank Classification). Our low income (LICs) sample comprises the last two groups and excludes emerging markets to make the sample as homogenous as possible (China, Colombia, India, Indonesia, Pakistan and Thailand). Our high income (HICs) sample—mainly used as a comparator group—includes the first two groups and the 6 countries listed above. Regression sample is often smaller due to the unbalanced nature of the dataset. Table A2 would indicate is a variable is constructed relative to trading partners: the weights used are those employed by the INS system of the IMF to calculate real effective exchange rates (see below). Acronyms corresponding to the databases are listed at the end of this Appendix.

Exchange rates

The real effective exchange rate

- The natural logarithm of the CPI-based real effective exchange rate from the International Monetary Fund (INS).
- The database also includes a measure of the real exchange rate computed based on the PWT variable "P", which captures price levels relative to the U.S.. The natural logarithm of this variable is taken, and it is then computed in deviations from trading partners, using the same weights as the INS one.

Black market premium

- The black market premium (BMP) is computed as the log difference between the black market nominal exchange rate and the official nominal exchange rate, both in local currency per US dollar. The data are annual averages of the monthly data from Reinhart and Rogoff (2004).

Demographics

Fertility

- Total fertility from the UN 2006 is defined as the average number of children a hypothetical cohort of women would have at the end of their reproductive period if they were subject during their whole lives to the fertility rates of a given period and if they were not subject to mortality. It is expressed as children per woman.

Infant mortality ratio

- Infant mortality rate from the UN 2006 is defined as infant deaths per 1,000 live births.

Old-age dependency ratio

- The old-age dependency ratio captures the share of people older than 64, relative to the working age population, defined as in the age group 15-64. The data are based on UN data, annualized by the World Bank. The variable is computed in deviations from trading partners.

Population growth

- The population growth data are computed from WB data, extended with UN projections.

External

Current account

- The current account to GDP ratio is based on WEO data.

Net foreign assets

- Net foreign assets (NFA), lagged one year, is computed relative to average trade for the real exchange rate regressions approach and relative to GDP for the current account regression (net foreign assets regressions encompass various version of this indicator, as discussed in the text) . Data on NFA in nominal terms are provided by Gian Maria Milesi-Ferretti. Trade data is from WEO or from IFS spliced with WEO data.
- Data on net foreign assets in net present value (NPV) terms are computed by adding back into NFA the measure of total debt, and then a subtracting time series data on the present value of debt from the World Bank. As the World Bank measure on the present value of debt is based only on long-term public and publicly guaranteed debt as well as use of IMF credit, we additionally subtracted short term and long term private non-guaranteed debt (which is not likely to be subject to substantial element of concessionality). For countries without data for the present value of debt, the nominal values are used.
- For a few countries, the cumulative current account is used in place of NFA.

Aid

- Foreign aid relative to GDP. The measure of foreign aid is computed by Roodman (2006). It is based on Official Development Assistance-Development Assistance Committee data and is computed as total net aid minus debt forgiveness plus offsetting entries for debt relief. The data are in millions of U.S. dollars and are computed relative to WEO nominal GDP in million U.S. dollars. We include in our estimations the concessional loans and net grants. The loans are constructed as foreign aid minus the net grants, and the latter is constructed as total grants minus debt forgiveness grants.

Oil balance

- The oil balance to GDP ratio is from WEO.

Fiscal

Fiscal balance

- The general government balance relative to GDP, using the central government balance for some countries where the general balance is not available. The data are from WEO.

Government consumption

- Government consumption relative to GDP is from the OECD, spliced with data from IFS and WEO.

Income related variables

GDP per capita growth

- Growth rate of GDP per capita from WEO.

Relative productivity

- The baseline measure of productivity is measured as real PPP GDP per capita from the Penn World Tables, extended with World Bank WDI Data.

GDP per worker PWT

- Real GDP divided by the number of worker, from the Penn World Tables.

Relative income per capita

- Relative income per capita is PPP income per capita, relative to the US. The data are from the World Bank.

Income groups

- Income groups are aggregated based on the World Bank income group classifications.

Shocks

Natural disasters

- Natural disaster data from the International Disaster Database (EM-DAT), Centre for Research on the Epidemiology of Disasters (CRED), include binary dummy variables (1 for event, 0 for no event) for drought, earthquake, extreme temperature, flood, volcano, wave surge, wildfires, and windstorm. It is the average of these indicators.

Wars

- War dummies from PRIO / Uppsala Armed Conflict Dataset, Version 4-2006, (Gleditsch and others (2002) are based on four types of conflicts: (i) extra systemic armed conflict (between a states and a nonstate group outside its own territory); these conflicts are by definition territorial, since the government side is fighting to retain control of a territory outside the state system; (ii) interstate armed conflict (between two or more states); (iii) internal armed conflict (between the government of a states and one or more internal opposition group(s)); and (iv) internationalized internal armed conflict (between the government of a state and one or more internal opposition group(s) with intervention from other states on one or both sides. Each type of conflict is coded as 0: no conflict; 1: minor; 2: intermediate; and 4: war (at least 1000 deaths per year).

Goods terms of trade

- The natural logarithm of terms of trade of goods (WEO).

Goods and services terms of trade

- The natural logarithm of terms of trade of goods and services (WEO).

Commodity-based terms of trade

- We also use for robustness the ratio of a weighted average price of the main commodity exports to a weighted average price of the main commodity imports. The index for 6 commodity goods is constructed as in Ricci et al. (2008). The index for 32 commodities encompasses: Aluminum, Bananas, Beef, Cocoa, Coconut oil, Coffee, Copper, Corn, Cotton, Crude oil, Fishmeal, Gold, Hard log, Hides, Iron, Lamb, Lead, Nickel, Palm oil, Rice, Rubber, Shrimp, Soybean meal, Soybean oil, Soybeans, Sugar, Sunflower oil, Tea, Tin, Wheat, Wool, and Zinc.

Structural reforms

Capital account liberalization

- The capital account liberalization measure from the Research Department's structural reform database is an index, normalized between 0 and 1. It is computed by Dennis Quinn and measures restrictions on capital account transactions.
- An alternative measure of capital account liberalization is taken from Abiad, Detragiache, and Tressel (2008).

Domestic financial reforms

- The domestic financial reform measure is an index, coded between 0 and 1. It is from the Research Department's structural reform database.

Price controls

- Administered prices is a [0,1] dummy reflecting the strong presence of price controls in the agricultural sector (from the agricultural product market index of the Research Department's structural reform database; code=3)
- Max agric. price intervention is a [0,1] dummy reflecting the presence of marketing boards setting the prices (from the agricultural product market index of the Research Department's structural reform database; code=4)
- Administered prices CGER is a measure of price controls based on the share of administered prices in the CPI from the EBRD, available for transition economies only (see Ricci et al. (2008)).

Trade restrictions

- Data on trade restrictions are from the IMF Research Department's Structural Reform Database. It is based on data for average tariffs and is normalized between 0 and 1 on the basis of smallest and largest observation in the sample.
- An alternative measure of trade restrictions is from Wacziarg and Welch (2003) who extended the liberalization years suggested by Sachs and Warner (1995).

Institutions

Constrains on executive

- Polity IV constraint on the executive variable (xconst), censored at zero for negative values.

Violent political transition

- Dummy variable equal to 1 whenever constraint on executive is negative, and is equal to zero otherwise.

Other controls

Change in private credit to GDP

Source: World Bank.

Notation

EBRD: European Bank for Reconstruction and Development
IFS: International Monetary Fund's International Financial Statistics
INS: International Monetary Fund's Information Notice System
PWT: Penn World Tables
UN: United Nations
WB: World Bank
WEO: International Monetary Fund's World Economic Outlook