Preliminary Version
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External Wealth, the Trade Balance,

and the Real Exchange Rate

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This draft: May 21, 2001

Abstract

We examine the link between the net foreign asset position, the trade balance and the real exchange rate. In particular, we decompose the impact of a country's net foreign asset position ('external wealth') on its long-run real exchange rate into two mechanisms: the relation between external wealth and the trade balance; and, holding fixed other determinants, a negative relation between the trade balance and the real exchange rate. We also provide additional evidence that the relative price of nontradables is an important channel linking the trade balance and the real exchange rate.

JEL Classification: F21, F31, F41.

Keywords: Net foreign assets, trade balance, real exchange rate.

* Email: plane@tcd.ie; gmilesiferretti@imf.org. We thank Patrick Honohan, Sam Ouliaris and Eswar Prasad for helpful discussions and seminar participants at the Federal Reserve Bank of New York. Part of this work was carried out while Lane was a visiting scholar in the research departments of the IMF and the Federal Reserve Bank of New York. Lane's work on this paper is part of a research network on 'The Analysis of International Capital Markets: Understanding Europe's Role in the Global Economy', funded by the European Commission under the Research Training Network Programme (Contract No. HPRN–CT–1999–00067). Lane also gratefully acknowledges the support of a TCD Berkeley Fellowship and the TCD Provost's Academic Development Fund.

1. Introduction

A country's external position is among the primary factors identified in the literature that seeks to determine a long-run fundamental value for the real exchange rate. The underlying intuition is straightforward: a positive steady-state net international investment position may allow a country to run persistent trade deficits; in turn, all else equal, the capability to sustain a negative net export balance allows the maintenance of a "strong" real exchange rate. Conversely, a debtor country that must run long-run trade surpluses may require a more depreciated real exchange rate.

The relation between external balances and the real exchange rate is of considerable interest to policymakers (and currency speculators). The most obvious current example is the rapidly growing net external liability position of the United States and its implications for a possible reversal in the current strength of the dollar.[1]

In this paper, we explore the relation between the external position and the long-run real exchange rate for a panel of industrial countries over 1970-98. We highlight two key mechanisms: (i) the long-run relation between the net foreign asset position and the trade balance; and (ii) the long-run relation between the trade balance and the real exchange rate.

With respect to the first mechanism, we emphasize that the impact on the trade balance critically depends on the interaction between the net foreign asset position, investment returns, output growth and exchange rate movements and provide direct evidence on the role played by these factors in driving the "intrinsic dynamics" of the external position. With respect to the second, in estimating the link between the level of the trade balance and the level of the real exchange rate, we control for other potential determinants, such as relative output per capita, relative productivity levels and the terms of trade.

In previous work (Lane and Milesi-Ferretti 2000a), we took an initial step in exploring the "transfer problem" --- the impact of net international payments on the

[1] See also Krugman (1985, 1987, 1991) and Obstfeld and Rogoff (2000a).

structure of relative prices.[2] Here, we build upon that contribution by focusing on the trade balance as a key mechanism that links net foreign asset positions and the real exchange rate. Moreover, by focusing on the industrial countries, we are able to refine our empirical analysis: for instance, by directly controlling for productivity variables in estimating the long-run relation between the trade balance and the relative price of nontradables. In addition, in order to learn from possible cross-country heterogeneity in coefficient estimates, we report here country-by-country real exchange rate regressions in addition to panel specifications.

The structure of the rest of the paper is as follows. Section 2 discusses some analytical issues that are important in interpreting the subsequent empirical work. The relation between the net foreign asset position and trade balance is estimated in section 3. Section 4 estimates a long-run real exchange rate equation as a function of the trade balance, plus some control variables. Some concluding remarks are offered in section 5.

2. Analytical Issues

Our overall approach is to argue that the impact of the net foreign asset position on the real exchange rate can be decomposed into two elements

$$\frac{\partial RER_t}{\partial b_{t-1}} = \frac{\partial RER_t}{\partial tb_t} * \frac{\partial tb_t}{\partial b_{t-1}} \qquad (1)$$

where RER_t denotes the CPI-based real exchange rate and tb_t and b_t are the ratios of the trade balance and net foreign assets to GDP respectively.[3] This decomposition assumes that the trade balance is the channel by which the net international investment position affects the long-run real exchange rate. It follows that two components are involved in linking the real exchange rate to net external wealth: (a) the long-run impact of the net foreign asset position on the trade balance; and (b) the long-run relation between the trade balance and the real exchange rate.

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[2] See also Faruqee (1995), Gagnon (1996), Broner et al (1997) and Alberola et al (1999). All these papers rule out any impact of the net foreign asset position on the relative price of nontradables. Moreover, none examines the trade balance as the channel linking net foreign assets and real exchange rates.

[3] Net foreign assets are measured at the end of each year: accordingly, the outstanding stock of net foreign assets at the beginning of year t is b_{t-1}.

We begin by studying the first component: the impact of the net foreign asset position on the trade balance. If we assume for simplicity that the rates of return on external assets and external liabilities are equal, the trade balance can be written as

$$tb_t \equiv -\left[\frac{(1+r_t)-(1+g_t)(1+\dot{e}_t)}{(1+g_t)(1+\dot{e}_t)}\right]b_{t-1}+\Delta b_t \equiv -\Psi_t+\Delta b_t \qquad (2)$$

where tb_t and b_{t-1} are the ratios of the trade balance and net foreign assets to GDP respectively, r_t is the real rate of return on foreign assets and liabilities (in US dollars), g_t is the real GDP growth rate of the economy and $\dot{e}_t$ is the rate of real exchange rate appreciation vis-à-vis the US dollar. Appendix B clarifies how equation (2) is altered when the rates of return on gross assets and gross liabilities differ.[4] The term multiplying b_{t-1} can also be written as $(i_t-\gamma_t)/(1+\gamma_t)$, where i_t is the nominal rate of return in US dollars and γ the nominal GDP growth rate, also in US dollars.

Holding fixed shifts in the country's net foreign asset position, we should observe an inverse relation between the net foreign asset position and the trade balance if the rate of return exceeds the growth rate ($i > \gamma$). We label Ψ_t the 'adjusted transfer' variable: it determines the size of the trade imbalance -- as a function of outstanding external wealth, investment returns, output growth and exchange rate movements -- that is consistent with a constant ratio of net foreign assets to GDP.

To make progress, we model the evolution of the net foreign asset position by

$$\Delta b_t = -\phi b_{t-1} + \varepsilon_t \qquad (3)$$

where $\phi > 0$ if there is a mean-reverting element in the dynamics of the net foreign asset position and ε_t is a shock term.[5]

Combining equations (2)-(3), we obtain a reduced-form equation for the trade balance

$$tb_t = -\phi b_{t-1} - \psi_t + \varepsilon_t \equiv -\lambda_t b_{t-1} + \varepsilon_t \qquad (4)$$

[4] The rate of return includes both interest or dividend income and capital gains. Clearly there is not a unique constant rate of return since it depends the particular assets and liabilities that comprise a country's net international investment position.

[5] In Lane and Milesi-Ferretti (2001), we relate the net foreign asset position to a set of long-run determinants: relative output per capita, the stock of public debt and demographic structure. However, there is no consensus model of what determines the net foreign asset position, and we adopt an agnostic position for this current exercise.

where $\lambda_t > 0$ if $[(i_t - \gamma_t) + (1+\gamma_t)\phi] > 0$. In this case, there will be a long-run tendency for countries with positive net foreign asset positions to run trade deficits and, conversely, debtor countries will tend to run trade surpluses.[6]

The second link is between the trade balance and the real exchange rate. Especially for a small open economy, the primary endogenous component of the real exchange rate is the relative price of nontraded goods.[7] A weak real exchange rate in a country that runs a persistent trade surplus may be attributed to several factors.[8] First, the negative wealth effect of maintaining absorption below production lowers demand for nontradables.[9] Second, this negative wealth effect also potentially raises labor supply, reducing costs in the nontraded sector. Third, a decline in the relative price of nontradables may also be useful in providing incentives for mobile factors to shift from the domestic to the export sector. These forces all point to an inverse relation between the trade balance and the relative price of nontradables.[10]

For countries with market power in international markets, we recognize that a trade imbalance may also affect the structure of international relative prices. For instance, a trade deficit may be associated with a strengthening of the external terms of trade, since into an increase in the price of exports relative to imports could accompany a contraction in net exports. Although there is not necessarily a mechanical connection between the terms of trade and the CPI-based real exchange rate, an improvement in the terms of trade will lead to real appreciation if there is a home bias in the tradables consumption basket

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[6] This statement assumes that Ψ_t is common across countries but we allow for cross-country differences in our empirical work. If Ψ_t and ε_t were positively correlated, this would weaken this claim.

[7] As is emphasized by Obstfeld and Rogoff (2000b), there is a strong equivalence between two-sector models with traded and nontraded goods and an environment in which all goods are tradable but transport costs are significant and there is limited substitutability between home and foreign goods. The reader may prefer this alternative framework, according to taste.

[8] Lane and Milesi-Ferretti (2000) provide a simple dynamic general equilibrium model that generates a negative steady-state effect of the trade balance on the relative price of nontradables.

[9] The wealth effect of a given net foreign asset position is captured by the additional 'permanent income' it generates. In turn, it is the level of these investment income flows (plus net capital gains) that determines the long-run trade imbalance that a country can maintain.

[10] It is well understood that there exist a range of conditions under which the relative price of nontradables depends only on relative productivity in the traded and nontraded sectors (see Obstfeld and Rogoff 1996, chapter 4). Some departure from these conditions is required for the trade balance effect to be important, which is ultimately an empirical question.

and/or the associated positive wealth effect raises demand for, and reduces the supply of, nontradables.

Due to the latter mechanism, terms of trade movements are a potential source of shifts in the real exchange rate. Although the terms of trade may in part be endogenously determined for larger countries, exogenous terms of trade movements are likely to predominate for most smaller countries. Accordingly, we directly control for the terms of trade in our empirical work: it follows that any relation between the trade balance and the real exchange rate in our specification will not be operating via the terms of trade channel.

In addition to the terms of trade, we also control for the impact of relative output per capita and, in some specifications, sectoral productivity in the real exchange rate equation. It is well understood that an improvement in productivity in the traded sector relative to the nontraded sector can generate an increase in the relative price of nontradables by driving up economy-wide real wage levels: this is the "Balassa-Samuelson" effect. We will directly control for productivity for the subsample of countries for which sectoral productivity data are available. For the broader panel of countries, we employ relative output per capita as a control variable. In part, this may proxy for the relative productivity effect since output per capita and relative traded-sector productivity are likely to be positively correlated.

However, relative output per capita may also exert additional influences on the real exchange rate. By the same mechanisms described above for the wealth effect of a positive net foreign asset position (via the capability to run persistent trade deficits), a rise in output per capita may be associated with an increase in demand for nontradables and a contraction in labor supply.[11] In addition, if tastes are non-homothetic and the income elasticity of demand for nontradables is greater than one, this may further apply upward pressure on the relative price of nontradables (Bergstrand 1991).

It is also worth noting that controlling for relative output per capita serves a useful additional purpose in seeking to capture the long-run relation between the trade balance and the real exchange rate, since relative output per capita controls for any effects of

[11] Note that, using relative output per capita should be similar to using relative income per capita, since we are holding fixed the trade balance (which we argue in the long-run is negatively related to net investment income flows, the primary difference between income per capita and output per capita).

historical current account imbalances on the level of output via past effects on the path for domestic investment.

In summary, our specification for the real exchange rate is

$$RER_{it} = q(tb_{it}, yd_{it}, tt_{it}) + \mu_{it} \qquad q_{tb} < 0, q_{yd} > 0, q_{tt} > 0 \tag{5}$$

where an increase in the real exchange rate index RER_{it} corresponds to a real appreciation, yd_{it} is relative GDP per capita, $rprod_{it}$ is relative sectoral productivity, tt_{it} is the terms of trade and μ_{it} is a disturbance term.[12]

As stated, we will also empirically examine the relative price of nontradables

$$(PN/PT)_{it} = p(tb_{it}, yc_{it}, rprod_{it}, tt_{it}) + v_{it} \qquad p_{tb} < 0, p_{yc} > 0, p_{rprod} > 0, p_{tt} > 0 \tag{6}$$

where yc_{it} is GDP per capita, $rprod_{it}$ is ratio of sectoral labor productivity in the tradable sector versus the nontradable sector and v_{it} is a disturbance term.[13]

3. External Wealth and the Trade Balance

In this section, we examine empirically the relation between the balance on goods and services, the net external position, its composition, and the "adjusted transfer" term Ψ_t. Our sample spans the period 1970-1998 and includes 20 OECD countries.[14] The data on the trade balance come from the IMF's Balance of Payments Statistics and refer to the

[12] Clearly this is a reduced-form equation: our goal is to establish the observed long-run comovement between the trade balance and the real exchange rate (holding fixed the other regressors). A full multi-equation structural model would be required to identify the various causal links between these variables but the identification problems inherent in such an exercise are forbidding.

[13] As is detailed in section 4, we also examine the difference between the relative price of nontradables at home and the weighted average of the relative price of nontradables in each country's major trading partners, since it is this difference that matters for the determination of the real exchange rate. For this more limited sample, we also re-run the real exchange rate specification with the addition of the relative productivity variable to the set of regressors.

[14] The sample here excludes Belgium, because the balance of payments data refer to Belgium and Luxembourg but the net foreign asset data to Belgium only, and Ireland, a country for which measurement of the trade balance and net investment income in the 1990s is strongly affected by transfer pricing issues. Data availability for the balance of goods and services starts, for some countries, in the mid-1970s.

balance of goods, services and transfers. [15] We use two sources of data for net foreign assets: the estimates we constructed in Lane and Milesi-Ferretti (1999) ("adjusted cumulative current account"), which are available for the period 1970-1998, and the International Investment Position data (IIP) reported in the IMF's Balance of Payments Statistics, which are generally available for a shorter period. Appendix A provides more details on data sources and definitions for all variables.

The ratio of nominal investment returns to GDP is calculated as the sum of net investment income and net capital gains on outstanding external assets and liabilities measured in US dollars, divided by GDP in US dollars ($i_t B_{t-1}/Y_t$). To calculate real returns, we subtract the impact of US inflation on the outstanding stocks of net foreign assets. The "adjusted transfer" term is calculated as the difference between the ratio of nominal returns to GDP $i_t B_{t-1}/Y$ and the impact of GDP growth on the ratio of outstanding net foreign assets to GDP $\gamma_t B_{t-1}/Y_t$.

We first focus on the time series evidence, presenting the results of fixed-effects panel regressions, and then move to the cross-sectional evidence. As highlighted in the previous section (see equation (2)), changes in the net foreign asset position of a country are the sum of trade imbalances and the "intrinsic dynamics" of the net foreign asset position, determined by rates of return, real exchange rate changes and the economy's growth rate. Here we are interested in exploring whether the trade balance responds to the level of the net foreign asset position and/or to its intrinsic dynamics .

Table 1 shows results of panel regressions, for the period 1974-1998, in which the dependent variable is the balance of goods, services and transfers as a ratio of GDP and the explanatory variables are the lagged stock of net foreign assets and the 'adjusted transfer' term $\Psi_t \equiv [(i-\gamma)/(1+\gamma)]b_{t-1}$. Our trade balance and 'adjusted transfer' variables are 5-year averages, in order to smooth out year-to-year fluctuations in the highly-volatile 'adjusted transfer' variable, while net foreign assets, net debt and net equity are the outstanding stock at the beginning of each 5-year period. The regressions also include

[15] We employ here the trade balance inclusive of current transfers since a trade surplus and an inward transfer are equivalent ways to finance a given level of debt service payments. As a practical matter, the inclusion of transfers matters mostly for Greece. In the real exchange rate section, we just use the balance on goods and services since it is the difference between domestic production and absorption that should matter for the real exchange rate.

fixed time and country effects, and an adjustment for the residual serial autocorrelation in the error term.[16]

Column (1) of Table 1 shows a clear negative relation between the trade balance and the net foreign asset position *within* countries: if a country's net external liabilities increase by 10 percent of GDP, its trade surplus increases on average by 1.3 percent of GDP.

An interesting hypothesis is whether the composition of net external wealth between equity and debt instruments matters for its relation with the trade balance.[17] One reason is that equity and debt may carry different rates of return; another is that risk premia or credit limits may depend just on the net external debt position.[18] In column (2), we break down the net foreign asset position into its net equity and net debt components, where the former is calculated as the sum of the net FDI and the net portfolio equity positions. The point estimate for net debt is higher and more precisely estimated but the difference between the coefficients is not statistically significant.

Columns (3) and (4) add the adjusted transfer term $\Psi_t \equiv [(i-\gamma)/(1+\gamma)]b_{t-1}$ to the explanatory variables. The coefficients on lagged net foreign assets and their composition are virtually unchanged, and the coefficient on the new term is statistically and economically significant, albeit considerably below its theoretical value of unity. This is not surprising, since Ψ_t is plausibly correlated with the disturbance term in equation (2).[19] That the net foreign asset position remains significant even after the introduction of Ψ_t suggests that either there is some element of (country-specific) mean-reversion in net foreign asset positions (see equation (2)) or that, due to measurement

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[16] The time dummies are jointly significant but do not affect the size and significance of the other coefficients. If we do not undertake the serial correlation adjustment, the coefficient on net foreign assets remains highly statistically significant but drops just below 0.10 in absolute value.

[17] Obstfeld and Rogoff (2000a) argue that the composition of the net foreign asset position does not matter for the relation between the trade balance and the real exchange rate, which is determined by the structure of goods markets. However, composition may still indirectly matter for the real exchange rate by altering the relation between the net foreign asset position and the trade balance.

[18] We have not yet explored possible asymmetries between debtor and creditor countries in this regard. See Lane and Milesi-Ferretti (2000b) on the determinants of the debt/equity split in the external capital structure.

[19] For instance, Lane and Milesi-Ferretti (2001) show that increases in the level of output per capita are associated with an improvement in the net foreign asset position among the industrial countries and we know that Ψ_t depends on the output growth rate. The rates of return that a country earns on its foreign assets and pays out on its foreign liabilities also plausibly affects its net foreign asset position.

error, Ψ_t does not fully capture all the returns earned on a country's net international investment position.

Finally, in column (5), we break down the transfer component into effect of real returns ($r_t b_{t-1}$) and the combined effect of growth and real exchange rate fluctuations, given by $-(g_t + \dot{e}_t)b_{t-1}$. The two coefficients are not different statistically and are both marginally significant at the 10 percent confidence level. Finally, comparing columns (3) and (5), the response of the trade balance to the raw net foreign asset position remains virtually unchanged quantitatively and in statistical significance.

To our knowledge the only other study that has looked at whether flow measures respond to the initial external stock position is Chinn and Prasad (2000) who conduct a cross-country study of the determinants of medium-term current account balances. Their findings suggest that the initial stock position is *positively* correlated with subsequent current account balances, both along the time series dimension and along the cross-sectional dimension. Since the current account is the sum of the trade balance and net factor income, a negative relation between the initial net foreign asset position and the trade balance can be reconciled with a positive relation with the current account, since net investment income is itself positively related to net external wealth.[20]

We turn to the cross-sectional dimension in Table 2. Our dependent variable is the trade balance averaged over the period 1974-1998 (columns (1), (3), (5)) and 1983-98 (columns (2), (4) and (6)). To check for the robustness of our results, we use IIP data as our measure of net foreign assets for the period 1983-98 whenever possible.[21] Our explanatory variables are the stock of net foreign assets at the beginning of the sample period, the average "adjusted transfer" term and its components. From columns (1) and (2), it is clear that there is no cross-sectional relation between the initial net foreign asset position and the subsequent average trade balance. However, the relation between the average trade balance and the adjusted transfer variable is close to one-to-one: creditor

[20] That said, if we use the current account instead of the balance of goods and services we still obtain a negative coefficient on the initial stock of net foreign assets for our sample of countries.

[21] We use the IIP data for Austria, Canada, Finland, Germany, Italy, Japan, Netherlands, Spain, Sweden, Switzerland, United Kingdom, United States. For the remaining countries, IIP data is available only for a shorter period or not available at all. Results are analogous if we use our own measure of net foreign assets for all countries for the same period.

countries with $i > \gamma$ run trade deficits, while debtor countries with $i > \gamma$ run trade surpluses. The converse happens for countries in which $i < \gamma$.

The cross-section relation between the average adjusted transfer and the average trade balance is also illustrated graphically in Figure 1. Over the 1974-98 period, those countries that enjoyed positive adjusted transfers (such as the US, UK and Greece) were able to run average trade deficits; conversely, those countries that on net were paying out adjusted transfers (such as the Netherlands, Canada, Denmark and Finland) ran average trade surpluses. Figure 2 shows instead the relation (or lack thereof) between the average trade balance over the period 1983-1998 and the stock of net foreign assets at the end of 1982: differences in rates of return and growth rates means that the cross-section relation between net foreign assets and the trade balance is weaker than the relation between adjusted transfers and the trade balance.

When we break down the adjusted transfer element into its underlying components in columns (4) and (5) of Table 2, we find that both the real return and the growth component are highly significant and have a coefficient that is statistically not different from minus one. That the net foreign asset position operates only via the adjusted transfer term is perhaps not surprising in the cross-section dimension: for instance, country-specific mean reversion in net foreign assets is more plausible than reversion across countries to a common mean.

As Appendix B makes clear, attempting to infer the "net" rates of return *i* or *r* directly (rather than multiplied by the ratio of lagged net foreign assets to GDP) is an exercise fraught with problems, which can be especially severe for countries that have net foreign asset positions not far from zero. The reason is that net investment income is given by the difference between returns on external assets and on external liabilities, and such returns will not in general be equal.[22] As a result, it is possible for a country to have nonzero net investment income or returns even when its net foreign asset position is zero. Simply dividing net investment income by the lagged net foreign assets when the denominator approaches zero gives clearly biased results. The problem can be addressed if we can estimate with confidence the gross stocks of external assets and liabilities, and

[22] The United States during most of the 1990s had net external liabilities but positive net investment income.

therefore the rates of return on external assets and external liabilities separately. With the net foreign asset data we constructed we have estimates of the gross positions only for portfolio equity and FDI, but for the debt component we can only provide estimates of the net position. However, the IIP provides measures of all gross assets and liabilities, albeit for a smaller set of countries and a shorter period of time.

In Table 3 we use this data for the period 1983-98 to cast further light on our regression results. We report the initial net foreign asset position, its period average, the trade balance, adjusted transfers, real returns (all as ratios to GDP), median real rates of return on external assets and external liabilities for those countries that have IIP data available for a sufficiently long period of time (at least 10 years), and finally the average rate of growth and real appreciation.

Debtor countries such as Canada, Finland, New Zealand, Spain and Sweden have negative average adjusted transfers (column (4)) and negative average net foreign assets (column (1)), suggesting a positive $i-\gamma$. Instead, the adjusted transfer term is positive for debtor countries such as Greece, Portugal and the United States and negative for creditor countries such as Germany and the Netherlands, suggesting that $i-\gamma$ is negative. However, if we look at columns (6)-(9) it is clear that the rates of return on external assets and liabilities are *higher* than the combined growth/real appreciation effect, most clearly in Japan, the Netherlands and the United States.

What is at work here is a *rate of return differential* between external assets and liabilities (positive for the US, negative for the US, negative for Japan and the Netherlands) which makes the average ratio of real returns to GDP (and the adjusted transfer term) *positive* for a debtor country like the US and *negative* for creditor countries such as Germany, Japan and the Netherlands.[23] One of the reasons why the median real rates of return on external assets and liabilities (nominal dollar returns minus US inflation) are high for most countries (mean and median are above 6 percent) is the impact of capital gains on equity holdings. Indeed, the mean and median value of real yields (not reported) are around 4 percent.

[23] See Appendix B for the expression corresponding to the ratio of real returns and adjusted transfer to GDP when there are rates of return differentials between assets and liabilities.

In summary, we have established that the outstanding net foreign asset position indeed helps to explain the evolution of the trade balance. Within countries, larger net external liabilities are associated with larger trade surpluses both directly and via the 'adjusted transfer' variable. Along the cross-sectional dimension, the net foreign asset position affects the trade balance solely through the 'adjusted transfer' variable.

4. The Real Exchange Rate and the Trade Balance

Having established a link between the net foreign asset position and the trade balance, the objective of the second part of our empirical exercise is to capture the long-run relation between the trade balance and the real exchange. We begin by examining the specification in which the real exchange rate is regressed on the trade balance, relative GDP per capita and the terms of trade. We employ a multivariate CPI-based real exchange rate and the same trade weights are employed to construct relative output per capita as the difference between domestic GDP per capita and the weighted average of the GDP per capita of each country's main trading partners.

Country-by-country estimation is by DOLS(-1,1), with Newey-West standard errors, and the panel estimation also employs the DOLS(-1,1) specification.[24] Accordingly, the general form of the panel regression is

$$\log(RER_{it}) = \alpha_i + \phi_t + \beta_1 * tb_{it} + \beta_2 * \log(yd_{it}) + \beta_3 * \log(tt_{it}) + \sum_{k=-1}^{k=1} \rho_{1k} \Delta tb_{it} + \sum_{k=-1}^{k=1} \rho_{2k} \Delta \log(yd_{it}) + \sum_{k=-1}^{k=1} \rho_{3k} \Delta \log(tt_{it}) + \mu_{it} \quad (7)$$

Following Maddala and Wu (1999) and Mark and Sul (1999), we check the stationarity of the residual term μ_{it} in all our specifications by running a Fisher test that allows the autoregressive dynamics of the residuals to vary across countries.[25] Results for the specifications with time effects are presented in Table A1. In all cases, the test clearly

[24] Stock and Watson (1993) originally developed the dynamic ordinary least squares estimator. See Mark and Sul (1999) and Kao and Chiang (1999) on its performance as an estimator of long-run relations in panel data. In fact, an ARDL specification generates very similar results.

[25] The test aggregates the p-values from country-specific Dickey-Fuller regressions on the residuals. The test statistic $-2\sum_{i=1}^{N} \ln(p_i)$ has a χ^2_{2N} distribution.

indicates that the null hypothesis of nonstationarity is rejected, suggesting a stationary relationship between the dependent variable and the regressors.

The country-by-country and panel results are shown in Tables 4 and 5 respectively.[26] Taking first the country-by-country estimates in Table 4, we observe that the point estimate on the trade balance is negative in 19 out of 21 cases: all else equal, real exchange rates tend to be more depreciated, the larger is the trade balance surplus. The coefficient is significant in just over half the countries (11 out of 21 countries) and, among the significant estimates, ranges in size from –7.62 for the United States to –1.19 in Austria. As is illustrated in Figure 3, a negative relation between country size and the magnitude of the trade balance coefficient is clearly evident in the data (the correlation is –0.46).[27] This is to be expected: in standard open-economy models, the deterioration in the real exchange rate that is associated with a given improvement in the trade balance is directly related to the relative size of the nontraded sector in the economy.

With respect to the other real exchange rate determinants, there is a positive relation between relative output and the real exchange rate for 14 countries (9 significant): countries that experience a relative improvement in output per capita tend to experience real appreciation. However, the evidence here is not all in the same direction: New Zealand, Switzerland and the United Kingdom all display significantly negative coefficients for the relative output variable.

Finally, the terms of trade enters with a positive sign in 18 out of 21 cases (11 significant), with only the Netherlands showing a significantly negative coefficient. By holding fixed the terms of trade, we emphasize that the observed relation between the trade balance and the real exchange rate must be operating through some other channel, such as the relative price of nontradables.

To gain efficiency, we also estimated panel equations, as reported in Table 5. In columns (1)-(2), the full panel is employed. The sample is then split between the non-G3 and G3 countries in columns (3)-(4) and (5)-(6) respectively, in order to allow for the differences in country size that we highlighted in Table 4. In all cases, country fixed effects are employed: these are necessary since the real exchange rate data are index

[26] To conserve space, we only report the estimated long-run β coefficients.

[27] Country size is measured by total GDP in 1990, in constant US dollars.

measures and therefore not comparable across countries. We report results both with and without time fixed effects.

The trade balance enters significantly in all specifications in Table 5. Taking the specification that includes time dummies, the trade balance coefficient for the full panel is –0.72. However, in line with the country-by-country evidence, the split between the non-G3 and G3 subsamples reveals a large difference in magnitude. For the non-G3 countries, a 3 percentage point increase in the trade surplus as a ratio to GDP is associated with only a 1 percent real depreciation. For the G3 countries, by contrast, the same improvement in the trade balance is associated with a 19.3 percent real appreciation.

A similar story applies for the role played by relative output per capita: in all specifications, its relation with the real exchange rate is significantly positive but the point coefficient is ten times larger for the G3 than for the non-G3 countries --- a 10 percent increase in relative output per capita is associated with less than a 2 percent real appreciation for the non-G3 countries but a 19 percent real appreciation for the G3 countries.

Finally, the terms of trade is significantly positive for the full panel and the non-G3 countries but is insignificant for the G3 countries. From Table 4, the latter result is attributable to the Japanese data: the country results for the US and Germany indicate a unitary coefficient for the terms of trade in the real exchange rate equation. For the non-G3 countries, the terms of trade coefficient is 0.52: a 10 percent improvement in the terms of trade is associated with a 5.2 percent real appreciation.

Overall, the results in Tables 5-6 provide broad support for an inverse long-run relation between the trade balance and the real exchange rate, holding fixed relative output per capita and the terms of trade.

We turn now to examining whether we can directly observe a relation between the trade balance and the relative price of nontradables, even when we directly control for the impact of differential relative sectoral productivity growth. We build proxies for sectoral productivity and sectoral prices from the OECD's Intersectoral Database (ISDB): this provides sufficient data for thirteen of the countries in our sample.[28] The "manufacturing" sector is taken to represent the tradable sector; the nontraded sector is proxied by an aggregate of "construction", "community, social and personal services", and "producers of government services."[29] We follow Cumby et al (1999) in taking labor productivity (value added divided by the number of employees) as the appropriate productivity variable. Sectoral prices are measured by the value added deflators.

The relative price of nontradables is the dependent variable in Table 7. We consider a slightly altered set of regressors: in addition to the introduction of the productivity variable, our focus on the relative price of nontradables means that we employ here GDP per capita (yc_{it}) rather than relative GDP per capita (yd_{it}).[30] As in Table 5, columns (1)-(2) employ the full panel; columns (3)-(4) include only the non-G3 countries; and column (5)-(6) show the results for the G3 sub-panel.

Consistent with De Gregorio et al (1994), Asea and Mendoza (1994) and Cumby et al (1999), relative sectoral productivity enters very strongly in determining the relative price of nontradables. However, it turns out that the trade balance is also a significant variable in determining the relative price of nontradables. The estimated point coefficients in columns (4) and (6) suggest that a one percentage point improvement in the trade balance is associated with a decline in the relative price of nontradables of 0.75 percent and 1.21 percent for the non-G3 and G3 countries respectively.

Although there is a difference between the non-G3 and G3 countries in these point estimates, it is much smaller in magnitude than in the real exchange rate regressions in Table 5. These findings can be reconciled by the fact that the relative price of nontradables is a more important component in the consumer price level in larger, more closed economies: the same change in the relative price of nontradables translates into a

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[28] These are the United States, Japan, Germany, France, Italy, the United Kingdom, Canada, Denmark, Finland, Norway, Australia, Belgium and Sweden. The Netherlands is also in the database but the data coverage is very poor.

[29] This selection maximizes data availability, since other services sectors (such as financial services) are available only for a small number of countries over a narrow time interval. Moreover, as is pointed out by McDonald and Ricci (2001), the "wholesale and retail trade" sector which is often incorporated into the nontraded bundle in fact more closely resembles a tradable sector in its characteristics.

[30] Imagine all countries grew at the same rate: the relative price of nontradables would plausibly rise in all countries --- for this purpose, it is absolute GDP per capita that matters.

much bigger change in the CPI-based real exchange rate for a large country than for a small country.[31]

With respect to the other regressors, the interpretation of the output per capita variable is that it captures demand factors and/or wealth effects on the supply of labor, since productivity is now directly included in the specification. In fact, the evidence on the output per capita variable is mixed: for the G3 countries, there is a significantly positive relation between output per capita and the relative price of nontradables but this is not the case for the non-G3 countries. Finally, there is weak evidence that the terms of trade positively affects the relative price of nontradables (more so for the non-G3 countries).

The findings in Table 6 refer to the determinants of the relative price of nontradables. What matters for the evolution of the real exchange rate is the relative price of nontradables at home relative to the relative price of nontradables overseas.[32] Accordingly, we report results for this "double" relative price in Table 7. By extension, we now use the difference in relative sectoral productivity between the home country and its trading partners (DRPROD) and relative GDP per capita (LYD) as the relevant regressors, in addition to the trade balance and the terms of trade.

The results in Table 7 are broadly similar to those in Table 6. Cross-country variation in relative sectoral productivity are very important in explaining differentials in the relative price of nontradables. As before, the trade balance is typically important in explaining the relative price of nontradables relative to trading partners , although it loses significance for the G3 countries if time dummies are excluded from the specification. However, for the specification that includes time dummies (columns (4) and (6)), the point estimate for the G3 countries is almost triple that for the non-G3 countries. Although substantial, this differential is much smaller than in the real exchange rate equations in Table 5: consistent with the different weights according to nontradables in the consumption baskets of large versus small countries.

In contrast to Table 6, (relative) output per capita is significant in all

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[31] Following Obstfeld and Rogoff (2000a, 2000b), nontradables should be broadly interpreted for this purpose to encompass all goods whose price is ultimately determined by domestic conditions.

[32] As already noted, similar changes in the relative price of nontradables can have different effects on consumer price levels and real exchange rates if nontradables have different weights in the consumption bundle in home and foreign countries.

specifications in Table 7. The point estimates suggest that this variable exerts a bigger impact for the G3 countries than the non-G3 countries: the magnitude of the coefficient is twice as large for the specification that includes time fixed effects (columns (4) and (6)). Finally, the terms of trade are significant only for the non-G3 countries in Table 7. We may expect a more important role for the terms of trade in smaller (more open) economies, since the wealth effect of a terms of trade improvement positively depends on the volume of export/import activity.

Finally, for the restricted sample, real exchange rate results are presented in Table 8. The qualitative findings for the trade balance continue to hold: a generally negative relation with the real exchange rate and a bigger coefficient for the G3 than the non-G3 countries. However, the point estimate for the G3 countries is not significant in columns (5)-(6). Country-by-country results (not reported) indicate that this imprecision for the G3 countries arises from restricting the coefficient to be the same for three countries: the individual country estimates are each significant with point estimates of –7.3, -9.3 and –1.8 for the USA, Japan and Germany respectively.

We note also that relative productivity typically enters with a significantly positive coefficient but that the relative output per capita variable remains important even in this expanded specification: it is not just proxying for the Balassa-Samuelson effect. Finally, as in Table 7, the terms of trade matter only for the non-G3 countries.

In summary, for our purpose, the key lesson from the empirical results in this section is that they establish a link between the trade balance and the real exchange rate: in the long-run, larger trade surpluses are associated with more depreciated real exchange rates. Furthermore, it is evident that magnitude of the trade balance coefficient is positively related to country size. Taken together, the results of sections 3 and 4 illustrate a key mechanism by which the net foreign asset position is an important fundamental driver of the real exchange rate: conditional on the patterns of investment returns and output growth, countries with positive net external wealth are able to run persistent trade deficits; in turn, a pattern of trade deficits is associated with long-run real appreciation of the real exchange rate.

5. Conclusions

This paper has explored the links between the net foreign asset position, the trade balance and the real exchange rate. We have shown that the relation between external wealth and the trade balance is typically negative within countries. Across countries, the magnitude of the effect critically depends on difference between investment returns and the rate of output growth. Second, controlling for other determinants, we have established a negative long-run association between the trade balance and the real exchange rate. Moreover, we find that the magnitude of the trade balance coefficient is increasing in country size and we provide direct evidence that the relative price of nontradables comoves with the trade balance, even controlling for relative sectoral productivity.

In terms of future work, much remains to be done in understanding the constraints imposed by long-term net foreign asset positions on net capital flows and net exports. In addition, we have not yet explored the short-run dynamics of the relation between the trade balance and the real exchange rate. Interesting issues here include possible non-linearities in the convergence of the exchange rate to its long-run value and the identification of alternative structural shocks that may generate different short-run comovements between the trade balance and the real exchange rate.

Appendix A. Data Sources and Definitions

NFA: Net foreign assets, calculated as cumulative current account adjusted for capital account transfers and for valuation changes in portfolio equity assets and liabilities, FDI assets and liabilities, and foreign exchange reserves. For details on the valuation adjustments, see Lane and Milesi-Ferretti (1999). Source: Lane and Milesi-Ferretti (1999).

IIP: International Investment Position net of gold holdings. Source: IMF, Balance of Payments Statistics.

TB: Balance on goods, services and transfers (ratio to GDP). Source: IMF's Balance of Payments Statistics, supplemented by OECD sources.

NET INVESTMENT INCOME: Investment income credits – investment income debits. Source: IMF, Balance of Payments Statistics.

NET CAPITAL GAINS: Difference between changes in the stocks of external assets and liabilities and the corresponding flows. Source: Lane and Milesi-Ferretti (1999) and IMF, Balance of Payments Statistics.

REAL RETURNS/GDP: Net investment income/GDP + net capital gains/GDP - $\pi_t^{\$} \frac{B_{t-1}}{Y_t}$ where $\pi_t^{\$}$ is the rate of inflation in the US (measured with the US GDP deflator).

ADJUSTED TRANSFER: Net investment income/GDP + net capital gains/GDP - $\frac{\gamma_t}{1+\gamma_t} b_{t-1}$, where γ is the nominal GDP growth rate in US dollars and b_{t-1} is the ratio of net foreign assets to GDP at the end of period t-1. Source: authors' calculations.

RER: Real effective exchange rate (CPI-based). Trade weights based on trade patterns in 1990, calculated using the IMF's Information Notice System (described in Desruelle and Zanello (1997)). Source: authors' calculations based on CPI and exchange rate data from the International Monetary Fund.

YD: GDP per capita relative to trading partners. Partner countries' weights are the same as those used in the construction of RERCPI. Source: The World Bank's World Development Indicators (WDI) database.

TT: ratio of export prices (or export unit values) to import prices (or import unit values), both expressed in US dollars. Sources: OECD, *Analytical Database*, and IMF, *International Financial Statistics.*

RPROD: Calculated from OECD's International Sectoral Database (2000).

PN/PT: Calculated from OECD's International Sectoral Database (2000).

Appendix B. Construction of adjusted transfer term

Changes in the net foreign asset position are due to current account imbalances and to capital gains and losses. Assume initially that external assets and liabilities earn the same rate of return. In this case, the dynamics of net foreign assets can be written as follows

$$B_t - B_{t-1} = TB_t + TR_t + (i_t^* + kg_t)B_{t-1} \qquad \text{(B1)}$$

where *TB* is the balance on goods, services and transfers, $i_t^* B_{t-1}$ is investment income and $kg_t B_{t-1}$ is the capital gain/loss on outstanding net external assets. Dividing both terms by GDP measured in US dollars and re-arranging terms, we obtain

$$\Delta b_t = tb_t + \frac{i_t^* + kg_t - \gamma_t}{1+\gamma_t} b_{t-1} \qquad \text{(B2)}$$

Let $i_t = i_t^* + kg_t$, define $r_t \equiv \frac{1+i_t}{1+\pi_t^\$} - 1 = \frac{i_t - \pi_t^\$}{1+\pi_t^\$}$, and re-write $1+\gamma_t = (1+g_t)(1+\dot{e}_t)(1+\pi_t^\$)$

where g_t is the economy's real growth rate, $\dot{e}_t$ the rate of real appreciation vis-à-vis the US dollar and $\pi_t^\$$ is the US inflation rate, where are the last two variables are measured in terms of GDP deflators. We can then re-write equation (B2) as follows

$$tb_t = -\frac{(1+r_t) - (1+g_t)(1+\dot{e}_t)}{(1+g_t)(1+\dot{e}_t)} b_{t-1} + \Delta b_t \qquad \text{(B3)}$$

which is equation (2) in the text. For the empirical analysis, we use both real returns, calculated as $\frac{i_t - \pi_t^\$}{1+\gamma_t} b_{t-1}$, and the "adjusted transfer" term, given by $\Psi_t = \frac{i_t - \gamma_t}{1+\gamma_t} b_{t-1}$.

Assume now that the rate of return on gross external assets and liabilities can differ. Let gfa_t, gfl_t be the stocks of gross foreign assets and gross foreign liabilities (as ratios of GDP), respectively, and define $i_t^A, i_t^L (r_t^A, r_t^L)$ as the nominal (real) US$ rate of return on gross foreign assets and liabilities, respectively.

In this case our computed ratios of net real returns and adjusted transfer to GDP are equal to

$$\begin{aligned} rret_t &= \frac{r_t^A}{(1+g_t)(1+\dot{e}_t)} b_{t-1} + \frac{(r_t^A - r_t^L)}{(1+g_t)(1+\dot{e}_t)} gfl_{t-1} \\ \Psi_t &= \frac{(1+r_t^A)-(1+g_t)(1+\dot{e}_t)}{(1+g_t)(1+\dot{e}_t)} b_{t-1} + \frac{(r_t^A - r_t^L)}{(1+g_t)(1+\dot{e}_t)} gfl_{t-1} \end{aligned} \tag{B4}$$

Clearly in the presence of a non-zero $r_t^A - r_t^L$, attempting to measure r as $[rret_t(1+g_t)(1+\dot{e}_t)]/b_{t-1}$ gives biased results. The size of this bias grows, the closer is the net foreign asset position to balance and the larger the underlying gross stock positions.

Appendix C. Stationarity Tests

Table A.1 Maddala-Wu Test

	(2)	(4)	(6)
Table 5	132.5	93.2	23.8
Table 6	72.8	51.9	29.9
Table 7	82.9	30.5	57.7
Table 8	80.0	29.4	50.7

Note: Maddala-Wu unit root test on the residuals from the specifications with time dummies in Tables 5-8 (ie columns (2), (4), (6) in these tables). Distribution of the test statistic is χ^2_{2N} . Null of non-stationarity is rejected at 1 percent level in all cases.

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Table 1. Trade balance, net foreign assets and adjusted transfers
Panel regressions, 5-year averages, 1974-1998

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
	Trade balance	Trade balance	Trade balance	Trade balance	Trade balance
NFA(t-1)	-0.129 (5.96)***		-0.143 (6.55)***		-0.137 (5.78)***
Net debt(t-1)		-0.130 (5.97)***		-0.145 (6.66)***	
Net eq. (t-1)		-0.094 (1.67)		-0.092 (1.68)	
Adj. Transf. / GDP			-0.258 (2.18)**	-0.279 (2.33)**	
Real returns/GDP					-0.228 (1.74)*
Growth term /GDP					-0.231 (1.80)*
Observations	80	80	80	80	80
Number of countries	20	20	20	20	20
Adjusted R-squared	0.21	0.20	0.26	0.27	0.25
F test net debt=net eq. (p-val in par.)		0.47 (0.49)		1.11 (0.30)	

* Note: the trade balance, adjusted returns, returns and growth effects are averages over 5-year periods, 1974 to 1998. NFA, net debt and net equity are the outstanding stocks at the beginning of each five-year period. t-statistics in parentheses. Regressions include correction for autoregressive errors.

Table 2. Trade balance, net foreign assets and adjusted transfers: Cross-sectional regressions, 1974-98 and 1983-98

	(1)	(2)	(3)	(4)	(5)	(6)
	Trade balance 1974-98	Trade balance 1983-98	Trade balance 1974-98	Trade balance 1983-98	Trade balance 1974-98	Trade balance 1983-98
NFA(t-1)	0.008 (0.40)	0.002 (0.15)	0.017 (1.16)	0.006 (0.52)		
Adj. Transf./GDP			-0.940 (4.05)***	-0.677 (3.16)***		
Real returns/GDP					-0.939 (4.46)***	-0.678 (3.22)***
Growth term/GDP					-1.790 (3.95)***	-0.920 (2.60)**
Observations	20	20	20	20	20	20
Adjusted R^2	-0.05	-0.05	0.44	0.32	0.53	0.30
F-test Adjusted Transfer=-1 (p-val in par.)			0.07 (0.80)	2.28 (0.15)		
Joint F test compon. adj. transf = -1 (p-val in par.)					2.58 (0.11)	2.34 (0.14)

Note: The trade balance, adjusted returns, returns and growth effects are averages over the periods, 1974 to 1998 (columns (1), (3), (5)) and 1983-1998 (columns (2), (4), (6)). Net foreign assets are the outstanding stocks at the beginning of each period. For the 1974-98 regressions, we use the CUMCA measure of net foreign assets. For the period 1983-98 we use International investment Position data for the following countries: Austria, Canada, Finland, Germany, Italy, Japan, Netherlands, Spain, Sweden, Switzerland, United Kingdom, United States. t-statistics in parentheses. Regressions include correction for autoregressive errors.

Table 3. Data summary, 1983-98

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
country	*avg NFA (ratio of GDP)*	*NFA in 1983 (ratio of GDP)*	*Trade balance (ratio of GDP)*	*Adj. Transfer (ratio of GDP)*	*Real returns (ratio of GDP)*	*Median real rate of return (Assets)*	*Median real rate of return (Liabilities)*	*avg change in RER*	*avg real growth rate*
UNITED STATES	-5.0	3.6	-2.4	1.0	0.9	11.3	8.1	0.0	2.2
UNITED KINGDOM	6.0	12.7	-1.7	-0.5	-0.1	6.6	7.1	1.3	2.2
AUSTRIA	-11.5	-10.1	-0.1	-0.5	-0.9	6.5	8.3	1.9	2.0
DENMARK	-22.6	-34.0	3.0	-1.4	-2.6			2.0	2.2
FRANCE	-0.1	1.0	0.6	-0.6	-0.6	8.5	8.9	1.2	1.5
GERMANY	10.9	3.8	0.8	-1.0	-0.2	2.9	4.3	1.7	1.0
ITALY	-7.0	-5.2	1.2	-0.5	-0.7	8.3	9.6	2.0	1.8
NETHERLANDS	26.1	23.7	3.5	-2.9	-2.3	5.9	7.3	0.7	2.2
NORWAY	-3.2	-22.1	3.7	-1.0	-1.2			-0.6	2.7
SWEDEN	-30.0	-19.1	2.2	-2.8	-3.1	11.7	11.0	0.6	1.3
SWITZERLAND	97.2	70.2	1.3	-0.1	3.7	6.9	8.7	1.7	0.8
CANADA	-38.9	-36.8	1.3	-1.8	-2.2	3.6	4.2	-1.4	1.5
JAPAN	13.2	2.4	1.8	-1.9	-1.7	7.0	9.6	2.3	2.3
FINLAND	-34.6	-17.8	2.3	-5.4	-5.7	0.4	7.2	0.6	1.9
GREECE	-42.2	-32.2	-1.2	0.5	-1.0			1.2	1.4
ICELAND	-34.4	-31.6	1.2	-1.4	-2.3	6.0	3.3	0.7	1.4
PORTUGAL	-30.4	-51.4	-0.1	1.0	-0.6			3.1	2.9
SPAIN	-14.9	-14.1	0.1	-0.7	-0.9	6.1	6.9	1.5	2.5
AUSTRALIA	-45.3	-26.3	-1.3	-1.0	-1.6	6.1	3.5	-1.8	2.3
NEW ZEALAND	-64.0	-42.4	0.9	-3.1	-4.5			0.2	0.7

Note: the NFA data is the International Investment Position (IIP) data for the following countries: Austria, Canada, Finland, Germany, Italy, Japan, Netherlands, Spain, Sweden, Switzerland, United Kingdom, United States. For the remaining countries, we use our own estimate of NFA. The median real rates of return can only be calculated for those countries for which IIP data are available. Among those, we excluded those countries for which IIP data are available for less than 10 years.

Table 4. Real Exchange Rate Equations: Country-by-Country Results

	TB	LYD	LTT	adjR2	Period		TB	LYD	LTT	adjR2	Period
AUS	-5.46	-0.83	0.90	0.76	1973-97	JPN	-5.43	2.39	-0.09	0.91	1972-97
	(1.76)*	(0.66)	(2.31)**				(1.39)	(5.71)***	(.56)		
AUT	0.01	1.17	0.16	0.70	1973-97	NLD	-0.89	1.0	-1.4	0.7	1972-97
	(.01)	(4.91)***	(.58)				(2.17)**	(4.64)***	(2.14)*		
BLX	-2.61	0.58	1.79	0.85	1977-97	NOR	-0.01	-0.17	0.07	0.63	1973-97
	(2.82)**	(.66)	(11.7)***				(.03)	(1.13)	(1.38)		
CAN	-1.27	1.55	0.93	0.35	1973-97	NZL	-4.98	-1.12	0.69	0.67	1973-97
	(.69)	(1.83)*	(1.25)				(2.34)**	(2.65)**	(3.63)***		
DNK	0.73	0.68	0.04	0.09	1972-97	PRT	-0.67	0.49	1.27	0.84	1974-97
	(1.48)	(1.1)	(.12)				(1.66)	(3.1)**	(8.47)***		
FIN	-0.70	1.79	0.09	0.71	1973-97	ESP	-3.21	-0.75	0.46	0.79	1977-97
	(1.76)*	(4.86)***	(.49)				(3.99)***	(.9)	(1.69)		
FRA	-0.71	1.82	0.25	-0.08	1977-97	SWE	-1.53	0.87	0.51	0.75	1973-97
	(.47)	(.92)	(.55)				(1.73)	(2.02)*	(2.94)**		
DEU	-2.66	0.98	0.94	0.50	1973-97	SWI	-1.19	-2.04	-0.24	0.92	1972-97
	(1.78)*	(3.12)***	(5.96)***				(2.91)**	(7.64)***	(1.48)		
GRC	-1.53	0.44	0.88	0.67	1972-97	GBR	-1.05	-2.41	1.14	0.71	1972-97
	(1.06)	(.83)	(4.12)***				(.97)	(2.33)**	(4.13)***		
ISL	-1.16	1.02	1.21	0.51	1972-97	USA	-7.62	-0.78	0.99	0.62	1972-97
	(5.04)***	(5.92)***	(3.75)***				(2.91)**	(.81)	(2.58)**		
ITA	-6.43	0.81	1.05	0.83	1973-97						
	(11.31)***	(2.33)**	(5.85)***								

Note: Estimation is by DOLS; t-statistics in parentheses.

Table 5. Real Exchange Rate Equation: Panel Results

	(1)	(2)	(3)	(4)	(5)	(6)
TB	-0.51 (2.83)***	-0.72 (3.33)***	-0.38 (2.28)**	-0.33 (1.64)*	-5.64 (5.15)***	-6.44 (3.79)***
LYD	0.4 (3.8)***	0.39 (5.66)***	0.18 (2.02)**	0.19 (2.83)**	1.61 (5.82)***	1.89 (5.32)***
LTT	0.44 (7.5)***	0.55 (11.68)**	0.48 (10.46)**	0.52 (10.95)**	0.19 (1.33)	0.05 (.25)
adjR2	0.51	0.55	0.54	0.57	0.65	0.62
#observations	519	519	442	442	77	77
#countries	21	21	18	18	3	3
time dummies?	no	yes	no	yes	no	yes

Note: Full panel in columns (1)-(2). Non-G3 countries dropped in columns (3)-(4) and G3 countries only in columns (5)-(6). Estimation is by DOLS; t-statistics in parentheses.

Table 6. Relative Price of Nontradables

	(1)	(2)	(3)	(4)	(5)	(6)
TB	-1.17 (6.2)***	-1.15 (6.49)***	-0.59 (3.3)***	-0.75 (3.72)***	-0.98 (1.97)*	-1.21 (2.19)**
RPROD	0.66 (16.7)***	0.71 (17.3)***	0.76 (18.4)***	0.76 (17.8)***	0.68 (8.35)***	0.63 (5.18)***
LYC	0.03 (.51)	0.56 (4.24)***	-0.26 (4.72)***	0.13 (.96)	0.35 (3.54)***	0.89 (4.48)***
LTT	0.19 (4.33)***	0.1 (2.01)**	0.12 (2.57)***	0.1 (1.71)*	0.16 (3.1)***	0.004 (.4)
adjR2	0.86	0.89	0.86	0.88	0.97	0.97
#observations	280	280	212	212	68	68
#countries	13	13	10	10	3	3
time dummies?	no	yes	no	yes	no	yes

Note: Full panel in columns (1)-(2). Non-G3 in columns (3)-(4); G3 in columns (5)-(6). DOLS estimation; t-statistics in parentheses. Nontradables: weighted sum of “construction”, “community, social and personal services”, and “government services”; tradables: “manufacturing”. RPROD: relative labor productivity in traded versus nontraded sector.

Table 7. “Double” Relative Price of Nontradables: Home versus Foreign

	(1)	(2)	(3)	(4)	(5)	(6)
TB	-0.77 (3.83)***	-0.97 (3.99)***	-0.76 (3.47)***	-0.88 (3.03)***	-0.89 (1.28)	-2.26 (3.94)***
DRPROD	0.92 (15.82)***	0.93 (15.2)***	0.91 (12.29)***	0.93 (12.5)***	0.85 (8.2)***	0.56 (4.15)***
LYD	0.57 (5.27)***	0.55 (4.2)***	0.44 (2.93)***	0.43 (2.47)**	0.68 (4.19)***	0.95 (4.68)***
LTT	0.05 (1.09)	0.09 (1.39)	0.13 (2.2)**	0.14 (1.86)*	-0.02 (.4)	-0.11 (1.0)
adjR2	0.85	0.84	0.844	0.836	0.87	0.91
#observations	248	248	186	186	62	62
#countries	13	13	10	10	3	3
time dummies?	no	yes	no	yes	no	yes

Note: Full panel in columns (1)-(2). Non-G3 in columns (3)-(4); G3 in columns (5)-(6). DOLS estimation; t-statistics in parentheses. Nontradables: weighted sum of “construction”, “community, social and personal services”, and “government services”; tradables: “manufacturing”. DRPROD: relative labor productivity in traded versus nontraded sector, measured as difference in value between home country and its trading partners.

Table 8. Real Exchange Rate: Restricted Sample

	(1)	(2)	(3)	(4)	(5)	(6)
TB	-0.78	-1.1	-0.58	-0.74	-1.94	-2.64
	(2.49)**	(2.86)***	(1.85)*	(2.05)**	(1.53)	(1.25)
RPROD	0.32	0.31	0.25	0.23	0.75	0.66
	(3.27)***	(3.05)***	(2.55)**	(2.32)**	(3.13)***	(1.65)
LYD	0.93	0.91	0.39	0.5	1.48	1.2
	(4.84)***	(4.52)***	(2.51)**	(2.52)**	(5.04)***	(2.44)**
LTT	0.16	0.28	0.34	0.36	-0.004	0.39
	(1.7)*	(2.73)***	(4.85)***	(4.1)***	(.03)	-1.1
adjR2	0.6	0.61	0.6	0.58	0.78	0.74
#observations	280	280	212	212	68	68
#countries	13	13	10	10	3	3
time dummies?	no	yes	no	yes	no	yes

Note: Full panel in columns (1)-(2). Non-G3 in columns (3)-(4); G3 in columns (5)-(6). DOLS estimation; t-statistics in parentheses.

Figure 1. Trade balance and adjusted returns

Averages, 1974-98

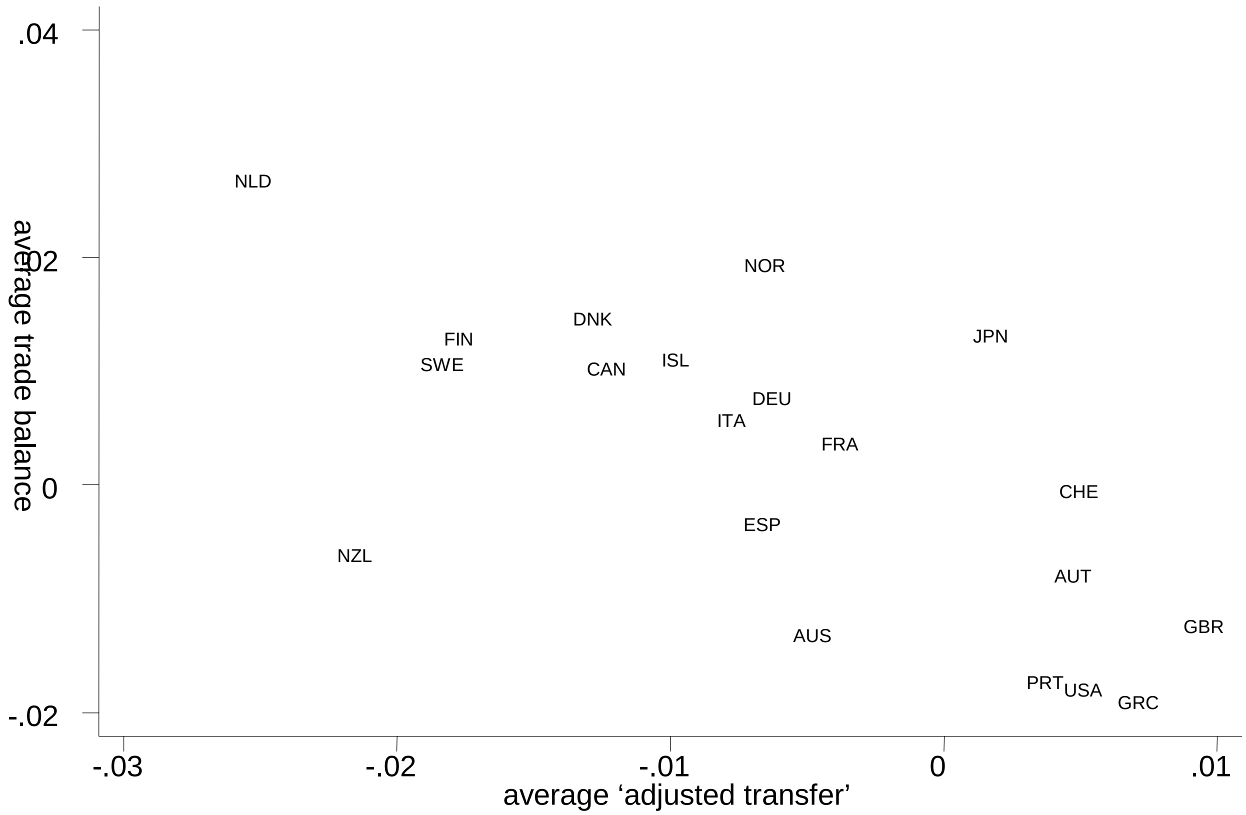

Figure 2. Initial net foreign assets and average trade balance (1983-98)

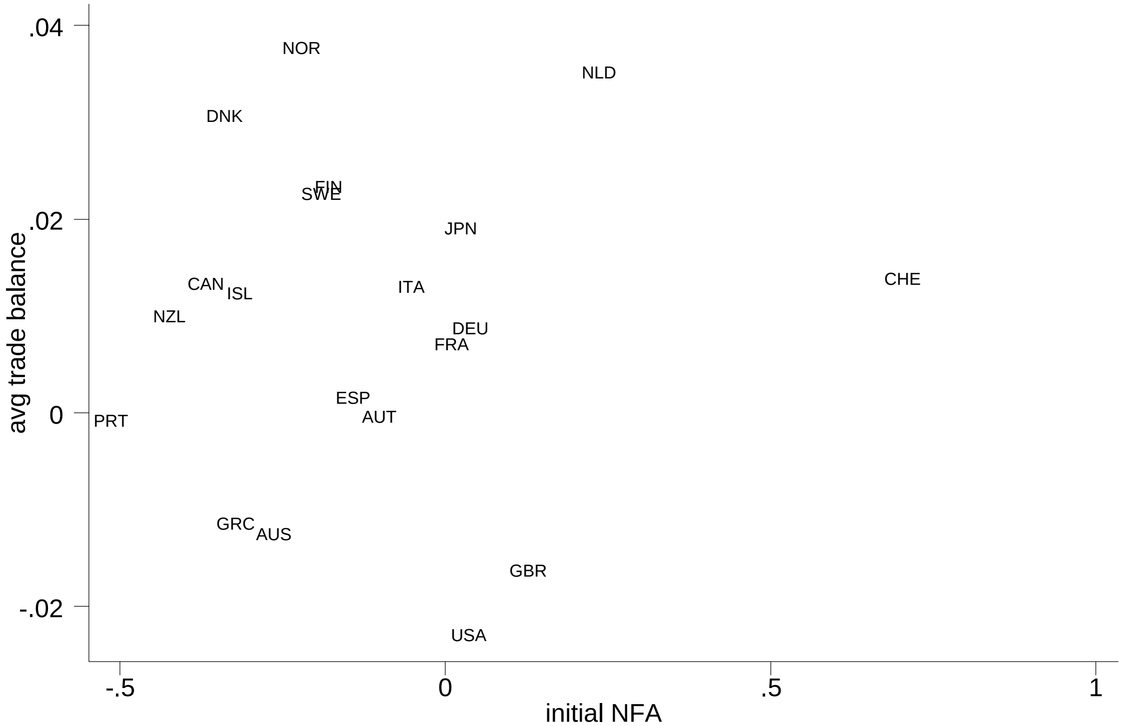

Figure 3. The Trade Balance and the Real Exchange Rate: Country Size