THE GRADUATE INSTITUTE | GENEVA
INSTITUT DE HAUTES ETUDES
INTERNATIONALES ET DU DÉVELOPPEMENT
GRADUATE INSTITUTE OF INTERNATIONAL
AND DEVELOPMENT STUDIES

HEID Working Paper No: 11/2008

Current Account Adjustment and Financial Integration

Pascal Towbin
Graduate Institute of International and Development Studies

Abstract

The paper investigates whether higher financial integration leads in general to slower current account adjustments. The study estimates theoretically founded trade balance reaction functions for a panel of seventy countries from 1970-2004. The empirical analysis finds that adjustment in integrated economies is slower. Consistent with the presented theory the trade balance of integrated economies is more persistent, responds less strongly to net foreign assets, and is more sensitive to fluctuations in net output. A sufficiently strong response to net foreign assets is also a condition for external sustainability. Under high integration countries appear to stay close to the sustainability limit.

Current Account Adjustment and Financial Integration[☆]

Pascal Towbin

Graduate Institute of International and Development Studies, 132 Rue de Lausanne, CH-1211 Geneva

Abstract

The paper investigates whether higher financial integration leads in general to slower current account adjustments. The study estimates theoretically founded trade balance reaction functions for a panel of seventy countries from 1970-2004. The empirical analysis finds that adjustment in integrated economies is slower. Consistent with the presented theory the trade balance of integrated economies is more persistent, responds less strongly to net foreign assets, and is more sensitive to fluctuations in net output. A sufficiently strong response to net foreign assets is also a condition for external sustainability. Under high integration countries appear to stay close to the sustainability limit.

Key words: current account adjustment, reaction function, financial integration, capital mobility
JEL: F32, F36, F41

1. Introduction

Persistent current account imbalances can be a source of concerns, but can also be seen as a consequence of higher integration. The intertemporal approach to the current account states countries use the current account as a buffer to absorb temporary shocks and to maintain a stable consumption profile. As international integration makes it easier to finance external imbalances, the current account adjustment in more highly integrated economies should be slower because of a stronger incentive to spread adjustment over many periods.

The study estimates trade balance reaction functions for a panel of seventy industrial and developing countries from 1970-2004. A small intertemporal model motivates the empirical specification. People aim for a stable consumption profile and use the current account to absorb transitory shocks. Habit

[☆]I am grateful to Charles Wyplosz and Cédric Tille for helpful comments and support. I thank the Swiss National Fund for financial support.

Email address: Pascal.Towbin@graduateinstitute.ch (Pascal Towbin)

formation leads to extra persistence in consumption. International financial intermediation is costly and the interest rate increases with the size of external liabilities. Under low integration the unfavorable effect of large external positions on financing conditions makes large imbalances unattractive and the trade balance reverts quickly to its long run value. The presence of financial frictions also forces people to consume more of a temporary income shock and to have a less persistent consumption pattern than they would otherwise. The model's solution is a trade balance reaction function that can be directly estimated. It predicts that higher integration weakens the response of the trade balance to net foreign assets, while it increases the persistence and the response to net output shocks.

The predictions are tested in three steps. I start by comparing industrial, emerging and other, less integrated, developing countries. Consistent with the model, industrial countries tend to have a more persistent trade balance, a weaker reaction to net foreign assets, and to respond more strongly to net output shocks than developing countries. Second, an analysis over time shows that the trade balance has become more persistent and less responsive to net foreign assets in recent years. Again, we can expect these developments if integration has increased over time. Third, interactions of the explanatory variables with integration measures help to explain the coefficient heterogeneity across countries and time. The effect of the integration measures on the reaction function coefficients remains significant with additional controls for other differences between the three country groups and a time trend.

The coefficient on net foreign assets is the parameter of main interest and can be alternatively interpreted as a sustainability measure or an integration measure. The sustainability interpretation comes from the fiscal policy literature: Bohn (1998) shows that a negative response of the primary deficit to public debt, conditional on temporary disturbances, is a sufficient condition for solvency. From the sustainability perspective a weak response of the trade balance to net foreign assets is worrying, as the sustainability condition is almost violated. The presented theoretical model offers a new perspective on the coefficient and sees a weak response as a sign of high integration. The theory gives also predictions on other reaction function coefficients, that can be tested and help to distinguish between the two interpretations.

Although there is a number of studies that uses reaction functions to analyze fiscal sustainability in different countries (see e.g. Galí and Perotti, 2003; Mendoza and Ostry, 2008; Wyplosz, 2005b), the few studies that apply the technique to external deficits focus on the United States (Engel and Rogers, 2006; Wickens and Uctum, 1993). The present study provides evidence for a broad panel of seventy countries, highlighting the differences between more and less integrated economies. The paper also presents the reaction coefficient estimates for single countries. Most countries' trade balance responds negatively to the external position and the only country with a significantly positive, unsustainable, coefficient is the United States.

The paper contributes to the studies on capital mobility. There is a large literature that builds on Feldstein and Horioka (1980)'s finding of a high cor-

relation between investment and saving across countries and its interpretation as evidence of low capital mobility. Blanchard and Giavazzi (2002) announce "the End of the Feldstein-Horioka Puzzle" in Europe and emphasize the long run benefits of integration by allowing the poorer members of the European Union to catch up faster and run larger structural deficits. The focus of the present paper is on capital mobility in the short and medium run and how integrated countries can use the current account as a buffer to absorb cyclical shocks. A number of studies (see e.g. Hoffmann, 2004; Pelgrin and Schich, 2008; Taylor, 2002) has analyzed saving-investment dynamics in an error correction framework and has generally found that periods of high capital mobility parallel periods of slow adjustment. The cited studies concentrate on selected industrial countries. Here, I take a closer look on how capital mobility has affected adjustment dynamics in the recent past for a broad sample of countries and from a different perspective. Many papers have criticized the Feldstein-Horioka regression because it lacks a structural interpretation and its results are consistent with a large number of explanations (see Coakley et al., 1998, for a survey). The reaction function approach has the advantage that it is based on a structural model and the results have a clear interpretation. [1]

The study also complements the empirical literature that investigates the link between risk sharing and financial integration. There is yet no clear consensus on whether higher financial integration actually improves risk sharing. [2] As this literature, the present paper asks whether financial integration helps to smooth consumption, but looks at it from an external adjustment perspective. It finds that integration helps to flatten the consumption profile, because the current account can remain off its equilibrium value for an extended period of time.

In the remainder of the paper, Section 2 presents the theoretical model and derives the reaction function. Section 3 describes specification and data. Section 4 presents the main results. Section 5 shows that the results are robust to the use of alternative measures of the external position, accounting for trends, and endogeneity issues. Section 6 concludes. Technical details and additional empirical results are in an appendix available on request.

[1] Ghosh (1995) tests for perfect capital mobility by comparing the empirical current account volatility with the one predicted by an intertemporal model. The present paper does not test for perfect capital mobility, but uses a theoretical framework to document how the extent of integration affects adjustment. Decressin and Disyatat (2008) use the intertemporal model in the Euro area to compare the response of the trade balance and investment to productivity shocks at the country level with the response at the regional level.

[2] See, for example, Sorensen et al. (2007) for a positive finding, Bai and Zhang (2006) for a negative finding, and Kose et al. (2007) for mixed evidence.

2. Theory

2.1. A Trade Balance Reaction Function

The study considers a small open endowment economy with an infinitely lived representative consumer. Consumers maximize

$$\max_{C_t,\ F_t} U = \sum_{t=0}^{\infty} \theta^t \frac{\left(C_t - \gamma C_{t-1}\right)^{1-\sigma}}{1-\sigma}, \tag{1}$$

subject to the intertemporal budget constraint

$$\left(1 + r_{t-1}^d\right) F_{t-1} + Y_t + T_t = C_t + F_t, \tag{2}$$

where C_t is consumption at time t , θ is the subjective time discount rate. σ is a measure for the willingness of the agent to substitute consumption across time. Habit formation parameter γ leads to extra persistence in consumption. Gruber (2004) shows that accounting for habit formation improves the empirical performance of the intertemporal model by increasing the volatility of the current account. The economy's potential endowment $\bar{Y}_t$ grows at a constant rate g. Cyclical deviations $\frac{Y_t - \bar{Y}_t}{\bar{Y}_t}$ from potential output follow an AR(1) process. The income can be spent on consumption or an international bond F_t that pays a real interest rate r_t^d.

The exchange of international bonds has to be processed by banks and is modeled as in Uribe and Yue (2006) and Boileau and Normandin (2008). Banks acquire international bonds F_t that pay a constant real interest rate r and offer a domestic interest rate r_t^d to consumers. Banks have convex operating costs that increase quadratically with the volume of funds intermediated. The financial sector is perfectly competitive and firms maximize profit $r_t^d \left(F_t - (\psi/2)\, F_t^2/\bar{Y}_t\right) - rF_t$. Profits are redistributed as a lump sum transfer to consumers. The first order condition to the maximization imply that banks charge an interest rate that increases with the country's external liabilities

$$1 + r_t^d = \frac{1+r}{1 - \psi F_t/\bar{Y}_t}, \tag{3}$$

Boileau and Normandin (2008) discuss several motivations for convex operating costs in banking and cite microeconomic evidence: risk averse banks want compensation for undesired foreign exposure and default risk. Another explanation are monitoring costs that increase with size of the outstanding position. Lane and Milesi-Ferretti (2001) find that real interest differentials with the United States decrease with net foreign assets and interpret it as evidence of portfolio balance effects. As in Nason and Rogers (2006) or Devereux and Smith (2007), the debt elastic domestic interest rate serves as a short cut for restricted capital mobility.[3] Higher financial integration, for example, less regulations on

[3] Apart from restricting capital mobility, the discussed operating costs also avoid the technical problems that come with unit roots in small open economy models (Schmitt-Grohé and Uribe, 2003).

capital flows or technical progress that facilitates international transactions, are then reflected as a lower ψ.

The standard assumption $1 + r = \frac{(1+g)^\sigma}{\theta}$ allows to abstract from trends in the current account. The assumption holds in the steady state in a model with many many small identical economies. To achieve stationarity, all variables are normalized by trend output, using notation $x_t = \frac{X_t}{Y_t}$. Plugging in the domestic interest rate r_t^d set by banks, the first order conditions are

$$\left(c_t - \frac{\gamma}{(1+g)} c_{t-1}\right)^{-\sigma} - \frac{\theta\gamma}{(1+g)^\sigma} \mathrm{E}_t \left(c_{t+1} - \frac{\gamma}{1+g} c_t\right)^{-\sigma} - \lambda_t = 0, \quad (4)$$

$$-\lambda_t + (1 - \psi f_t) \mathrm{E}_t \lambda_{t+1} = 0, \quad (5)$$

$$y_t + (1 + \tilde{r}) f_{t-1} - c_t - \frac{\psi}{2(1+g)} f_{t-1}^2 - f_t = 0, \quad (6)$$

$$(y_t - 1) - \rho (y_{t-1} - 1) - \varepsilon_t = 0, \quad (7)$$

where λ_t is the Lagrange multiplier on the normalized version of the budget constraint (2) and can be interpreted as the marginal utility of income, $\tilde{r}$ is the growth adjusted real interest rate $1 + \tilde{r} = \frac{1+r}{1+g} \approx 1 + r - g$, and ε_t is an endowment shock .

The Euler equation (5) shows that financial frictions ψ make it more costly to stabilize the marginal utility of income. In order to avoid large financing costs people want an external position close to zero and consume more (less) if external wealth is positive (negative) than in a frictionless world. Equation (4) displays that because of habit formation the marginal utility of income falls faster than the marginal utility of consumption. Equations (6) and (7) are the resource constraint and the law of motion for output.

To analyze local adjustment dynamics I linearize the first order condition around the steady state , with $\hat{x}_t = (x_t - \bar{x})$. [4] Using the methodology of Blanchard and Kahn (1980) the decision rule for consumption can be expressed as a function of the three state variables.

$$\hat{c}_t = b\hat{f}_{t-1} + a\hat{c}_{t-1} + d\hat{y}_t.$$

The coefficients of the decision rule depend on the model's structural parameters. Using the identity $tb_t = y_t - c_t$ and the steady state relationship $tb = f = 0$, we have a trade balance reaction function in levels that will be used in the empirical part

$$tb_t = \beta f_{t-1} + \alpha tb_{t-1} + \delta_1 \hat{y}_t + \delta_2 \hat{y}_{t-1}, \quad (8)$$

with $\beta = -b$, $\alpha = a$, $\delta_1 = (1 - d)$, $\delta_2 = -a$.

[4] If financial frictions are low, persistence and interest rates are high, it is possible to have no stable steady state. A sufficient condition for stability is $\gamma(1+g)/(1+r) < 1$. See footnote 6.

2.2. The Effects of Higher Financial Integration

In general no analytical solution for the coefficients in (8) exists and we are forced to consider numerical simulations. Keeping all parameters fixed but one, allows to analyze the effect of each parameter on the four coefficients of the reaction function.[5]. The financial friction parameter is $\psi = 0.028$ as in Nason and Rogers (2006) (adjusted for annual data), who calibrate to Canada. It implies that a one percentage point increase in the liabilities to output ratio increases the interest rate by 2.8 basis points. For the other parameters the baseline values are standard with $r = 0.04$, $g = 0.02$, $\rho = 0.5$, $\sigma = 2$, and $\gamma = 0.7$.

[Figure 1 approximately here] Figure 1 shows how the reaction function coefficients depend on ψ and γ. A higher level of financial frictions ψ reduces the incentive to spread the correction of an external imbalance over many periods and prompts for a strong reaction to net foreign assets. For the same reasons, the trade balance responds less to income shocks, if financial frictions are high. People are willing to bear a relatively large part of the income shock immediately if external finance is costly. A high degree of habit formation makes consumption more persistent. People know that their present reaction will be carried over to future periods and respond more weakly to net foreign assets. The preference for a smoother consumption profile will also make them save a larger amount of a temporary output shock and lead to larger trade imbalances. High financial frictions reduce persistence and weaken the effects of habit formation.

Quantitatively, the baseline case with $\psi = 0.028$ implies a response to net foreign assets $\beta = -0.041$, Persistence $\alpha = -\delta_2 = 0.61$ and the coefficient δ_1 on net output is 0.93. As financial frictions ψ tend to zero, dynamics get smoother and we have we have $\beta = -0.006$, $\alpha = 0.67$,$\delta_1 = 0.99$. Although the model is probably too stylized to give exact quantitative predictions, the example shows that relatively small, reasonably parametrized, frictions have a measurable impact on trade balance dynamics.

2.3. Sustainability Analysis

We can use the reaction function for sustainability analysis, similar to the approach pioneered by Bohn (1998) in fiscal policy. Additionally, the prsent analysis allows also for persistence in the primary balance, whereas Bohn's specification does not include a lagged dependent variable. The dynamics of the net external position are given by the reaction function (8) and the accumulation equation (6). The Appendix shows that the system is stable, if

$$-2\left(1+\alpha\right)-\left(1-\alpha\right)\tilde{r}<\beta<-(1-\alpha)\tilde{r} \tag{9}$$

[5]Additionally, there are two special cases with analytical solutions. Without habit formation $\gamma = 0$, we have $\beta = -\left(\tilde{r}+\sqrt{4\psi/\sigma+\tilde{r}^2}\right)/2$, $\alpha = \delta_2 = 0$, and $\delta_1 = 1 - \left(\tilde{r}+\sqrt{\tilde{r}^2+4\,\psi\,/\sigma}\right)/\left(\tilde{r}+\sqrt{\tilde{r}^2+4\,\psi/\,\sigma}+2\,(1-\rho)\right)$. With very low frictions $\psi \to 0$, we have $\alpha = \delta_2 = \frac{\gamma}{1+r}$, $\beta = -(1-\alpha)\tilde{r}$. and $\delta_1 = 1-(1-\alpha)\,\tilde{r}/\,(1+\tilde{r}-\rho)$

Assuming $\tilde{r} > 0$, the path is only stable if $\beta < 0$.[6] The estimated coefficient on net foreign assets can then be used as a sustainability measure. Compared to other sustainability analysis approaches (see e.g. Wyplosz, 2005a, for an overview), the present method has the advantage that few assumptions are required. For example, we do not need to take a stand on the target debt level or the future development of deficit determinants .

The intuition behind the sustainability condition is relatively straightforward: the higher the stock of net liabilities, the larger will be the amount of interest that has to be served on the stock. A larger trade surplus is necessary to stabilize the external position. Persistence, here motivated by habit formation, decreases the need for immediate strong adjustment, as the short run impact differs from the long run impact. If the persistence level is high, a reaction coefficient that is very close to zero does not necessarily imply unsustainability. The theoretical model predicts that the sustainability restriction will always be satisfied. Countries that have very easy access to external finance (ψ near zero) might come close to the limit.

3. Empirical Specification and Data

3.1. Model

Based on equation (8), the reaction function of the trade balance to be estimated for country i is

$$\mathsf{tb}_{it} = \beta \mathsf{nfa}_{it-1} + \alpha \mathsf{tb}_{it-1} + \delta_1 \mathsf{nogap}_{it} + \delta_2 \mathsf{nogap}_{it-1} + \mu_i + v_{it}$$

where tb_t is the trade balance to trend net output ratio, nfa_t is the ratio of net foreign assets to trend net output and the net output gap measure nogap_{it} controls for temporary income shocks. v_t is an iid error term which can be motivated as a time preference shock. I add an ad-hoc country specific effect μ_i to account for heterogeneities in steady state net foreign assets. [7]

3.2. Data

The data sample consists of yearly observations for 21 industrial and 49 developing countries from 1970-2004. I use Prasad et al. (2004)'s sample of developing countries and their distinction between, more financially integrated, emerging countries and, less financially integrated, other developing countries.

[6] The lower bound is unlikely to be economically relevant and means that the reaction should not be too strong. A second requirement for sustainability is $\alpha\,(1 + r - g) < 1$. Details are worked out in the Appendix. The condition above is necessary for a mean stationary path of net foreign assets. Bohn (1998) shows that $\beta < 0$ is a sufficient condition to meet the intertemporal solvency constraint.

[7] Under stability the steady state is $\mathsf{nfa} = -\frac{\mu}{(1-\alpha)(r-g)+\beta}$ and $\mathsf{tb}=\frac{\mu(r-g)}{(1-\alpha)(r-g)+\beta}$. The paper is concerned with adjustment to temporary shocks and does not not attempt to explain differences in long run positions explicitly, see Lane and Milesi-Ferretti (2001) for a study on long run determinants of external positions.

The countries, their abbreviations and their classifications are listed in the Appendix.

Real net output is defined as nominal GDP minus government expenditure and minus investment, divided by the GDP deflator. The reason for using net output is that the model does not explain investment dynamics and government expenditure. Net output is then the part of GDP of which consumers can dispose (see e.g. Ghosh, 1995). The net output gap ((nogap)) is the cyclical component of Hodrick-Prescott filtered log real net output. I experimented also with linear detrending, as the assumed constant growth rate in the theory part implies, which gave very similar results. The trade balance is the current account minus net income and sometimes also called primary current account. Consistent with the model I normalize the deflated trade balance and net foreign assets with potential net output. Data sources, construction, and abbreviations are in the Appendix.

4. Main Results

The model predicts that easier access to external finance increases the trade balance's persistence and its sensitivity to income shocks, while weakening its response to lagged net foreign assets. Of course, the friction parameter ψ is not directly observable. A first step to test the model is to compare industrial, emerging countries and other developing countries. We would expect that the trade balance of industrial countries is more persistent, less sensitive to the external position and more sensitive to net output shocks. Second, if integration has increased over time, a trend of the coefficients in the predicted direction should be observed. Third, the study interacts international integration measures with the explanatory variables and tests whether they can explain coefficient heterogeneities.

4.1. Comparison across countries

Table 1 displays results from panel fixed effects regressions for the whole sample and separately for industrial countries, emerging countries, and other developing countries. All coefficients have the expected signs and are statistically significant.

[Table 1 approximately here]

The ranking of the coefficients across groups is in line with the model's predictions. The trade balance in industrial countries is more persistent, responds less to net foreign assets, and is also more sensitive to temporary income fluctuations than in less financially integrated developing countries. Wald tests show statistically significant differences at the five percent level in all four cases. [8] As expected, the estimates for emerging economies lie somewhere between those for industrial countries and those for other developing countries. The differences

[8] The Wald Test is based on a regression with separate coefficients for each country group and uses a covariance matrix that is robust against heteroskedasticity.

between emerging countries and other developing countries are again significant for all four coefficients, whereas the differences between emerging and industrial countries go always in the predicted direction but are never significant at the 5% level. [9]

Using the estimates together with the reaction function (8), the accumulation equation (6) and an assumption on the growth adjusted real interest rate $\tilde{r} = 0.02$, we can simulate numerically which fraction of the initial deviation from steady state net foreign assets remains after ten years. The whole sample estimates imply that 68% of the deviation persists. We have a fraction of 80% for industrial countries, 79% for emerging economies, and 48% for other developing countries.

The model also implies a coefficient restriction $\alpha = -\delta_2$. A positive net output shock in the previous period affects lagged consumption and matters, because of habit formation, also in the present period. However, conditional on net foreign assets and the present net output gap, it should not have any influence on the trade balance beyond its effect via lagged consumption. A Wald test does not reject the restriction for industrial countries, but rejects for the three other samples. [10] Possibly financial restrictions in developing countries are more severe than the model assumes. The Appendix shows that the finding can be rationalized in an extended model where a fraction of the population is liquidity constrained (Decressin and Disyatat, 2008; Campbell and Mankiw, 1991) and cannot borrow or lend at all.

Univariate country by country regressions can serve as a check whether the results above are by driven outliers. Table 2 shows the mean, standard deviation, and median for the whole sample and the three country groups. The results confirm the picture from the panel regressions. The mean and median have similar magnitudes as the panel estimates and the ranking across country groups is preserved. However, different from the panel estimates, the response of the trade balance to net foreign assets in emerging counties is similar to the response in other developing countries and further away from industrial countries. A discrepancy between fixed effects and group mean can be evidence of substantial coefficient heterogeneity, potentially because of very different levels of integration in the emerging countries group. Below the study will take this issue into account by allowing coefficients to vary with the level of integration.

[Table 2 approximately here]

When comparing the coefficients across single countries, I focus on the re-

[9] The stronger response of the trade balance to net output gap in industrial country does not contradict real business cycle studies (see e.g. Neumeyer and Perri, 2005) that find the trade balance to be more countercyclical in emerging countries. First, as the paper does not consider investment, it uses a different measure of output (net output instead of GDP). Second, it looks at conditional responses instead of unconditional correlations.

[10] The restriction can be either rejected because the model is invalid or because the transitory output components are computed incorrectly. The non rejection for the industrial countries therefore indirectly also supports the chosen HP filtering as a method to extract cyclical deviations.

sponse to net foreign assets, the central coefficient when assessing sustainability. Figures 2 -4 display the results for the three groups, dashes represent the 95% confidence intervals, statistically signficant estimates are in black. For almost all countries the coefficient is negative. The only country that has a significantly positive, unsustainable, coefficient at the five percent level is the United States. The result is line with Engel and Rogers (2006) who find the coefficient to be unsustainable for a much longer period of time (1791-2004). They explain the result with the rising US share on world output. The results of the present study indicate that US trade balance dynamics are nonetheless quite unique.

4.2. Comparison across time

Figures 5 to 8 display rolling regression estimates with an 18 years window. The initial sample goes from 1970 to 1987 and the last estimate covers the period from 1987 to 2004. The order of the coefficients across groups is again in line with theory. Across time we can observe observe a downward trend in the size of net foreign assets coefficients for all three groups, whereas the persistence of the trade balance has increased. Wald tests that compare the coefficients from the first half (1970-1988) with those from the second half (1989-2004) confirm the visual impression. I find significant differences at the five percent level for net foreign coefficients in all three groups. The null of equal persistence in both periods can be rejected for industrial countries at the five percent level, for emerging countries at the ten percent level, and cannot be rejected for emerging economies. The less strong results for developing countries maybe due to the less uniform trend towards higher integration. There is no visible trend for the coefficients on the two net output gap and statistical tests find no significant differences. A possible explanation is that these estimates are less precise (standard errors are twice as large as for for persistence and the magnitude is roughly the same) and the fluctuations may hide the trend. [11]

[Figures 5 6 7 8 approximately here]

4.3. Interaction with Integration Measures

The specification is augmented with interaction terms of the explanatory variables with different integration measures that approximate friction parameter ψ: I use de jure financial openness (kaopen), de facto financial openness (finopen), trade openness (tradeopen), and financial development (findev). De jure financial openness measure is an index constructed by Chinn and Ito (2007) that varies between 2.6 and -1.8. The de facto measure is the sum of gross foreign assets and liabilities normalized by GDP, as proposed by Lane and Milesi-Ferretti (2006). In order to avoid distortions that come from highly indebted

[11] I also checked whether the persistence of the gap measure varies across time and country groups. A higher persistence in cyclical fluctuations would dampen the response of the trade balance because people consume a larger fraction of the shock. Statistical tests indicate no significant differences across countries and time.

developing countries, debt is excluded and the study uses only data on portfolio equity and foreign direct investment. Trade openness is the sum of exports and imports of goods and services over GDP. Trade openness can lead to a reduction in information asymmetries and make people hold more foreign assets. Financial development is private credit over GDP. Higher financial development means easier access to credit and therefore facilitates consumption smoothing. Trade openness and de facto financial openness are potentially affected by the contemporaneous current account. To avoid endogeneity problems I lag these two indicators by one period.

Table 3 presents the results. Column (1) displays the estimates for interactions with kaopen. All interaction terms are statistically significant and have the right signs. Consider a country that switches from a completely closed capital account (kaopen= -1.8) to a completely open capital account (kaopen= 2.6). The persistence of the trade balance increases by about 0.4, the reaction to the external position becomes by about 0.02 weaker. The response to the contemporaneous and lagged net output gap increases by about 0.6.

The specification of column (2) adds as additional control variables interaction of the four explanatory variables with country group dummies and with a linear time trend. The country group dummies account for the possibility that the results maybe driven by other differences between the country groups that are correlated with capital account liberalization. A linear time trend controls for other events in time that paralleled capital account liberalization. The results are not strongly affected, only the effect of deregulation on persistence is substantially lower. All coefficients remain statistically significant.

For de facto financial openness the results are similar. Again all coefficients have the right sign and are statistically significant. In industrial countries the average financial openness increased from 0.3 in 1990 to 1.6 in 2004. According to column (2) this development means an increase in the the persistence by about 0.10, while the response to the net external position should have decreased by about 0.01. The results for trade openness and financial development again confirm the predictions of the model for all four coefficients and can be similarly interpreted.

[Table 3 approximately here]

To check which of the four used integration measures is more important I run a horse race that includes all integration measures at the same time (reported in the Appendix): The winner is trade openness, where all coefficient retain the right sign and except for net foreign assets all of them remain significant. The results should be taken with some caution, as there is a clear multicollinearity problem when we use all four measures at the same time.

5. Robustness Checks

The study proceeds with a series of robustness checks. For space reason most of the regression results are not reported and relegated to the Appendix.

5.1. Varying Rate of Returns

The theoretical model assumes the rate of return to be constant across countries and over time. As an extension I allow the rate of return to vary and to be stochastic. The focus of the present subsection is on the response of the trade balance to net foreign assets. Lane and Milesi-Ferretti (2005) document substantial differences in net return rates on external positions across countries. If the cross sectional variation of net returns is important, the net position becomes a less accurate measure for the trade balance that is necessary to achieve stability. Variation in the unobservable world interest rate over time have a similar effect. Additionally, capital gains through exchange rate and asset price fluctuations have made the external position more volatile in recent years. The new specification uses an alternative measure for net foreign assets is

$$\mathsf{tb}_{it} = \beta_1 * \mathsf{ninc}_{it} + \beta_2 * \mathsf{kgain}_{it} + \alpha \mathsf{tb}_{it-1} + \delta_1 \mathsf{nogap}_{it} + \delta_2 \mathsf{nogap}_{it-1} + \mu_i + \varepsilon_{it}. \quad (10)$$

The total return on net foreign assets ($i_t NFA_{t-1}$) is the sum of net income and capital gains. Scaling with with trend net output, we have $i_t \mathsf{nfa}_{\mathsf{t}-1} = \mathsf{kgain}_t + \mathsf{ninc}_t$. The ex post nominal interest rate i_t can be split in an expected component $\bar{i}_t$ and a random component e_t. As an approximation I associate all of the expected component with net investment income and capital gains with the unexpected. We can then see ninc_{it} as a rescaled version of $\mathsf{nfa}_{\mathsf{t}-1}$ that takes into account variations in returns, whereas we would expect the coefficient on unpredictable kgain_{it} to be zero.

[Table4 approximately here]

Table 4 presents results. For all the coefficients the ranking across groups preserved and in line with the theoretical predictions. Consider column 1: The coefficient estimate on net income is -0.272. The coefficient is exactly equivalent to the estimate of Table 1 with a nominal interest rate of 7.3% (-0.272*0.073), which seems a reasonable number. Surprisingly, for the whole sample estimate the trade balance responds also to the capital gains component. However, the response is about ten times smaller than for net income and seems to be driven by developing countries, possibly because of a larger predictable component in capital gains for developing countries due to an expected debt restructuring or default. The results with interaction terms parallel those of Table 3 and are reported in the Appendix. All coefficients on the interaction terms (except capital gains) are statistically significant and have the correct signs.

5.2. Trend in Net Foreign Assets

Net foreign assets are highly persistent and conventional univariate and panel unit root tests generally fail to reject the null of a unit root (not reported). It was exactly a similar finding in public debt that motivated Bohn (1998) to propose a reaction function approach: He argued unit root tests fail to reject the null because they do not account for cyclical factors that drive the balance temporarily off its equilibrium path. The results of the estimated reaction function indicate mean reversion in net foreign assets for less integrated economies and

near unit root behavior for integrated economies. It is in line with the predictions of the theoretical model and an exact unit root seems therefore unlikely. One might nonetheless be concerned about the use of asymptotic inference and the estimate of the country specific effect (from which the long run external position can be derived) might be imprecise. As an alternative I estimate the reaction function in deviations from a trend. The deviation is defined as the cyclical component according to a Hodrick-Prescott filter ($\lambda = 100$). [12] The approach implicitly allows the steady state external position to change over time, for example, because of changes in demographics. Most of the previous analysis assumed a constant country specific effect μ, although the rolling regression estimates allowed for some variation in the intercept. A disadvantage is that some information gets lost through the filtering. The estimates are documented in the Appendix. The qualitative results and the ranking of coefficients across country groups were not affected. Again, industrial countries adjust less strongly than developing countries. Naturally, filtering has removed persistence from the data and the estimates for the persistence parameter are substantially lower for all country groups. A specification that includes interactions with integration measures confirms the main results from previous analysis.

5.3. Endogenous net output

Both the theoretical model and the empirical analysis treat net output as exogenous. However, there may be some simultaneity between the trade balance and net output. For example, an external demand shock can improve both the trade balance and net output. The estimate of the effect of net output on the trade balance would then be upward biased. I instrumented net output gap with lags 2 to 5 and use a two step GMM estimation procedure. The results are robust to using more or less lags. Compared to the OLS estimates, the coefficient on the net output gap were about 0.10 lower for industrial countries and emerging economies, but basically unchanged for the whole sample and developing countries. Standard errors were about thirty percent higher. The instruments are valid if the net output gap is not correlated with future shocks to the trade balance, but only with past and present shocks. A Hansen Test for overidentifying restrictions accepted the validity of the instruments for all country groups but the emerging countries. Excluding oil exporting Venezuela restored the result of valid instruments also for emerging countries. In general the instruments seem also valid for emerging countries. OLS estimates of the response to the net output gap may be a bit upward biased, but the ranking of the coefficient is unchanged and still in line with the models predictions.

5.4. Fixed effects bias in dynamic panels

Nickell (1981) showed that the presence of a lagged dependent variable in a fixed effects model leads to biased estimates when T is small. To counter the

[12] In a different context Gourinchas and Rey (2007) choose a similar approach no meet stationarity concerns.

bias Arellano and Bond (1991) have developed a GMM estimator that yields consistent estimates in micro panels with fixed T, but require a large cross section N. The fixed effects estimator gives consistent estimates for large T. For the present sample with a relatively large T we can expect that the bias in the fixed effects estimate is not too strong. Estimates using the System-GMM version of the estimator of the dynamic panel estimator (Blundell and Bond, 1998) lie in similar regions as in Table 1 and confirm previous findings. [13]

6. Conclusion

The paper has explored the consequences of higher financial integration on the adjustment process of the trade balance. It estimates trade balance reaction functions for a sample of developed and developing countries. The reaction function is derived from an intertemporal model. Theory predicts that the trade balance of highly integrated countries should be more persistent, more sensitive to fluctuations in net output and should react less to net foreign assets. The predictions find empirical confirmation, both when comparing coefficients across time and country groups. International integration measures also help to explain the variation in coefficients.

The regression coefficient on net foreign assets can also be used for sustainability analysis. A negative response of the trade balance to net foreign assets is a sufficient condition to meet the intertemporal solvency constraint. From a sustainability perspective a weak response in a large number of countries seems therefore worrying. The present study, however, provides evidence that in general countries respond weakly to their net external position, because they can: easy access to finance makes fast corrections unnecessary and allows for a more stable consumption pattern. A comparison of coefficients across countries and time needs some care, as it has to be conditional on financing conditions.

A. Data

A.1. Sources and construction.

All nominal data is expressed in US dollars.

Net Output Gap (nogap); potential net output: Source: World Bank Development Indicators (WDI). Nominal net output is nominal GDP minus nominal government expenditure minus investment (Gross capital formation). Real net output is nominal net output divided by the GDP deflator. Net output gap is the cyclical component of HP filtered log real net output ($\lambda = 100$) . Potential net output put is the exponential of the cyclical component of HP filtered log real net output

[13] To avoid a finite sample bias because of too many instruments, I follow Roodman (2007)'s recommendations to restrict the number of lags and "collapse" the moment conditions. As predetermined, but not strictly exogenous variable lagged net foreign assets are instrumented as well.

Net Foreign Assets (nfa): Source: Lane and Milesi-Ferretti (2006). Nominal net foreign are deflated with the GDP deflator and scaled by potential net output

Trade balance (tb): Source: WDI. The trade balance is current account minus net income, normalized with potential net output .

Net income (ninc): Source: WDI, normalized with lagged potential net output.

Capital gains (kgain): Capital gains (KGAIN) are calculated as the difference between the change in the stock and the flow. $\mathsf{KGAIN}_t = \mathsf{NFA}_t - \mathsf{NFA}_{t-1} - \mathsf{CA}_t$. The calculated measure is normalized with lagged potential net output.

De jure financial openness (kaopen) Source: Chinn and Ito (2007).

De facto financial openness (finopen) Source: Lane and Milesi-Ferretti (2006).

Trade Openness (tradeopen) Source: WDI. tradeopen is the sum of exports and imports of goods and services over GDP.

Financial Development (findev) . Source: WDI. Financial development is private credit over nominal GDP.

A.2. Country Sample

Industrial countries. Australia (AUS), Austria (AUT), Canada (CAN), Denmark (DNK), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Ireland (IRL), Iceland (ITA), Italy (ITA), Japan (JPN), Netherlands (NLD), New Zealand (NZL), Norway (NOR), Portugal (PRT), Spain (ESP), Sweden (SWE), Switzerland (CHE), United Kingdom (GBR), and United States (USA).

Developing Countries. The classification follows Prasad et al. (2004). The developing countries are split into, more financially integrated, emerging (21) and, less financially integrated, other developing (28) countries. [14]

Emerging countries

Brazil (BRA), Chile (CHL), China (CHN), Colombia (COL), Egypt (EGY), India (IND), Indonesia (IDN), Israel (ISR), Korea (KOR), Malaysia (MYS), Mexico (MEX), Morocco (MAR), Pakistan (PAK), Peru (PER), Philippines (PHL), Singapore (SGP), South Africa (ZAF), Thailand (THA), Turkey (TUR), and Venezuela (VEN).

Other Developing Countries

Algeria (DZA), Benin (BEN), Bolivia (BOL), Burkina Faso (BFA), Cameroon (CMR), Costa Rica (CRI), Cote d'Ivoire (CIV), Dominican Republic (DOM), Ecuador (ECU), El Salvador (SLV), Ghana (GHA), Guatemala (GTM), Haiti (HTI), Honduras (HND), Jamaica (JAM), Kenya (KEN), Mauritius (MUS), Niger (NER), Nigeria (NGA), Panama (PAN), Papua New Guinea (PNG),

[14] I exclude Nicaragua, Botswana, and Gabon as outliers. Nicaragua's net external position to net output ratio varies between -20% and -2000%. Botswana and Gabun display extreme volatility in the trade balance. They account together for half of all observations that lie above the 99.5% or below the 0.5% percentile of the sample distribution. Both countries appear at both ends of the distribution. The study is also not able to use data on Belgium, Luxembourg, Argentina, Burundi, and Bangladesh, as one or several data series are missing.

Paraguay (PRY), Senegal (SEN), Sri Lanka (LKA), Syrian Arab Republic (SYR), Togo (TGO), Tunisia (TUN), and Uruguay (URY).

References

Arellano, M., Bond, S., 1991. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. Review of Economic Studies 58 (2), 277–97.

Bai, Y., Zhang, J., 2008. Financial Integration and International Risk Sharing. Unpublished Working Paper, Arizona State University.

Blanchard, O., Giavazzi, F., 2002. Current Account Deficits in the Euro Area: The End of the Feldstein-Horioka Puzzle? Brookings Papers on Economic Activity, 147–210.

Blanchard, O., Kahn, C. M., 1980. The Solution of Linear Difference models under Rational Expectations. Econometrica 48 (5), 1305–11.

Blundell, R., Bond, S., 1998. Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. Journal of Econometrics 87 (1), 115–143.

Bohn, H., 1998. The Behavior of US Public Debt and Deficits. The Quarterly Journal of Economics 113 (3), 949–963.

Boileau, M., Normandin, M., 2008. Dynamics of the Current Account and Interest Differentials. Journal of International Economics 74 (1), 35–52.

Campbell, J. Y., Mankiw, N. G., 1991. The Response of Consumption to Income : A Cross-country Investigation. European Economic Review 35 (4), 723–756.

Chinn, M., Ito, H., May 2007. A new measure of financial openness. Unpublished Working Paper, University of Wisconsin, Madison.

Coakley, J., Kulasi, F., Smith, R., 1998. The Feldstein-Horioka Puzzle and Capital Mobility: A Review. International Journal of Finance & Economics 3 (2), 169–88.

Decressin, J., Disyatat, P., 2008. Productivity Shocks and the Current Account: An Alternative Perspective of Capital Market Integration. Journal of International Money and Finance, Forthcoming.

Devereux, M. B., Smith, G. W., 2007. Transfer Problem Dynamics: Macroeconomics of the Franco-Prussian War Indemnity. Journal of Monetary Economics 54 (8), 2375–2398.

Engel, C., Rogers, J. H., 2006. The U.S. Current Account Deficit and the Expected Share of World Output. Journal of Monetary Economics 53 (5), 1063–1093.

Feldstein, M., Horioka, C., 1980. Domestic Saving and International Capital Flows. Economic Journal 90 (358), 314–29.

Galí, J., Perotti, R., 2003. Fiscal Policy and Monetary Integration in Europe. Economic Policy 18 (37), 533–572.

Ghosh, A. R., January 1995. International Capital Mobility amongst the Major Industrialised Countries: Too Little or too Much? Economic Journal 105 (428), 107–28.

Gourinchas, P.-O., Rey, H., 2007. International Financial Adjustment. Journal of Political Economy 115 (4), 665–703.

Gruber, J. W., 2004. A Present Value Test of Habits and the Current Account. Journal of Monetary Economics 51 (7), 1495–1507.

Hoffmann, M., 2004. International Capital Mobility in the Long Run and the Short Run: Can We still Learn from Saving-investment Data? Journal of International Money and Finance 23 (1), 113–131.

Kose, M. A., Prasad, E., Terrones, M., Nov. 2007. How Does Financial Globalization affect Risk Sharing? Patterns and Channels. IMF Working Papers 07/238, Washington, DC.

Lane, P. R., Milesi-Ferretti, G. M., 2001. Long-term Capital Movements. NBER Macroeconomics Annual 16, 73–116.

Lane, P. R., Milesi-Ferretti, G. M., 2005. A Global Perspective on External Positions. IMF Working Papers 05/161,Washington, DC.

Lane, P. R., Milesi-Ferretti, G. M., Mar. 2006. The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970-2004. Journal of International Economics 73 (2), 223–250.

Mendoza, E. G., Ostry, J. D., 2008. International Evidence on Fiscal Solvency: Is Fiscal Policy "Responsible"? Journal of Monetary Economics, Forthcoming.

Nason, J. M., Rogers, J. H., 2006. The Present-value Model of the Current Account Has Been Rejected: Round up the Usual Suspects. Journal of International Economics 68 (1), 159–187.

Neumeyer, P. A., Perri, F., 2005. Business Cycles in Emerging Economies: the Role of Interest Rates. Journal of Monetary Economics 52 (2), 345–380.

Nickell, S. J., November 1981. Biases in Dynamic Models with Fixed Effects. Econometrica 49 (6), 1417–26.

Pelgrin, F., Schich, S., 2008. International Capital Mobility: What do National Saving-Investment Dynamics Tell Us? Journal of International Money and Finance 27 (3), 331–344.

Prasad, E., Rogoff, K., Wei, S.-J., Kose, M. A., 2004. Effects on Financial Globalization on Developing Countries: Some Empirical Evidence. IMF Occasional Papers 220, Washington, DC.

Roodman, D., 2007. A Short Note on the Theme of too Many Instruments. Working Papers 125, Center for Global Development, Washington, DC.

Schmitt-Grohé, S., Uribe, M., 2003. Closing Small Open Economy Models. Journal of International Economics 61 (1), 163–185.

Sorensen, B. E., Wu, Y.-T., Yosha, O., Zhu, Y., 2007. Home Bias and International Risk Sharing: Twin Puzzles Separated at Birth. Journal of International Money and Finance 26 (4), 587–605.

Taylor, A. M., 2002. A Century of Current Account Dynamics. Journal of International Money and Finance 21 (6), 725–748.

Uribe, M., Yue, V. Z., 2006. Country Spreads and Emerging Countries: Who Drives Whom? Journal of International Economics 69 (1), 6–36.

Wickens, M. R., Uctum, M., 1993. The Sustainability of Current Account Deficits : A Test of the US Intertemporal Budget Constraint. Journal of Economic Dynamics and Control 17 (3), 423–441.

Wyplosz, C., Oct. 2005a. Debt Sustainability Assessment: The IMF Approach and Alternatives. HEI Working Papers 03-2007, Geneva.

Wyplosz, C., 2005b. Institutions for Debt Sustainability in Brazil. In: Giavazzi, F. , Goldfajn, I., Herrera, S.(Eds.), Inflation Targeting, Debt, And The Brazilian Experience, 1999 To 2003, MIT Press, Cambridge, MA, pp. 193–223.

Figures

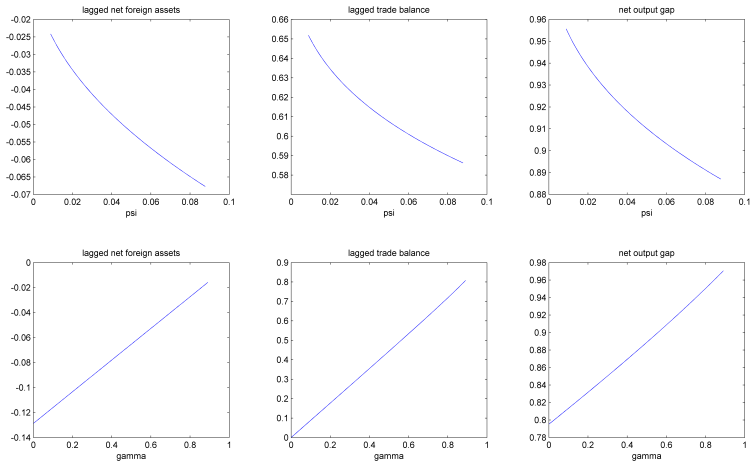

Figure 1: Sensitivity of the reduced form coefficients to the structural parameters

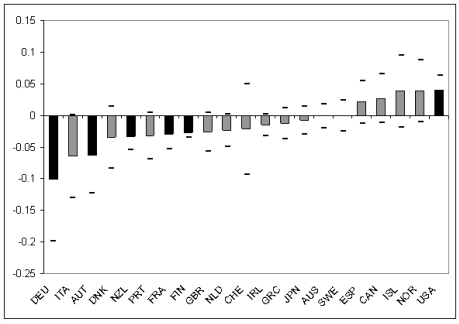

Figure 2: Response to Net Foreign Assets: Industrial Countries

Dashes represent the 95% confidence intervals, statistically signficant estimates are in black.

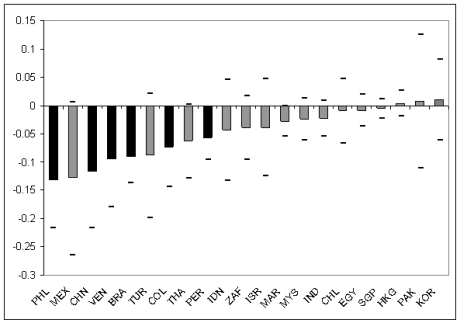

Figure 3: Response to Net Foreign Assets: Emerging Countries

Dashes represent the 95% confidence intervals, statistically signficant estimates are in black.

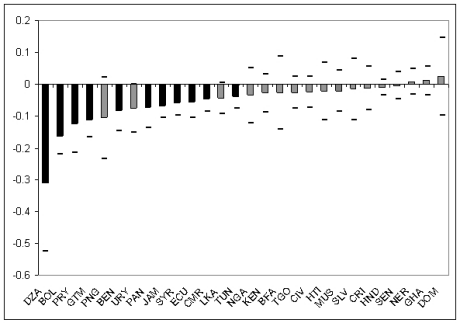

Figure 4: Response to Net Foreign Assets: Other Developing Countries

Dashes represent the 95% confidence intervals, statistically signficant estimates are in black.

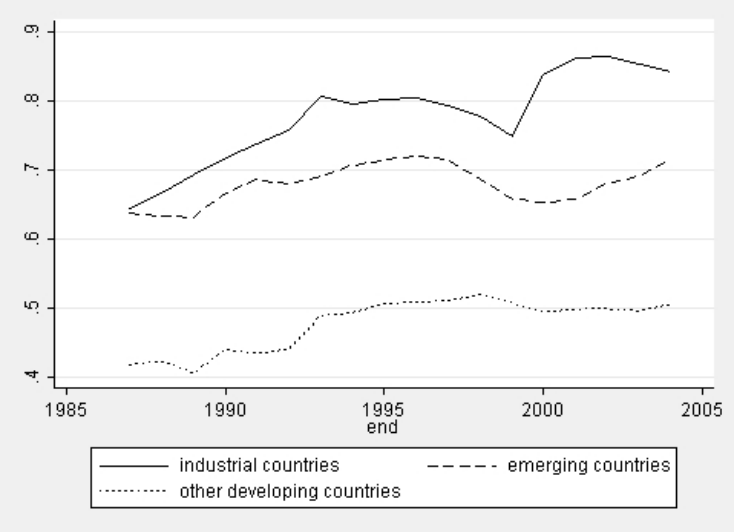

Figure 5: Rolling Regression: lagged trade balance

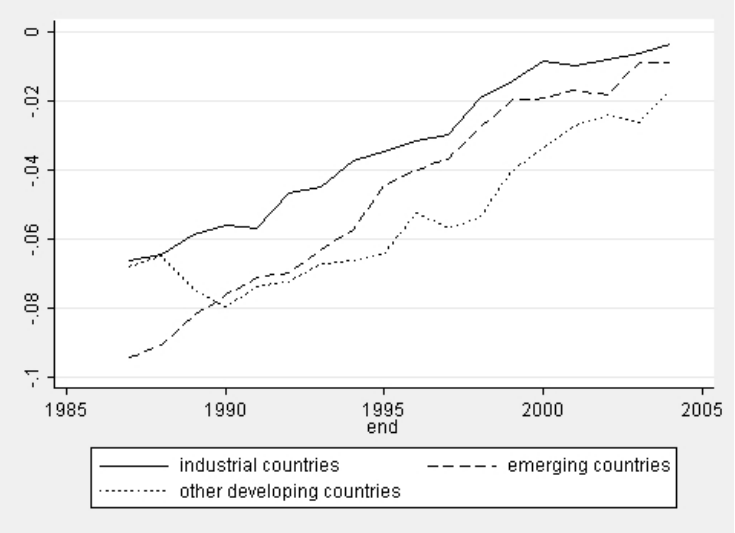

Figure 6: Rolling Regression: Net Foreign Assets

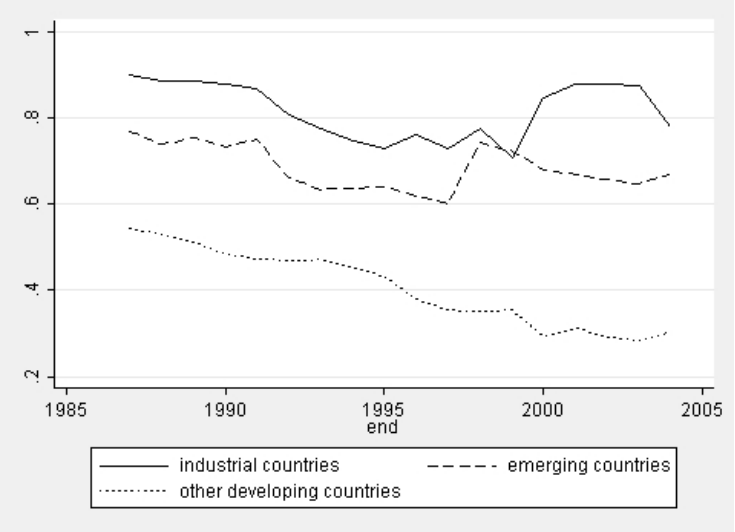

Figure 7: Rolling Regression: net output gap

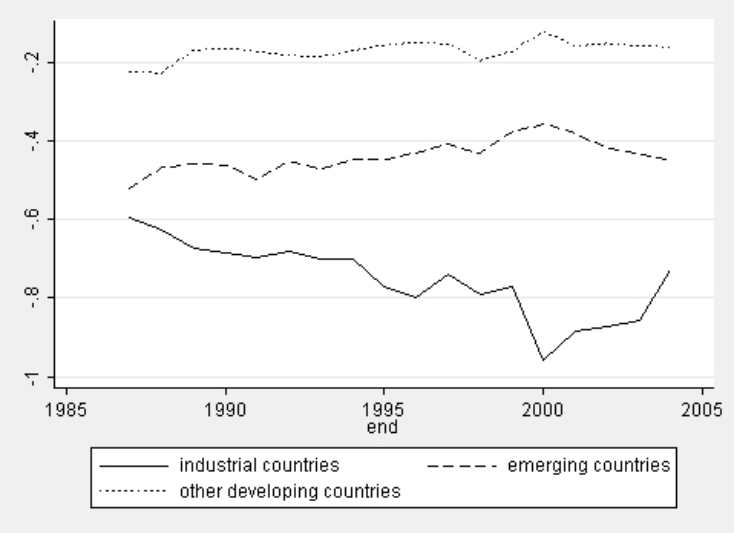

Figure 8: Rolling Regression: lagged net output gap

Tables

	dependent variable: tb			
	all countries	industrial countries	emerging countries	other dev. countries.
lagged tb	0.726***	0.886***	0.825***	0.541***
	(0.027)	(0.028)	(0.032)	(0.049)
lagged nfa	-0.020***	-0.010**	-0.012*	-0.044***
	(0.005)	(0.004)	(0.007)	(0.009)
nogap	0.576***	0.887***	0.785***	0.442***
	(0.048)	(0.091)	(0.075)	(0.062)
lagged nogap	-0.448***	-0.853***	-0.618***	-0.264***
	(0.053)	(0.091)	(0.084)	(0.063)
N	1997	644	585	768

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table 1: Panel Regressions

		all countries	industrial countries	emerging countries	other dev. countries.
lagged tb	median	0.689	0.790	0.700	0.534
	mean	0.621	0.780	0.652	0.478
	st. dev.	0.243	0.164	0.222	0.230
lagged nfa	median	-0.027	-0.021	-0.038	-0.036
	mean	-0.041	-0.015	–0.049	-0.054
	st. dev	0.054	0.036	0.045	0.066
nogap	median	0.593	0.724	0.589	0.544
	mean	0.552	0.726	0.527	0.439
	st.dev	0.509	0.395	0.641	0.453
lagged	median	-0.393	-0.760	-0.386	-0.097
nogap	mean	-0.391	-0.627	-0.426	-0.190
	st. dev.	0.450	0.405	0.504	0.348

Table 2: Country by Country Regressions

dependent variable: tb								
	kaopen		finopen		tradeopen		findev	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
INT *lagged tb	0.088***	0.054***	0.119***	0.060***	0.148***	0.111***	0.385***	0.180***
	(0.013)	(0.016)	(0.018)	(0.017)	(0.027)	(0.027)	(0.052)	(0.057)
INT *lagged nfa	0.005***	0.006***	0.005**	0.006**	0.006	0.011**	0.016**	0.014*
	(0.001)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)	(0.007)	(0.007)
INT * nogap	0.129***	0.128***	0.269***	0.268***	0.457***	0.462***	0.688***	0.580***
	(0.031)	(0.032)	(0.093)	(0.086)	(0.095)	(0.100)	(0.124)	(0.151)
INT* lagged nogap	-0.133***	-0.122***	-0.263**	-0.213*	-0.452***	-0.429***	-0.796***	-0.583***
	(0.030)	(0.030)	(0.122)	(0.112)	(0.087)	(0.085)	(0.137)	(0.156)
N	1960	1960	1938	1938	1997	1997	1990	1990

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1. INT is the corresponding integration variable. For space reasons only the interaction terms of interest are reported, other explanatory variables are omitted. (1) is the base line specification with additional explanatory variables lagged tb, lagged nfa, net output gap, and lagged output gap, (2) additionally interacts the four explanatory variables with a linear time trend and dummies for the three country groups.

Table 3: Interaction with Integration Measures

dependent variable: tb				
	all countries	industrial countries	emerging countries	other dev. countries.
lagged tb	0.696***	0.860***	0.800***	0.522***
	(0.028)	(0.027)	(0.032)	(0.053)
ninc	-0.272***	-0.154***	-0.239**	-0.403***
	(0.064)	(0.048)	(0.102)	(0.108)
kgain	-0.026**	-0.003	-0.032	-0.044*
	(0.011)	(0.007)	(0.023)	(0.023)
nogap	0.580***	0.882***	0.768***	0.470***
	(0.049)	(0.090)	(0.076)	(0.067)
lagged nogap	-0.439***	-0.833***	-0.604***	-0.282***
	(0.053)	(0.088)	(0.083)	(0.066)
N	1994	644	585	765

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Panel Regression on Total Returns