Fixed versus Flexible Exchange Rates: A Panel-VAR Analysis*

Mathias Hoffmann
Department of Economics
University of Cologne†

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Abstract

This paper empirically investigates Mundell's (1961) formalisation that in a small open economy flexible exchange rates act as a 'shock absorber'. The role of a world real interest rate shock in driving output, trade imbalances and real exchange rate fluctuations under different exchange rate regimes is empirically investigated in a Panel VAR, which utilises economic theory for identification.

JEL Classification: C33, F31, F41

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†Address of Correspondence: Mathias Hoffmann, Department of Economics, University of Cologne -Chair of International Economics, Albertus-Magnus-Platz, 50931 Cologne, Germany. email: m.hoffmann@wiso.uni-koeln.de

1 Introduction

An important feature of the global economy is the great variety of exchange rate policies. Since Bretton Woods, the comparative properties of fixed and flexible exchange rates have been of concern and interest for many international economists and policy makers.[1] The experience of numerous emerging market economies over the last decade has led to a refreshed discussion of the question whether to adopt a fixed or flexible exchange rate regime (e.g. Obstfeld, 2002; Lane, 2002). The general argument in favour of flexible exchange rates follows Mundell's (1961) formalisation that they act as a 'shock absorber' in a small economy.

This paper tests the conventional wisdom that external shocks are less contractionary under floating exchange rates. Especially in small open developing economies, macroeconomic dynamics are heavily influenced by the outside world. The collapse of international prices for their exports, demand shortfalls, withdrawal of foreign capital or interest rate fluctuations provide good examples of exogenous macroeconomic dynamics which affect open economies. This study examines the impact of an external shock on a selected group of small open economies, which have adopted different exchange rate regimes. A panel vector autoregression (PVAR) approach will be utilised to test whether economies respond differently to such shocks. The PVAR captures both the stochastic patterns and co-movements of macroeconomic variables and allows to study dynamics in terms of deviations from the equilibrium across countries. The paper analyses and compares the adjustment process of home real output, the trade balance and the real exchange rate by concentrating on world real interest rate shocks.

Despite the prominent role played by exchange rate regimes, there is relatively little empirical work addressing their properties. Baxter and Stockman (1989) focus on correlations in the data to analyse the variability of output and inflation over time in an atheoretical approach. Their finding is that different regimes are able to explain shifts in the data. However, a difficulty with this approach is that a given set of observations may be compatible with different economic interpretations. To overcome this problem, Bayoumi and Eichengreen (1994) use a VAR model to analyse nominal and real shocks under different exchange rate regimes. However, the authors do not explicitly test for any hypothesis under fixed and floating exchange rates. Hoffmaister and Roldos (1997) utilise a PVAR approach to analyse business cycle behaviour in Asian and Latin American countries. Similar to Bayoumi and Eichengreen, they apply the Blanchard and Quah (1989) approach to separate nominal and real shocks. Except Broda (2000), who concentrates on terms of trade shocks, there has not been any PVAR research analysing the effects of shocks

[1] In a classical paper Helpman (1981) formally compares different exchange rate regimes. He points out that in the presence of no market distortions and perfect foresight all equilibrium allocations are Pareto efficient.

under different exchange rate regimes.

The next section explains the role of the world interest rate in a small open economy. While section 3 outlines the econometric issues involved, section 4 presents the empirical evidence by utilising pooled time series data. The dynamic adjustment is illustrated by the impulse response functions. Section 5 concludes.

2 The World Real Interest Rate

Small open economies provide several channels by which world shocks influence their performance. In theory, the world real interest rate is an important mechanism by which foreign shocks and business cycles are transmitted to small economies. In recent years emerging market economies have faced large disturbances in international financial markets. The collapse of asset values in Japan at the onset of the current recession can be seen as one event causing such a disturbance, which represents an external financial shock for developing countries. Changes in the world real interest rate are therefore shocks to the financial system and affect the behaviour of variables in the economy in a unique way, depending on the domestic conditions. By generating the intertemporal substitution of households, affecting wealth as well as the portfolio allocation, the world real interest rate has an impact on the 'real side' of the economy and alters the allocation of resources. Thus, the world interest rate provides a useful focus for the analysis, since it causes significant disturbances to real economic performance.[2] In an intertemporal model with nominal rigidities, e.g. sticky prices, the adjustment mechanism also depends on the adoption of the exchange rate regime. An unexpected temporary increase in the world real interest rate implies that current consumption becomes relatively more expensive so that consumers favour future over current consumption. As a result, consumption falls in the short-run. Under a floating exchange rate regime, the nominal and real exchange rate depreciate and raise the relative price of foreign traded goods. Under an exchange rate peg the fixed nominal exchange rate limits the response of the real exchange rate. The relative price change makes home produced goods relatively cheaper under floats. Moreover, a more pronounced trade balance surplus occurs under floating exchange rates. Consequently, in the floating exchange rate economy home production would decline to a lesser extent in case of a world real interest rate shock (Hoffmann, 2002). In the presence of nominal rigidities the nominal exchange rate allows a faster adjustment process in floating compared to pegging exchange rate economies since there is no need to wait until

[2] However, there are some difficulties in obtaining the world interest rate. Obstfeld and Rogoff (1995, p. 1781) discuss tests of intertemporal current account models and note that it is not obvious which real interest rate should be used.

imbalances in the goods market reduce domestic prices.[3]

The empirical analysis of the effects of the world real interest rate on the small open economy's output, trade balance and real exchange rate requires the consideration of interactions between world output and the world interest rate. The world interest rate and world output are presumably not independent; movements in world output affect the world interest rate. As a result, to estimate the effect of one, it is also necessary to include the other.[4]

3 Econometric Approach: Panel VAR

This section explains the econometric method used to test the hypothesis that floating exchange rates are superior in insulating an economy against external shocks.

3.1 Data

The econometric model considers a set of variables to recover the pattern of shocks in 42 low, lower and middle income economies (Table 1) for the sampling period 1973 to 1999. All data, except the world interest rate and net exports, are measured in logs. To measure the world real interest rate the method suggested by Barro and Sala-i-Martin (1990) and applied by Bergin and Sheffrin (2000) is utilised. Short-term nominal interest rates of the G-7 countries are adjusted by the inflation expectations to calculate the ex-ante real interest rate for each of the G-7 countries.[5] To compute an individual average world real interest rate for country i in the sample, weights based on the trade shares of country i with each of the G-7 countries are used to construct a modified world real interest rate since loans to developing countries by the G-7 countries are closely related to their trade flows with such countries. The world real output is measured by the trade weighted GDP of the countries' trading partners in constant currency units. To construct the home real output, the developing countries' GDP is utilised in constant units.[6] Countries' net exports are measured by the external balance on goods and services as a percentage of GDP in constant domestic currency units. The countries' real exchange rate is the ratio of CPI indexes,

[3] This is in line with the argument brought forward by Friedman (1953).

[4] For example, in times of high world output, demand for investment may be high and so may be the world interest rate.

[5] Inflation expectations are forecasts, calculated by a six-quarter autoregression (Bergin, 2001).

[6] The real output data are measured in domestic currencies to overcome the real exchange rate effects, which would influence the data if they were obtained in US dollar terms. To see this more clearly, consider the following equality: $\frac{Y^H_{i/\$}}{P_{i/\$}} = \frac{S_{\$/HomeCurrency} * Y^H_i}{P_{i/\$}} = \frac{S_{\$/HomeCurrency}}{P_{i/\$}} * P_i * \frac{Y^H_i}{P_i}$.

Thus, real output is measured in terms of constant domestic currency units.

adjusted by the nominal exchange rate (national currency per dollar).[7]

3.2 Nonstationarity and Cointegration

Prior to the statistical analysis the data series are tested for unit roots and cointegration, since a necessity for calculating means and variances is the data's stationarity.[8] The Levin and Lin Test (1992) is utilised to test the null hypothesis of nonstationarity. Table 2 presents the test results. Overall, there is no evidence for the data's stationarity in levels. However, the data appear to be stationary in first differences (Table 2). Given that the time series properties of the data are not stationary in levels the null hypothesis that the variables are cointegrated is tested. Mc Coskey and Kao (1998) derive such a residual based test statistic. Table 3 depicts the results and shows that there does not exist a long-run relationship between the variables. Hence, the econometric model is estimated in first differences without imposing any cointegration relationship. Given the time series properties of the data set, Table 4 presents the summary statistics of the data used in the empirical analysis. It becomes apparent that the real exchange rate appreciates or depreciates on average more strongly under floats than under pegs during the sample period under both, the de jure and de facto specification.[9] The standard deviation of the real exchange rate is always higher under floats, which implies that a higher real exchange rate volatility is evident in floating countries. Table 4 also shows that under pegs average net exports are lower and even negative when considering the de facto specification. Additionally, fixed exchange rate economies experience a higher volatility in net exports on average. Interestingly, the statistical analysis demonstrates that the average growth rate of real GDP is higher under the de jure specification in countries which adopt a fixed exchange rate. Nevertheless, under both specifications the real GDP growth rate is more volatile under pegs than under floats.[10]

3.3 Choice of Exchange Rate Regimes

Following Frankel (1999), nine exchange rate regimes exist, which can be categorised into three types. Currency unions, currency boards and truly fixed exchange rates can be specified as *fixed exchange rates*. *Intermediate regimes* comprise crawling pegs (adjustable pegs, crawling pegs and basket pegs) and dirty floats (target zone/bands or managed floats). Free floats represent a

[7] Short-term nominal interest rates are derived from the International Financial Statistics (International Monetary Fund, 2000). Output data and net exports are obtained from the World Development Indicators (World Bank, 2001). Data on the real exchange rate are taken from Lane and Milesi-Ferretti (2002) and are re-based so that a rise in the real exchange rate reflects a depreciation and a fall an appreciation.

[8] Tests are implemented using the NPT 1.2 in Gauss, provided by Chiang and Kao (2001).

[9] For a discussion of the two exchange rate specifications please refer to the next section.

[10] According to Taylor (1989) flexible exchange rates reduce output volatility by almost one half.

pure float regime. For the econometric analysis intermediate regimes are considered under the floating category.

This paper follows the recent work by Reinhart and Rogoff (2002) and the International Monetary Fund's (2000) Annual Report on Exchange Arrangements and Exchange Rate Restrictions (AREAER) to classify the exchange rate regimes of the 42 countries of interest. The AREAER report is based on the publicly stated commitment of the authorities in the countries in question, known as the de jure analysis. The approach is problematic since it constitutes the uncertainty of not knowing whether the actual policy in the country is consistent with the commitment stated in the AREAER (e.g. Frankel, 1999; Reinhart and Rogoff, 2002). This problem can be overcome by basing the classification on the observed behaviour of the exchange rate. Thus, data on interventions (reserve changes), exchange rate volatility, exchange rate changes or market-determined parallel exchange rates can be applied. Reinhart and Rogoff (2002) utilise the de facto approach, which forms the basis of the following empirical analysis and is compared to the de jure approach. An overview of the de jure and de facto approaches in the country set indicates a clear trend towards a floating exchange rate policy. However, differences between the two approaches emerged from the mid 70s to the mid 80s, where a policy towards floating exchange rate regimes prevailed under the de facto specification. By contrast, under the de jure specification such a clear trend towards floating exchange rates was not evident.

3.4 Identification of the Econometric Model

Developing countries represent the focal point of attention of the empirical analysis so that the econometric application is derived from small open economy assumptions. Domestic innovations do not affect external variables, i.e. the world real interest rate, r, and world (foreign) real output, $y^{Foreign}$. To be more precise, it is assumed that current and past values of the real exchange rate, rer, real home output, y^{Home}, and net exports, nx, of a small open economy do not affect r and $y^{Foreign}$, neither in the short nor in the long-run. However, the data generation process of home output, the trade balance and the real exchange rate is affected by world output and the world real interest rate, which are determined outside of the system under investigation. Additionally, the real exchange rate, the trade balance and domestic output are jointly influenced by movements of one of the three variables.[11] The joint effects on home output, net exports and the real exchange rate complicate the identification of structural innovations in a model which

[11] For example, changes in the real exchange rate impact on the private sector's real wealth and expenditure through its effect on domestic prices. The change in domestic absorption leads firms to revise expectations on future demand and, hence, alters production. This affects aggregate supply and, therefore, output and the trade balance. The latter has an impact on home prices and has feedback effects on the real exchange rate.

contains all variables. To overcome this problem an exogenous Vector Autoregression (VARX) model is applied in which world output and the world real interest rate are treated as exogenous variables. This approach imposes no restrictions on the model.[12] The exogeneity of world output and the world real interest rate enables the tracing of such shocks through the system.[13] The econometric model takes the following reduced form:

$$\mathbf{Y}_{i,t} = \mathbf{B(L)}\mathbf{Y}_{i,t} + \mathbf{C}_0\mathbf{X}_{i,t} + \mathbf{C(L)}\mathbf{X}_{i,t} + \mathbf{u}_{i,t}. \tag{1}$$

$\mathbf{Y}_{i,t}$ is the 3 x 1 dependent and endogenous variable vector. $\mathbf{Y}_{i,t} = \left[\Delta \log y^{Home}, \Delta \log RER, \Delta nx\right]'$ comprises real home output, the real exchange rate and net exports. $\mathbf{X}_{i,t} = \left[\Delta \log y^{Foreign}, \Delta r\right]'$ is a 2 x 1 vector of the exogenous real world output and the world real interest rate. $\mathbf{u}_{i,t}$ reflects the model's error term. $\mathbf{B(L)}$ and $\mathbf{C(L)}$ are matrix polynomials in the lag operator.[14] To examine whether the responses of the exogenous shocks are different between regimes, the estimated model allows to interact $\mathbf{B(L)}$, $\mathbf{C}_0$ and $\mathbf{C(L)}$ with the dummies $D_{fix_{i,t}}$ and $D_{float_{i,t}}$, which capture the effects of the different exchange rate regimes. Countries that float today might peg their exchange rate tomorrow, which would consequently lead to a confusion between responses of floats and pegs. To overcome this potential source of bias, the sample includes only observations of countries with the same exchange rate regime during four periods.[15] From equation (1) the representation of the exogenous process takes the form

$$y_{i,t} = \sum_{s=0}^{\infty} J\mathbf{B}^s\mathbf{C}x_{i,t-s} + \sum_{s=0}^{\infty} J\mathbf{B}^s J' u_{i,t-s}. \tag{2}$$

The expression in equation (2) allows the derivation of the impulse response functions for a given exogenous shock to the system (section 4). To examine whether the findings and responses to the real shock are robust a sensitivity analysis will be applied.[16] In this context, impulse responses obtained from the de facto approach are compared with responses under the de jure specification, given the shock to the world real interest rate.

[12] The reduced form model is obtained by the premultiplication of the inverted non-singular instantaneous effects matrix.

[13] Hoffmann (2002) also considers a shock to world output.

[14] $\mathbf{B(L)} = B_1L + ... + B_sL^s$ and $\mathbf{C(L)} = C_1L + ... + C_pL^p$.

[15] This issue was also raised by Broda (2000).

[16] In Hoffmann (2002) several robustness checks are applied. The sample was split in order to be able to attribute responses to different exchange rate regimes which actually might be associated with other characteristics. Financial openness and the degree of trade openness are factors which may affect the overall results found for the world real interest rate.

4 Empirical Results

The empirical model in section 3.4 is estimated by generalised least square (GLS).[17] It can be used to compute the dynamic response functions, which study the effects of changes in the world real interest rate on domestic real output of countries as well as their real exchange rate and net exports. The impulse response functions are accompanied by one standard deviation error bands.[18]

4.1 World Real Interest Rate: Fixed versus Flexible Exchange Rates

Figures 1 to 6 show the responses of the complete sample under the de facto specification of Reinhart and Rogoff (2002) to the one period one hundred basis point rise in the world real interest rate. Figure 1 depicts the adjustment process of real output in the fixed exchange rate economies. After an initial positive impact effect, the economy is pushed into recession in the short-run, i.e. the first period of the shock. This negative effect of the external shock equates to 0.05 percentage points and is statistically different from zero. In the medium-run, the third period after the shock, output growth declines again and reaches a negative growth rate of 0.01 percentage points. Overall, the adjustment process is relatively volatile. Figure 3 shows the time path of the adjustment of the trade balance. The impulse response function suggests that the adjustment process of the trade balance is only completed in the long-run, i.e. the eighth period after the shock. After an initial deterioration, which is statistically significant, net exports improve by 0.88 percentage points in the short-run. Thus, countries with a nominal fixed exchange rate off-set the external shock to the trade balance by increasing their exports relative to their import demands in the short-run. The real exchange rate response is outlined in Figure 5. Initially, the real exchange rate appreciates before slowly moving towards a real depreciation of 0.13 percentage points in the second period after the shock. Overall, the responses are significant for the first two periods of the adjustment process. The adjustment process is completed in the fifth period after the shock. The total long-run impact on the real exchange rate equals -1.5 percentage points (bottom panel of Table 5).

The analysis of the flexible exchange rate regimes illustrates that the effect of a one time change of the world real interest rate on real output growth under floating exchange rates is negative and significantly different from zero in the initial period of the shock (Figure 2). The economy moves into recession. The real GDP growth rate declines by 0.33 percentage points. In

[17] The estimation strategy of dynamic panel data depends on the error term being serially uncorrelated. Several tests of normality are applied to validate the choice of the estimation approach (e.g. Holtz-Eakin, 1988). Results are available on request.

[18] The confidence intervals were computed using the approach by Luetkepohl (1990).

the medium-run, real GDP growth returns to its pre-shock level. Overall, the adjustment process is less volatile than under fixed exchange rate regimes. Figure 4 illuminates the behaviour of the trade balance to the shock of the world real interest rate. The trade balance instantaneously improves by 0.02 percentage points. In the following periods the trade balance improves further and remains in surplus. Only the short-run and second period improvements of net exports by 0.28 and 0.1 percentage points remain statistically significant. The adjustment process is completed after five years. This is in contrast to the trade balance response under the fixed exchange rate regimes. Figure 6 depicts the real exchange rate response to the external shock. The real exchange rate depreciates strongly in the short-run, although it is subject to an initial appreciation. The real exchange rate in a floating exchange rate regime behaves markedly in contrast to the pegging exchange rate regimes. The short-run depreciation of 0.55 percentage points is statistically different from zero. The accumulated long-run impact of the world real interest rate shock on the real exchange rate equals 0.72 percentage points, as illustrated in the bottom panel of Table 5.

The real exchange rate response gives empirical validity to the theoretical proposition that under floating exchange rate regimes the real exchange rate should depreciate more strongly. It is also found that the adjustment process of the trade balance lasts longer under pegs than under floats. Floating regimes are able to smooth effects of negative real shocks on real GDP growth by utilising the nominal exchange rate as a shock absorber. By contrast, the growth rate of real GDP under pegging exchange rate regimes needs a longer time horizon of adjustment and reflects a higher volatility during the process of adjustment.[19]

Statistical differences between the estimated coefficients of the two regimes also play an important role in the analysis. Tables 5 present Wald tests which report the joint significance of the difference between the floating and pegged coefficients from the VAR in conjunction with the estimated accumulated coefficients of the impulse response process for the adjustment of the variables of interest. The bottom panel of Table 5 illustrates that the accumulated total responses of the real exchange rate are in line with the predictions that the real exchange rate depreciates more strongly under floats and, hence, allows the trade balance to adjust faster under floats. However, an examination of the real output response in the top panel of Table 5 reveals that the accumulated long-run response of real GDP is less contractionary under fixed exchange rate regimes on the whole. A statistical difference of the floating and pegged coefficients is found for the trade balance and real exchange rate variables (medium and bottom panel of Table 5).

[19] The results do not vary significantly if sub-samples of financially or trade-open countries are considered (see Hoffmann, 2002).

4.1.1 De Jure Specification

This subsection replicates the analysis for the de jure specification. The previous findings of the evolution of real output are revised in Figures 7 and 8 since the actual and publicly stated behaviours do not necessarily coincide. Under fixed and floating exchange rate regimes the economy initially moves into recession. The recessionary impact is more pronounced under pegs than under floats (see top panel of Table 6). Nevertheless, in the short-run both regimes recover. The process of recovery is clearly more accentuated under floating exchange rate regimes. The negative accumulated effect on the real GDP growth rate in the medium-run is equal to 0.17 percentage points under pegs, while the positive accumulated effect of real output under floats equals 0.6 percentage points. Wald tests, which evaluate differences between the world real interest rate and GDP coefficients respectively, generate statistical significance (top panel of Table 6).

The behaviour of net exports are described in Figures 9 and 10. The initial trade balance effect is negative in the pegging countries. The first four periods after the shock are statistically significant. The trade balance improves only in the second period after the shock. Overall, the trade balance deteriorates by 0.9 percentage points (medium panel of Table 6) and is relatively volatile. Under floats net exports follow a different adjustment pattern. After an initial improvement net exports remain in surplus. Overall, an accumulated trade balance surplus of 0.76 percentage points is established in the long-run (medium panel of Table 6). The Wald test of the differences in all trade balance coefficients is statistically significant.

The adjustment process of the real exchange rate is portrayed in Figures 11 and 12. The instantaneous real exchange rate movements illuminate a negative effect in floating exchange rate economies. Under fixed exchange rate regimes the real exchange rate depreciates instantaneously and the rise of the real exchange rate reaches its peak during the first period. Under floats a real depreciation occurs in the first period. However, the real exchange rate depreciation is stronger in the fixed exchange rate economy. The overall accumulated impact on the real exchange rate is presented in the bottom panel of Table 6, which illustrates a stronger positive effect under fixed exchange rate regimes. This is in contrast to the de facto analysis. Again, Wald tests of the difference between the real exchange rate coefficients are significant at the one percent level (bottom panel of Table 6).

5 Conclusion

In order to meaningfully add to the debate whether fixed or floating exchange rate regimes are superior, this paper examines the theoretical hypothesis that nominal exchange rates act as a shock absorber under floating exchange rate regimes. The paper utilises a Panel VAR approach. The empirical results provide support for the predictions of the literature on exchange rate regimes. Given a shock to the world real interest rate, the paper confirms for the de facto sample that the adjustment process of real GDP is more volatile under pegs. Real exchange rate movements in form of a real depreciation are stronger under floats. Hence, a smooth trade balance adjustment is achieved more quickly under floating exchange rate regimes. The de jure specification confirms the results for the evolution of real output and the trade balance. Overall, the contrasts between the two exchange rate regimes are more pronounced under the de jure specification.

References

[1] Barro, R. and Sala-i-Martin, X. (1990), "World Real Interest Rates", *NBER Working Paper* 3317.

[2] Baxter, M. and Stockman, A. (1989), "Business Cycles and the Exchange Rate Regime: Some International Evidence", *Journal of Monetary Economics* 23: 377-400.

[3] Bayoumi, T. and Eichengreen, B. (1994), "Macroeconomic Adjustment under Bretton Woods and the Post-Bretton-Woods Float: An Impulse-Response Analysis", *Economic Journal* 104: 813-827.

[4] Bergin, P. (2001), "Putting the 'New Open Economy Macroeconomics' to a Test", mimeo, University of California at Davis.

[5] Bergin, P. and Sheffrin, S. (2000), "Interest Rates, Exchange Rates and Present Value Models of the Current Account", *Economic Journal* 110: 535-558.

[6] Blanchard, O.J. and Quah, D. (1989), "The Dynamic Effects of Aggregate Demand and Supply Disturbances", *American Economic Review* 79: 655-673.

[7] Broda, C. (2000), "Terms of Trade and Exchange Rate Regimes in Developing Countries", mimeo, MIT.

[8] Chiang, M. H. and Kao, C. (2000), "Nonstationary Panel Time Series Using NPT 1.2- A User Guide", mimeo, Syracuse University.

[9] Frankel, J.A. (1999), "No Single Currency Regime is Right for all Countries or at all Times", *NBER Working Paper* 7338.

[10] Frankel, J.A. and Romer, D. (1999), "Does Trade Cause Growth?", *American Economic Review* 89: 379-399.

[11] Friedman, M. (1953), "The Case for Flexible Exchange Rates", in: *Essays in Positive Economics*, University of Chicago, Chicago.

[12] Helpman, E. (1981), "An Exploration in the Theory of Exchange Rate Regimes", *Journal of Political Economy* 89: 865-890.

[13] Hoffmaister, A.W. and Roldos, J.E. (1997), "Are Business Cycles Different in Asia and Latin America?", *IMF Working Paper* 97/9.

[14] Hoffmann, M. (2002), "Fixed versus Flexible Exchange Rates: Theory and Empirical Evidence, mimeo, University of Cologne.

[15] Holtz-Eakin, D. (1988), "Testing for Individual Effects in Autoregressive Models", *Journal of Econometrics* 39: 297-307.

[16] International Monetary Fund (2000), *International Financial Statistics: CD-Rom*, Washinghton D.C..

[17] International Monetary Fund (2000), *Annual Report on Exchange Arrangements and Exchange Restrictions*, Washington D.C..

[18] Lane, P.R. (2002), "Business Cycles and Macroeconomic Policy in Emerging Market Economics", mimeo, Trinity College Dublin.

[19] Lane P. and Milesi-Feretti, G. M. (2002), " External Wealth, the Trade Balance and the Real Exchange Rate", Forthcoming in *European Economic Review.*

[20] Levin, A. and Lin, C.F. (1992), "Unit Root Test in Panel Data: Asymptotic and Finite sample Properties", *University of San Diago Discussion Paper* 92-93.

[21] Luetkepohl, H. (1990), "Asymptotic Distributions of Impulse Response Functions and Forecast Error Variance Decomposition of Vector Autoregressive Models", *Review of Economics and Statistics* 72: 116-125.

[22] McCoskey, S. and Kao, C. (1998), " A Residual Based Test of the Null of Cointegration in Panel Data", *Econometric Reviews* 17: 57-84.

[23] Mundell, R.A. (1961), "A Theory of Optimum Currency Areas", *American Economic Review* 51: 657-665.

[24] Obstfeld, M. (2002), "Exchange Rates and Adjustment: Perspectives from the New Open Economy Macroeconomics", mimeo, University of California, Berkley.

[25] Obstfeld, M. and Rogoff, K. (1995), "The Intertemporal Approach to the Current Account," in: *Handbook of International Economics vol. 3*, edited by G. Grossman and K. Rogoff, North-Holland.

[26] Reinhart, C. M. and Rogoff, K. (2002), "The Modern History of Exchange Rate Arrangements: A Reinterpretation", *NBER Working Paper* 8963.

[27] Taylor, J.B. (1989), "Policy Analysis with a Multicountry Model", in: *Macroeconomic Policies in an Interdependent World*, edited by R.C. Bryant, D.A. Currie, J.A. Frenkel, P.R. Masson and R. Portes, Washington D.C., IMF, 122-142.

[28] World Bank (2001) *World Development Indicators CD-Rom*, Washington D.C..

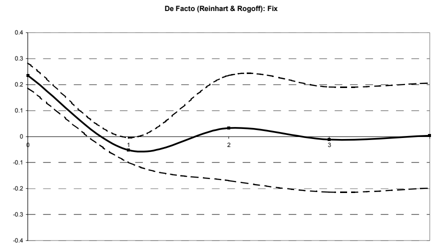

Figure 1: De Facto: Impulse response function of the real GDP growth rate under fixed regimes.

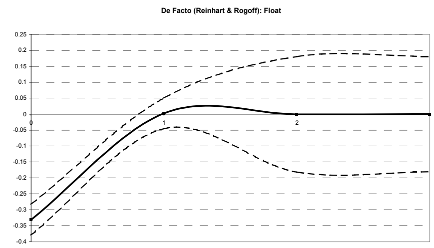

Figure 2: Impulse response function of the real GDP growth rate under floating regimes.

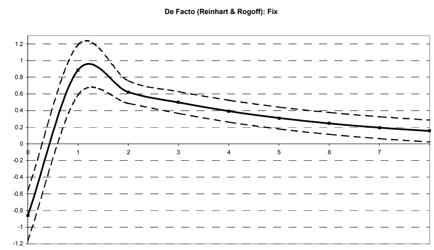

Figure 3: Impulse response function of the growth in net exports under fixed regimes.

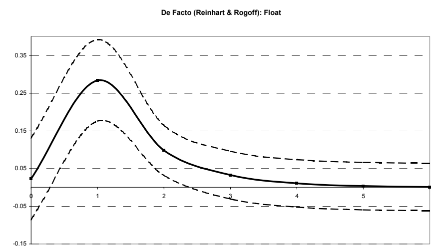

Figure 4: Impulse response function of the growth in net exports under floating regimes.

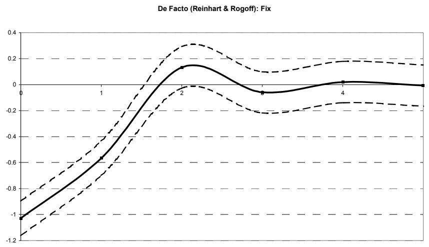

Figure 5: Impulse response function of the real exchange rate growth rate under fixed regimes.

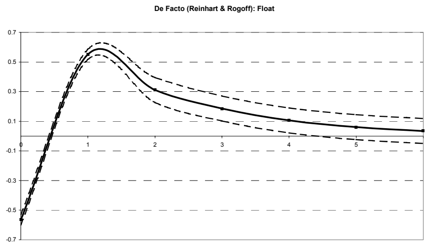

Figure 6: Impulse response function of the real exchange rate growth rate under floating regimes.

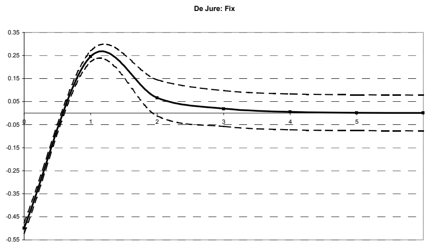

Figure 7: Impulse response function of the real GDP growth rate under fixed regimes.

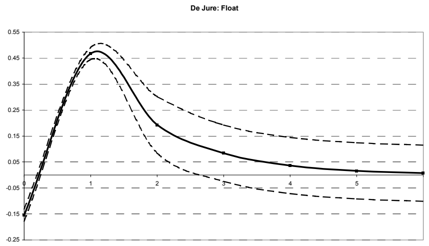

Figure 8: Impulse response function of the real GDP growth rate under floating regimes.

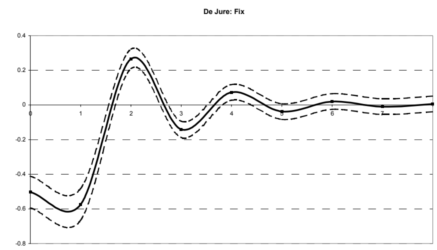

Figure 9: Impulse response function of the growth in net exports under fixed regimes.

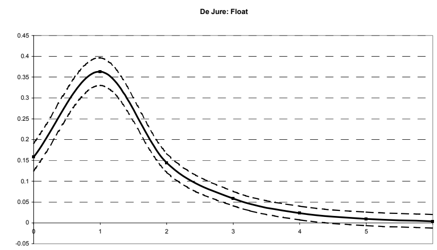

Figure 10: Impulse response function of the growth in net exports under floating regimes.

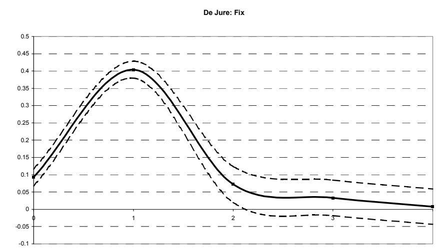

Figure 11: Impulse response function of the real exchange rate growth rate under fixed regimes.

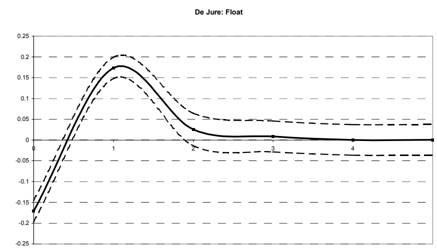

Figure 12: Impulse response function of the real exchange rate growth rate under floating regimes.

Sample of Countries				
Argentina	Dominican Republic	Jordan	Paraguay	Tunisia
Bahrain	Ecuador	Korea	Peru	Turkey
Bolivia	Egypt	Malaysia	Philippines	Trinidad and Tobago
Botswana	El Salvador	Mauritius	Saudi Arabia	Uruguay
Brazil	Guatemala	Mexico	Singapore	Venezuela
Chile	India	Morocco	South Africa	Zimbabwe
Colombia	Indonesia	Oman	Sri Lanka	
Costa Rica	Israel	Pakistan	Syria	
Cote D'Ivore	Jameica	Panama	Thailand	

Table 1: Country List

Variables					
Levin and Lin Test					
Levels:	t_{Rho}	*criticalProb.*	*First Differences:*	t_{Rho}	*criticalProb.*
Real GDP (Level)	0.291	0.418	ΔReal GDP	-58.97	0.000
Real Exchange Rate (Level)	0.376	0.395	ΔReal Exchange Rate	-152.58	0.000
Net Exports (Levels)	0.825	0.314	ΔNet Exports	-180.75	0.000
World Interest Rate (Level)	0.078	0.478	ΔWorld Interest Rate	-166.07	0.000
World Real GDP (Level)	0.24	0.432	ΔWorld Real GDP	-60.59	0.000

Table 2: Panel Unit Root Test. *Note: The null hypothesis is that the series is nonstationary.*

Variables (Relation)		
	Mc Coskey and Kao	
	LM Plus Test	
Real GDP: World Real GDP→World Interest Rate →Net Exports→Real Exchange Rate	38.827 (0.0000)	(reject)
Real Exchange Rate: World Real GDP→World Interest Rate →Net Exports→Real GDP	26.268 (0.0000)	(reject)
Net Exports: World Real GDP→World Interest Rate →Real Exchange Rate→Real GDP	26.495 (0.0000)	(reject)

Table 3: Residual Based Cointegration Test. *Note: The null hypothesis is that there is cointegration (no unit root in the errors). The critical probabilities are in parentheses.*

Variables				
	Complete Mean	*Sample* StDev	Max	Min
Fix: De Jure				
Real GDP	0.045	0.05	0.22	-0.14
Net Exports	0.001	0.06	0.21	-0.23
RER	0.0012	0.10	0.62	-0.39
Float: De Jure				
Real GDP	0.038	0.04	0.12	-0.14
Net Exports	0.002	0.04	0.21	-0.14
RER	0.021	0.13	1.05	-0.38
Fix: De Facto				
Real GDP	0.039	0.05	0.17	-0.14
Net Exports	-0.0003	0.05	0.17	-0.23
RER	0.007	0.08	0.48	-0.18
Float: De Facto				
Real GDP	0.040	0.04	0.17	-0.13
Net Exports	0.0003	0.03	0.20	-0.17
RER	0.01	0.12	0.81	-0.38

Table 4: Summary Statistic. *Note: Obtained from first differenced variables in the system.*

Elasticities		Real Output	
	Wald-Test	*Float*	*Fixed*
All WIR Coeff. $\chi^2_{(4)}$	2.39		
All Coeff. $\chi^2_{(13)}$	6.02		
Impact		-0.331	0.235
		(0.024)	(0.025)
Medium-Run		-0.329	0.205
		(1.165)	(1.669)
Long-Run		-0.329	0.208
		(1.164)	(1.669)
Elasticities		Net Exports	
	Wald-Test	*Float*	*Fixed*
All WIR Coeff. $\chi^2_{(4)}$	8.58*		
All Coeff. $\chi^2_{(13)}$	14.82		
Impact		0.023	-0.856
		(0.055)	(0.046)
Medium-Run		0.438	1.145
		(0.297)	(0.768)
Long-Run		0.453	2.442
		(0.30)	(0.761)
Elasticities		Real Exchange Rate	
	Wald-Test	*Float*	*Fixed*
All WIR Coeff. $\chi^2_{(4)}$	12.08***		
All Coeff. $\chi^2_{(13)}$	47.59***		
Impact		-0.565	-1.029
		(0.017)	(0.068)
Medium-Run		0.483	-1.522
		(0.541)	(1.304)
Long-Run		0.716	-1.508
		(0.543)	(1.299)
Sample Size		724	
Estimation Period		1974-99	

Table 5: Accumulated Coefficients of Real GDP, Net Exports and the Real Exchange Rate on the De Facto Estimation to a Positive Shock to the World Real Interest Rate. *Note: All countries. Standard errors in parentheses. Wald Test for the joint significance of the difference of the peg and float coefficients of real output, net exports and real exchange rate equation respectively. (.) imply the number of restrictions. *** Represence of significance at the 1 percent, ** at the 5 percent, * at the 10 percent level. The medium-run reflects three years and the long-run eight years after the shock.*

		Real Output	
	Wald-Test	*Float*	*Fixed*
All WIR Coeff. $\chi^2_{(4)}$	7.78*		
All Coeff. $\chi^2_{(13)}$	36.11***		
Impact		-0.154 (0.012)	-0.499 (0.011)
Medium-Run		0.591 (0.373)	-0.166 (0.238)
Long-Run		0.655 (0.371)	-0.159 (0.236)
Elasticities		Net Exports	
	Wald-Test	*Float*	*Fixed*
All WIR Coeff. $\chi^2_{(4)}$	6.55		
All Coeff. $\chi^2_{(13)}$	29.49***		
Impact		0.158 (0.017)	-0.503 (0.046)
Medium-Run		0.724 (0.046)	-0.952 (0.132)
Long-Run		0.763 (0.041)	-0.902 (0.125)
Elasticities		Real Exchange Rate	
	Wald-Test	*Float*	*Fixed*
All WIR Coeff. $\chi^2_{(4)}$	31.03***		
All Coeff. $\chi^2_{(13)}$	62.11***		
Impact		-0.171 (0.0131)	0.093 (0.012)
Medium-Run		0.04 (0.126)	0.602 (0.153)
Long-Run		0.04 (0.124)	0.613 (0.154)
Sample Size		629	
Estimation Period		1974-99	

Table 6: Accumulated Coefficients of Real GDP, Net Exports and the Real Exchange Rate on the De Jure Estimation to a Positive Shock to the World Real Interest Rate. *Note: All countries. Standard errors in parentheses. Wald Test for the joint significance of the difference of the peg and float coefficients of real output, net exports and real exchange rate equation respectively. (.) imply the number of restrictions. *** Represence of significance at the 1 percent, ** at the 5 percent, * at the 10 percent level. The medium-run reflects three years and the long-run eight years after the shock.*