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Fixed versus Flexible Exchange Rates: Evidence from Developing Countries*

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Abstract

This paper investigates the formalisation that in a small open economy flexible exchange rates act as a 'shock absorber' and mitigate the effects of external shocks more effectively. An intertemporal small open economy model with nominal rigidities, in which real shocks generate internal imbalances under fixed and flexible exchange rates, is laid out. The role of world interest rate and world output shocks in driving output, trade imbalances and real exchange rate fluctuations is investigated. Using a sample of 38 developing countries, the paper assesses whether the responses of real GDP, the trade balance and the real exchange rate to world real interest rate and world output shocks differ across exchange rate regimes.

JEL Classification: C33, F31, F41

Keywords: Small Open Economies, Exchange Rate Regimes, Panel VAR

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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 to many international economists.[1] The experience of numerous emerging economies over the last decade has led to a refreshed discussion of the question whether to adopt a fixed or flexible exchange rate regime.[2] The general argument in favour of flexible exchange rates follows Friedman (1953) and Mundell's (1961) formalisation that flexible exchange rates act as a ´shock absorber´ in a small economy. In the case of a negative external shock and sticky goods prices or sticky wages it is easier to adjust the nominal exchange rate than to wait until imbalances in the goods and labour market push the relative prices into the desired direction. Consequently, a floating exchange rate insulates the economy against external shocks by mitigating the transmission of external shocks to the domestic economy. A fixed exchange rate regime requires the monetary authority to maintain a peg, forcing all the adjustment to take place in the real economy. Therefore, a floating exchange rate economy should experience a smoother transition of its macroeconomic variables by adjusting its nominal and, hence, real exchange rate.

This paper analyses whether external shocks are less contractionary under floating exchange rates. Especially in small open developing economies, macroeconomic dynamics are heavily influenced by the outside world. Global demand shortfalls or interest rate fluctuations provide good examples of exogenous macroeconomic dynamics which affect open economies. Despite the importance of the exchange rate regime choice of developing countries, there is relatively little empirical work addressing their properties. Among the first authors to analyse different exchange rate regimes were Mussa (1986), Baxter and Stockman (1989) as well as Flood and Rose (1995). The authors focus on correlations and volatility in the data to analyse the relationship between exchange rate regimes and macroeconomic variability. Their evidence shows that floating exchange rate regimes are associated with a higher exchange rate variability. However, Baxter and Stockman argue that different exchange rate regimes are not able to explain shifts in the data of other macroeconomic aggregates. 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 and apply the Blanchard and Quah (1989)

[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.

[2] Obstfeld (2002) discusses the stabilisation benefits of different exchange rate regimes under the perspectives of the new open economy macroeconomics. Lane (2003) illustrates the effectiveness of stabilisation policies in emerging markets in the context of different exchange rate regimes.

approach 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. More recently, Uribe and Yue (2003) utilise a panel vector autoregression (PVAR) to analyse the role of fluctuations in US interest rates in driving business cycles in African and Latin American countries. Except for Broda (2003) no PVAR research has explicitly analysed whether adjustments of macroeconomic variables to real shocks differ systematically under different exchange rate regimes.

This study aims to shed further light on the puzzle concerning the relationship between exchange rate regimes and macroeconomic volatility by examining the impact of external shocks on small open developing economies with different exchange rate regimes. The paper utilises a PVAR approach 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 the real exchange rate, home real output and the trade balance under different exchange rate regimes by concentrating on world output and world real interest rate shocks. Analysing the effects of world output shocks on small open economies' real GDP, trade balance and real exchange rate requires the empirical consideration of interactions between world output and the world real interest rate. To assess the effect of one, it is also necessary to include the other. Movements in the world interest rate affect world output. For example, in times of high world output, demand for financial and physical assets may be high and so may be the world interest rate. This affects the propensity to invest and in turn feeds back into the development of world output. Consequently, the empirical analyses of world output shocks requires the inclusion of the world real interest rate in the econometric model to account for possible interactions between the two variables.

World output shocks are an important mechanism by which foreign shocks and business cycles are transmitted to small open economies. Changes in world output can be seen as exogenous movements in the demand for small open economies' goods and services. This influences the wealth of domestic producers and households and impacts on domestic absorption which leads firms to revise expectations about future demand. This affects aggregate supply and, as a consequence, output and the trade balance. An important result of Mundell's (1961) formalisation is that with sticky prices and flexible exchange rates the nominal exchange rate insulates a small open economy against external shocks, such as movements in world output. More precisely, under floating exchange rates one would expect the nominal and, hence, real exchange rate to depreciate as a consequence of a negative world output shock and thereby to stabilise domestic output. This is due to the relative price change with moderates the output effect of the negative shock. By contrast, under a fixed exchange rate regime the negative external shock leads to destabilising effects on domestic output since the real exchange rate response is mitigated and a contractionary monetary policy is necessary under a fixed exchange rate regime in order to maintain the peg.

The world real interest rate is also a mechanism by which foreign shocks and business cycles are able to affect small open economies. In recent years emerging market economies have faced large disturbances in international financial markets.[3] From the perspective of developing countries changes in the world real interest rate are external shocks which generate the intertemporal substitution of households and affect wealth as well as the portfolio allocation.[4] A prediction of the Mundell-Fleming-Dornbusch framework is that a rise in the world real interest rate requires the real exchange rate to depreciate. Under floating exchange rates this real depreciation should be accomplished by a nominal depreciation which allows for relative price changes. This mitigates the transmission of the external shock and stabilises output. Under fixed exchange rates the real depreciation is accomplished by deflation to keep the nominal exchange rate constant which causes all adjustments to take place in the real economy.

To examine the theoretical implications of the exchange rate regime on the real exchange rate, real GDP and the trade balance in more detail, the next section outlines a model of imperfect competition with nominal price rigidities. Section 3 discusses the econometric issues involved and utilises pooled time series data to present the empirical evidence whether flexible nominal exchange rates act as a shock absorber in developing countries. Section 4 concludes by discussing the main implications of the paper's findings.

2 The Model

The small open economy produces a competitively priced export good. Imports are competitively priced by the outside world.[5] The nontraded goods sector is characterised by monopolistic producers who set domestic product prices. In general, nontraded goods make up a significant amount of a country's output and allow for systematic violations of purchasing power parity and

[3] The increase in the interest rates in the United States as a result of a restrictive monetary policy to control inflation in the beginning of the 1980s as well as the decrease of the interest rate to stimulate the economy in response to the 1990-1991 recession are good examples of disturbances in the financial markets. Calvo et al. (1993) point out the importance of external factors, such as financial market volatility, for macroeconomic developments in Latin America.

[4] Mendoza (1991) was among the first authors to analyse the effects of the world interest rates in small open economies.

[5] The model deviates from the work by Obstfeld and Rogoff (1995, 1996) and Lane (1999) by endogeneously determining traded goods output. A similar model has been applied by Lubik (2003).

real exchange rate variations.

Model Elements

The small open economy model is derived from the definition of international asset markets, the household's budget constraint and the specification of preferences. The household's inter and intratemporal choice as well as the production structure of the economy are incorporated. One then arrives at the model solution under different exchange rate regimes.

International Asset Markets, Budget Constraint and Preferences Households in the small open economy are assumed to be able to allocate their wealth among domestic money, M, and foreign bond holdings, expressed in units of tradeable goods, $P_T F$. The typical home agent's i budget constraint at time t becomes:

$$P_{T,t}F_t^i + M_t^i + P_t C_t + \tau_t = (1+r)P_{T,t}F_{t-1}^i + M_{t-1}^i + \int_0^1 \pi_{N,t}(z)dz + \pi_{T,t} + W_t(L_T^i + L_N^i). \quad (1)$$

τ_t denotes household taxes in period t. $P_t C_t = P_{T,t}C_{T,t}^i + P_{N,t}C_{N,t}^i$ can be seen as the trade balance condition. C_t denotes the consumption index, which aggregates the consumption of traded and nontraded goods, $C_t = C_T^{\gamma} C_N^{1-\gamma}$. The implication of the consumption index is that the intratemporal elasticity of substitution equals *unity.* C_T reflects the consumption of tradable goods while C_N is the aggregate of nontraded goods consumption characterised by a range of goods (z) over the interval $[0, 1]$. The composite of nontraded goods is defined by $C_N = \left(\int_0^1 C_N(z)^{\frac{\theta-1}{\theta}} dz\right)^{\frac{\theta}{\theta-1}}, \theta > 1$. θ is the elasticity of substitution between any two heterogeneous nontraded goods. For $\theta \to \infty$ different $C_N(z)$ become perfect substitutes. The nontraded price index is defined as $P_N = \left(\int_0^1 P_N(z)^{1-\theta} dz\right)^{\frac{1}{1-\theta}}$. The consumption price index in time t is given by $P_t = \frac{P_T^{\gamma} P_N^{1-\gamma}}{\gamma^{\gamma}(1-\gamma)^{1-\gamma}}$. The law of one price holds for traded goods so that $P_T = SP_T^*$. P_T^* is the world price, which is exogenously determined for the small open economy. Household i works in the two sectors and receives a nominal wage W_t. L_T^i and L_N^i reflect the labour supply in the two sectors. The representative agent is the owner of the firms and receives the profits in the two sectors, $\int_0^1 \pi_{N,t}(z)dz + \pi_{T,t}$. S is the nominal exchange rate, defined as the number of domestic currency units per unit of foreign currency. The real exchange rate is defined as

$$E = \frac{SP^*}{P}. \quad (2)$$

P^* is the foreign consumption price index. When normalising the foreign price index to one, the real exchange rate becomes $E = \frac{S\gamma^{\gamma}(1-\gamma)^{1-\gamma}}{P_T^{\gamma} P_N^{1-\gamma}}$. A balanced government budget is assumed and no government consumption is present. The government redistributes its seignorage income to the households such that $-\tau_t = M_t - M_{t-1}$. Home agent i has the following utility function:

$$U_t^i = \sum_{s=t}^{\infty} \beta^{s-t} \left(\frac{\sigma}{\sigma - 1} C_s^{\frac{\sigma-1}{\sigma}} + \mu \ln \left(\frac{M_s}{P_s} \right) - \frac{\kappa}{\nu} \left(L_s^i \right)^{\nu} \right), \tag{3}$$

where β is the subjective discount factor and $\kappa > 0$ represents the disutility of work effort. $\mu > 0$ reflects a scale parameter and is the weight of money in the utility function. σ is the intertemporal elasticity of substitution and has to be greater than zero. Households associate utility benefits from holding real money balances and disutility from having to provide labour effort, $L_s^i = L_{T,s}^i + L_{N,s}^i$, to the home traded and nontraded goods sector.

The Households' Choice The first order conditions for the representative household are obtained by maximising the utility function of equation (3) subject to the budget constraint outlined in equation (1). The Euler equation, $\left(\frac{C_{t+1}}{C_t}\right)^{\frac{1}{\sigma}} = \frac{P_{T,t+1}}{P_{T,t}} \frac{P_t}{P_{t+1}}$, which links present and future consumption, follows from maximising with respect to C and F. It is assumed that $\beta(1+r) = 1$. Consumers like to smooth consumption and therefore take into account relative price changes. The money demand relates the desired real balances to relative price changes and the variable on which transactions are based, C_t. Real balances, $\frac{M_t}{P_t} = \mu C_t^{\frac{1}{\sigma}} \left(1 - \frac{1}{(1+r)} \frac{P_{T,t}}{P_{T,t+1}}\right)^{-1}$, increase with the level of consumption, C_t. They negatively depend on the internationally given real interest rate, $(1+r)$, and tradeable price changes, $\frac{P_{T,t}}{P_{T,t+1}}$.

Households have to choose how to allocate C among the tradeable and nontradable goods. Maximising the objective function (3) subject to equation (1) and the trade balance condition, it becomes clear that the relative demand for traded and nontraded goods, $\frac{C_{N,t}}{C_{T,t}} = \frac{(1-\gamma)}{\gamma} \left(\frac{P_{N,t}}{P_{T,t}}\right)^{-1}$, depends on relative prices, $P_{N,t}/P_{T,t}$, the elasticity of substitution between traded and nontraded goods, which equals *unity*, as well as the relative share of traded goods, γ. Given the total demand function for traded goods, the Euler equation can be rewritten in the following form:

$$\frac{C_{T,t+1}}{C_{T,t}} = \left(\frac{P_{T,t+1}}{P_{T,t}} \frac{P_t}{P_{t+1}} \right)^{\sigma-1}. \tag{4}$$

If the aggregate price level relative to the price of traded goods is currently low relative to future values, present traded goods consumption will be encouraged over future consumption (Dornbusch, 1983). It also leads to the substitution of traded by nontraded goods if $\sigma < 1$. Household's labour supply depends on the real wage, $\frac{W_t}{P_t}$, and the overall consumption level: $L_t^i = \left(\frac{W_t}{P_t} \frac{C^{-\frac{1}{\sigma}}}{\kappa} \right)^{\frac{1}{\nu-1}}$. The supply of an additional unit of labour depends on the marginal disutility, $\kappa \left(L_t^i\right)^{\nu}$, relative to the marginal utility of consuming an additional unit of consumption, $C_t^{-\frac{1}{\sigma}}$.

Production in the Small Open Economy The production in the economy constitutes nontraded, $Y_N(z) = \left(L_N^i\right)^{\alpha}$, and homogeneous traded goods, $Y_T = \left(L_T^i\right)^{\alpha}$, for $0 < \alpha < 1$. Changes in the consumption and production dynamics of traded goods are mirrored in the trade balance, $TB_t = Y_{T,t} - C_{T,t}$, of the small open economy. Traded goods firms maximise their profits, $\pi_{T,t}= P_{T,t}Y_{T,t} - W_t L_{T,t}$, and wish to charge a relative price $\frac{P_{T,t}}{P_t} = \frac{W_t}{P_t}\frac{L_{T,t}^{1-\alpha}}{\alpha}$. The nontraded goods sector, Y_N, is characterised by monopolistic firms of a variety of goods (z). Adding up individual demands for good (z) shows that the producer of good (z) faces the period t aggregate demand curve $Y_{N,t}(z) = \left(\frac{P_{N,t}(z)}{P_{N,t}}\right)^{-\theta} C_{N,t}$. The income or total revenue earned from producing the good (z) equals $P_{N,t}(z)Y_{N,t}(z)$. Each supplier will wish to maximise his profits $\pi_{N,t}(z) = P_{N,t}(z)Y_{N,t}(z) - W_t L^i_{N,t}$, so that

$$\frac{P_{N,t}(z)}{P_t} = \frac{\theta}{\theta-1}\frac{W_t}{P_t}\frac{\left(L^i_{N,t}\right)^{1-\alpha}}{\alpha}. \tag{5}$$

Monopolistic price setting incorporates a price mark-up of $\frac{\theta}{\theta-1}$ relative to the competitive equilibrium.[6] The real output, Y, of the small open economy is defined as $\frac{P_T}{P}Y_T + \frac{P_N}{P}Y_N$.

The Economy under Fixed and Floating Exchange Rate Regimes The conventional viewpoint is that flexible exchange rates are less contractionary than fixed exchange rates. A floating nominal exchange rate allows the relative prices of countries to adjust in response to real shocks. Consequently, the economy's response to external shocks should be less pronounced under floating exchange rates. To analyse the outcome of external shocks under different exchange rate regimes it is necessary to specify the monetary rules. Under a floating exchange rate regime, the central bank uses money supply to target the rate of money growth in the economy. Therefore, the monetary authority's policy instrument is used to maintain a constant (growth rate of the) money supply in the short and long-run, $\hat{M} = \tilde{M} = 0$.[7] The fixed exchange rate is fully credible and sustainable. Under a fixed exchange rate regime, e.g. a currency board or a dollarisation policy, the monetary authority targets the nominal exchange rate, which implies that $\hat{S} = \tilde{S} = 0$. Putting these equations together, a model under different exchange rate regimes can be developed and solved explicitly. The model's solution, which includes the application of different monetary rules, is provided in the Appendix.

The model demonstrates effects of temporary deviations in the world interest rate, expressed by $\hat{r}$.[8] It also demonstrates the economy's adjustment to a contradiction in world output. The decline in world output goes along with a reduction in world demand for traded goods. Hence, a contraction in world output (demand) requires a fall in $\hat{\gamma}$, the share in consumption of traded goods.[9] Due to monopoly power in the nontraded goods sector, nontraded good price

[6] Here it is assumed that nontraded good firms are homogeneous ex-post.

[7] Short-run deviations from the steady state are denoted by hats. Hence, for any variable X, $d\ln X = dX_t/\overline{X}_0 = \hat{X}$ holds. By contrast, any long-run deviations from the benchmark value $\overline{X}_0$ are denoted by $d\overline{X}/\overline{X}_0 = \tilde{X}$. If X_0 equals zero the variables are normalised by $C_{T,0}$.

[8] The econometric part of the paper also focuses on temporary shocks.

[9] See Devereux (2002) for a similar argument.

rigidities are allowed to last for one period only, $\hat{P}_N = 0$. Under this assumption nontraded goods prices are above marginal costs. Nontraded goods producers will change output to accommodate small changes in demand, given that they cannot adjust their prices. In the following periods, nontraded goods prices are free to adjust and the economy moves towards the new steady state. The analytical results to a world real interest rate and world output shock are obtained by log-linearising around the model's steady state (see Appendix). The solution of the model takes into account the short and long-run effects of the external shocks on nontraded goods and traded goods output, $Y_N = C_N$ and Y_T, consumption of traded goods, C_T, the real exchange rate, E, and the trade balance, $Y_T - C_T$. Therefore, it considers the different monetary rules.

Numerical Results under Fixed and Floating Exchange Rate Regimes

In the following section a simulation exercise considers the implications of world real interest rate and world output shocks in the model developed. Several parameters are identified: the discount rate β equals 0.99, the intertemporal elasticity of substitution and the labour supply elasticity $\frac{1}{\nu}$ equal 0.5. The preference parameter γ is set at 0.5 and the labour income share α equals 0.67.

Temporary World Interest Rate Shock Table 1 demonstrates the adjustment under different exchange rate regimes to a temporary one unit increase in the world real interest rate, $\hat{r}$, by providing some numerical results. This unexpected temporary increase implies that current consumption becomes relatively more expensive. Consequently, consumption, $\hat{C}$, of traded, $\hat{C}_T$, and nontraded goods, $\hat{C}_N$, declines under both exchange rate regimes. Since nontraded goods production, $\hat{Y}_N$, is demand determined a fall in $\hat{C}_N$ leads to a decline in nontraded goods production. Table 1 illustrates that the downturn in nontraded goods production is mitigated by 1.95% under floating exchange rate regimes. The less pronounced deterioration in nontraded goods production is due to the real exchange rate depreciation, $\hat{E}$, under floats in the short-run (Table 1). A real depreciation is the result of a nominal depreciation, which helps to cushion the external shock. Under pegs, the nominal exchange rate is fixed and, therefore, not able to accommodate the external shock. The short-run stickiness of nontraded goods prices also circumvents the response of the real exchange rate under fixed exchange rate regimes. The rise in the nominal exchange rate increases the price of traded goods and makes nontraded goods consumption relatively cheaper under floats. Table 1 shows that the relative price change under floating exchange rates induces an alleviated fall in consumption, $\hat{C}$, by 0.72%. The increase in the price of traded goods makes traded goods production more attractive. Since households under floating exchange rates supply relatively more labour to nontraded goods production, the rise in traded goods production, $\hat{Y}_T$, is less pronounced under floating exchange rates (Table 1). As traded goods production increases and traded goods consumption declines, the economy generates a trade balance surplus under both regimes. The relative impact on the trade balance, $\hat{T}B$, is 0.52% higher under pegs than under floats (Table 1). A balanced current account in the long-run requires a trade balance deficit. The positive long-run traded goods consumption requires a real appreciation. The real appreciation is stronger under pegs than under floats (see Table 1). The relative price increase for nontraded goods results in a negative spillover. The increase in traded goods consumption generates a decline in consumption and production of nontradables, $\tilde{Y}_N$, which is more pronounced under fixed exchange rates.

The findings of Table 1 indicate that the relative short-run production response in the economy, $\hat{Y}$, is mitigated by 0.63% under floats. The depreciation of the real exchange rate raises the price of traded goods relative to nontraded goods more strongly under floating exchange rate regimes and, hence, implies a less pronounced decline in consumption under floats relative to the pegging exchange rate economy. The positive impact on the trade balance is more accentuated under fixed exchange rate regimes. The findings are in line with Mundell's (1961) prediction that a flexible exchange rate acts as a ´shock absorber´ in a small economy and insulates a floating exchange rate economy more strongly against external shocks.

Temporary World Output Shock The temporary decline in world output is reflected by a one unit decrease in $\hat{\gamma}$. Table 2 depicts the effects of this shock. The decline in world output goes along with a decline in demand of home traded goods. Consequently, production of traded goods declines. This has a negative wealth effect on the level of desired consumption of traded goods. The fall in tradeable goods consumption leads to a shift towards nontraded goods consumption and triggers a nominal and, hence, real exchange rate depreciation in the short-run under floats. Under pegs the nominal exchange rate is not able to cushion the external shock, so that the relative real exchange rate response is amplified by 100% under floating exchange rates. Since no relative price adjustment of traded goods occurs the overall production response, $\hat{Y}$, is 6.31% stronger under pegs relative to floating exchange rates (Table 2). The positive change towards nontraded goods consumption positively spills over into the nontraded goods production under both regimes. Since traded goods consumption declines more strongly than traded goods production the two exchange rate regimes experience a trade balance surplus. The trade balance effect is more pronounced under fixed exchange rate regimes (Table 2). The less pronounced trade balance surplus under floating exchange rates is due to the real exchange rate depreciation, which stimulates consumption and production in the nontraded goods sector. Thus, households supply relatively more labour to the nontraded goods sector and produce relatively less traded goods. In the long-run, the current account needs to be balanced. This requires an increase in tradeable consumption, $\tilde{C}_T$, and a decrease in tradeable production, $\tilde{Y}_T$, to allow for an decumulation of net foreign assets. Table 2 confirms this mechanism and illustrates that the effect is more pronounced under the fixed exchange rate regime. The positive long-run tradable consumption requires a real appreciation of the long-run real exchange rate, $\tilde{E}$, which is also more pronounced under fixed exchange rates. The change in traded goods consumption has a wealth effect on the level of desired consumption of nontraded goods. The rise in long-run consumption of traded goods results in the decline of production and consumption in nontraded goods under floats and pegs.

The preceding analysis has ascertained that the real exchange rate depreciates in the short-run under floats and partly absorbs the effect of the external shock. Thus, overall output is more strongly affected under pegs since the nominal exchange rate is not able to cushion the real shock. The fall in traded consumption goes along with a trade balance surplus, which is higher in the fixed exchange rate economy.

The analysis of the two shocks indicates that stronger real exchange rate depreciations under floats help to cushion the response of output and the trade balance under floating exchange rates. The theoretical results derived for consumption, output, the trade balance and the real exchange rate are highly stylised, as they give simplistic account of the sources and duration of price stickiness. The econometric approach is therefore broader and employs the theory in a less restrictive way when identifying the role of shocks (see for example Sims, 1980).

3 Econometric Approach: Panel VAR

In this section the econometric method used to test the hypothesis that floating exchange rates are superior in insulating an economy against external shocks will be explained. Given a dynamic relationship between world output, the world real interest rate, the real exchange rate, real home output as well as net exports, the paper proceeds with a dynamic estimation using a VAR. The VAR utilises not only the time dimension of the data but also accounts for deviations from equilibrium across countries.

Data Selection and Time series Properties

Following Frankel (1999), nine exchange rate regimes are defined, 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 *pure float* regime. For the econometric analysis intermediate regimes are considered as belonging to the floating category.

This paper follows the International Monetary Fund's (2000a) Annual Report on Exchange Arrangements and Exchange Rate Restrictions (AREAER) and Reinhart and Rogoff (2004) in classifying the exchange rate regimes of 38 low, lower and middle income economies (Table 3) for the sampling period 1973 to 1999. The AREAER report is based on the publicly stated commitment of the authorities in the countries in question, known as the de jure analysis. Reinhart and Rogoff (2004) utilise the de facto approach, which is based on observed behaviour of the nominal exchange rate. The two classifications form the basis of the empirical analysis. Figures 1 and 2 provide an overview of the de jure and de facto approaches in the country set. They indicate 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 and, by contrast, under the de jure specification such a clear trend towards floating exchange rates was not evident.

The econometric model considers a set of variables to recover the pattern of shocks in the 38 countries of interest. 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.[10] 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 home real output, the developing countries' GDP is utilised in constant units.[11] 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, adjusted by the nominal exchange rate (national currency per dollar).[12]

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.[13] The test by Levin et al. (2002) is utilised to test the null hypothesis of nonstationarity. Table 4 presents the test results. Overall, there is no evidence for the data's stationarity in levels. However, the data

[10] Inflation expectations are forecasts, calculated by a six-quarter autoregression (Bergin, 2003).

[11] 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.

[12] Short-term nominal interest rates are derived from the International Financial Statistics (International Monetary Fund, 2000b). 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).

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

appear to be stationary in first differences. 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 5 depicts the results and shows that a long-run relationship between the variables does not exist. Hence, the econometric model is estimated in first differences without imposing any cointegration relationship.

Given the time series properties of the data set, Table 6 presents the summary statistics of the data used in the empirical analysis. It becomes apparent that on average the real exchange rate appreciates or depreciates more strongly under floats than under pegs during the sample period under both, the de jure and de facto specification. 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. 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.[14]

The Econometric Model and Method

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^F. To be more precise, current and past values of the real exchange rate, real home output and net exports of a small open economy are assumed not to affect r and y^F, 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. The joint effects on home output, net exports and the real exchange rate complicate the identification of structural innovations in a model which 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.[15]

The exogeneity of world output and the world real interest rate enables the tracing of such shocks through the system. The econometric model takes the following reduced form:

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

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

$$\begin{aligned}\mathbf{Y}_{i,t} &= \mathbf{B}_{peg}(\mathbf{L})\mathbf{Y}_{i,t} * D_{fix_{i,t}} + \mathbf{B}_{float}(\mathbf{L})\mathbf{Y}_{i,t} * D_{float_{i,t}} + \mathbf{C}_{peg,\mathbf{0}}\mathbf{X}_{i,t} * D_{fix_{i,t}} + \\ & \mathbf{C}_{float,\mathbf{0}}\mathbf{X}_{i,t} * D_{float_{i,t}} + \mathbf{C}_{peg}(\mathbf{L})\mathbf{X}_{i,t} * D_{fix_{i,t}} + \mathbf{C}_{float}(\mathbf{L})\mathbf{X}_{i,t} * D_{float_{i,t}} + \mathbf{u}_{i,t}.\end{aligned} \tag{6}$$

$\mathbf{Y}_{i,t}$ is the 3 x 1 dependent and endogenous variable vector. $\mathbf{Y}_{i,t}=\left[\Delta \log y^H, \Delta \log RER, \Delta nx\right]'$ comprises real home output, the real exchange rate and net exports. $\mathbf{X}_{i,t}=\left[\Delta \log y^F, \Delta r\right]'$ 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. $\mathbf{B}(\mathbf{L})$ and $\mathbf{C}(\mathbf{L})$ are matrix polynomials in the lag operator.[16] To examine whether the responses of the exogenous shocks are different between regimes, the estimated model allows to interact $\mathbf{B}(\mathbf{L})$, $\mathbf{C}_0$ and $\mathbf{C}(\mathbf{L})$ 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 three periods.[17] Equation (6) allows the derivation of the impulse response functions for a given exogenous shock to the system.

To validate the estimation results the paper tests whether individual effects and second-order serial correlation for the disturbances of the estimated first differenced equations are present. Under second-order serial correlation both OLS and instrumental variable estimators of the first differenced model are not consistent anymore (Baltagi, 2001).[18] Arellano and Bond (1991) propose such a test statistic for the hypothesis that no second-order serial correlation is present. Holtz-Eakin (1988) derives a test for the presence of individual effects in dynamic models with panel data. Under the null hypothesis of no individual effects, the lagged dependent variables are orthogonal to the error component. Table 7 presents the results. There are no serial correlation of the error term and individual effects in the dynamic panel estimation. A lag length of order three is chosen. This is done by estimating the VAR model for each cross-section and by taking the average optimal lag length over the complete sample.

Empirical Results

The empirical model is estimated by generalised least squares (GLS). It is used to compute the dynamic response functions, which study the effects of changes in the exogenous variables on domestic real output of developing countries as well as their real exchange rate and net exports. The impulse response functions are accompanied by one standard deviation error bands.[19] Fig-

[16] $\mathbf{B}(\mathbf{L}) = B_1 L + ... + B_s L^s$ and $\mathbf{C}(\mathbf{L}) = C_1 L + ... + C_s L^s$.

[17] This issue was also raised by Broda (2003).

[18] The hypothesis is true if the errors in levels are not serially correlated. Note that the consistency of the instrumental estimator relies upon the fact that $E(\Delta\varepsilon_{i,t}\Delta\varepsilon_{i,t-2}) = 0$.

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

ures 3-14 provide the dynamic responses of the three variables of interest to world real interest rate and world output shocks. Solid lines mirror the level effects of the variables while dashed lines represent the standard error bands.[20]

World Real Interest Rate Figures 3 to 8 show the responses of the de jure sample to the one time one hundred basis point rise in the world real interest rate.[21] Figure 3 depicts the adjustment process of real output in the fixed exchange rate economies. The initial negative impact effect illustrates that the economy is pushed into recession. This negative impact effect of the external shock equates to 0.45 percentage points. After the first period, real GDP starts to improve. In the medium-run, i.e. the third period after the shock, the decline in output equals 0.15 percentage points. The real exchange rate response is outlined in Figure 4. Initially, the real exchange rate is almost unchanged and only moves towards a real depreciation of 0.51 percentage points in the first period after the shock. The adjustment process is completed in the fifth period after the shock. Figure 5 illustrates the time path of the adjustment of the trade balance. The impulse response function suggests that the adjustment process of the trade balance is also completed in the fifth period after the shock. After an initial deterioration net exports deteriorate further by 0.7 percentage points in the medium-run. Thus, countries with a nominal fixed exchange rate off-set the external shock to the trade balance by increasing their imports relative to their export demands in the medium-run. The results indicate that fixed exchange rate economies' real GDP and trade balance strongly react to changes in the world real interest rate, which might be explained by the slow depreciation of the real exchange rate under pegs.

The picture is different for flexible exchange rate regimes. The impulse responses are illustrated in Figures 6 to 8. The effect of a one time change of the world real interest rate on real output under floating exchange rates is relatively less pronounced (Figure 6). Even though the economy moves into recession, real GDP declines by only 0.23 percentage points. The initial real GDP response under floats is reduced by almost 95% relative to the pegging exchange rate economy. The difference might be explained by the real exchange rate response. The real exchange rate in a floating exchange rate regime behaves markedly in contrast to the pegging exchange rate regimes. Figure 7 shows that it depreciates strongly in the short-run, i.e. the first period of the shock. Figure 8 illustrates the behaviour of the trade balance to the shock of the world real interest rate. The trade balance instantaneously improves by 0.22 percentage points. In the following periods the trade balance improves further and remains in surplus. The adjustment process is completed after five periods.

[20] The level of the variables is obtained by utilising the accumulated coefficients of the VAR.

[21] The de jure sample size corresponds to 669 observations.

Statistical differences between the estimated coefficients of the two regimes also play an important role in the analysis. Wald tests report the joint significance of the difference between the floating and pegged coefficients of the VAR. A statistical difference of the floating and pegged coefficients is found for all three variables.[22] The Wald test statistic for the difference between the coefficients of the real exchange rate equation equals 49.61, and is significant at the one percent level. Wald tests for the difference between coefficients of the real GDP and trade balance equation equal 27.47 and 28.21 respectively. They imply statistical significance at the five percent level. Comparing only the estimated world real interest rate coefficients, statistical differences are established by a Wald test for the real exchange rate equation.[23] The Wald test returns a value of 10.43, which implies statistical significance at the 5 percent level. Thus, 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.[24] 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. The real depreciation under floats promotes exports under floats relative to the fixed exchange rate case.

World Output Shock In the following the results of the previous section are compared with a one time one percent decrease in world output. The contraction in world output has a recessionary impact under both fixed and floating regimes. Initially, real GDP declines as shown in Figures 9 and 12. Under fixed regimes real GDP deteriorates by 0.71 percentage points. This is in contrast to a reduction in growth by only 0.3 percentage points under floats. Thus, floating regimes are superior in absorbing the initial external shock. In the following periods output growth recovers under both regimes. However, the adjustment process has a more favourable impact under floating exchange rates. The statistical comparison between the estimated coefficients of the real GDP equation is established by a Wald test, equal to a statistic of 47.13, which is statistically significant at the 1 percent level. The mitigated impact effect of real GDP under floats might again be explained by the adjustment of the real exchange rate. The real exchange rate movements under pegs and floating regimes are compared in Figures 10 and 13. The contraction in world output results in a real depreciation under pegs and floats. The impact multipliers equal 0.1 and 0.39 respectively. Their implication is that the initial real exchange rate response under fixed exchange rates is reduced by 74% relative to the response under floating exchange rates. This might explain the mitigated deterioration of real GDP under floats. A Wald test, equal to a statistic of 54.29, shows that the difference between the coefficients

[22] In the following the Wald test utilises a chi-square distribution, χ^2_{13}, with 13 restrictions.

[23] The Wald test utilises a chi-square distribution, χ^2_4, with 4 restrictions.

[24] It is worth to note that also Calvo et al. (1993) find that periods of high world real interest rates are associated with real depreciations in countries of Latin America.

of the real exchange rate equation is statistically significant at the 1 percent level. The initial impact of the world output shock on the trade balance is negative under pegging regimes and equals -0.08 percentage points (Figure 11). In the following periods the trade balance improves. The net exports are initially positive under floats (Figure 14). The impact multiplier mirrors a trade balance surplus of 0.17 percentage points. As for real GDP and the real exchange rate, the difference between the trade balance coefficients is statistically significant since the Wald test statistic equals 37.85. Comparing only the estimated world output coefficients, a Wald tests returns values of 19.69, 7.96 and 18.75 for the real exchange rate, trade balance and real GDP equation respectively. Thus, the null hypothesis that the difference in the world output coefficients across regimes is equal to zero can statistically be rejected.

In summary, as a reaction to an external world output shock fixed and floating exchange rate regimes experience a contraction in domestic output and a depreciation of the real exchange rate. Net exports are more strongly affected by the external shock under pegs relative to floating exchange rate regimes. The real exchange rate seems to be the key variable in the adjustment process. It enables floating exchange rate economies to cushion the external shock to a great extent.

This provides evidence for Mundell's formalisation that the nominal exchange rate acts as a shock absorber. Overall, the analysed impulse responses (Figures 3-14) indicate that the differences across regimes are clearly apparent in the initial periods of the shock while in the long-run the exchange rate regimes do not differ substantially.

Sensitivity Analyses

To assess the robustness of the findings above the de jure specification is compared with the de facto approach. Additionally, to overcome the problem of attributing responses to different exchange rate regimes, which actually might be associated with other characteristics, a number of sample splits are conducted. Firstly, less financially open countries are excluded from the de jure analysis of the word real interest rate shock. Secondly, trade open countries constitute the focal point of attention when analysing a world output shock under the de jure specification.

De Facto Specification The analysis above is replicated for the de facto specification. As discussed above and shown in Figures 1 and 2, the actual and publicly stated exchange rate behaviour does not necessarily coincide. Hence, the previous findings of the evolution of real output the real exchange rate and net exports are revised in Table 8. Given a shock to the world real interest rate, both exchange rate regimes initially move into recession as real GDP declines. However, in contrast to the de jure specification, a Wald test cannot reject the null hypothesis that no differences between the coefficients exist. The real exchange rate initially depreciates under floats while only a minor impact is observed under pegs. As for the de jure specification, an instantaneous trade balance deficit is found for pegs while an initial trade balance surplus occurs under floating exchange rates.

A one percent decline in world output leads to a recession under both exchange rate regimes. The recessionary impact is more pronounced under pegs than under floats (see Table 8). This is in line with the findings for the de jure approach. While the real exchange rate immediately depreciates under floats a real depreciation occurs only in the subsequent periods of the shock under pegs. Similar to the de jure analysis, an immediate trade balance surplus can only be observed under floating exchange rates.

Overall, the de facto specification qualitatively confirms the previous findings of the analysis. The real exchange rate is the key variable which prevents the floating exchange rate economy from being hit too strongly by the external shocks. However, differences in the exchange rate regimes are less pronounced when concentrating on a shock to the world real interest rate. This is especially true for the response of real GDP.

Financial Openness Financially more open countries might be affected more strongly by a shock to the world real interest rate. However, those countries might be able to utilise their international asset position to smooth consumption and hedge against the effect of the exogenous disturbance. The first part of Table 9 illustrates the findings.[25] The initial impact on the real GDP growth rate is negative under pegs and floats. The two regimes initially move into recession. Table 9 illustrates that the negative effect is more accentuated under the fixed exchange rate regime. While the economy under the pegging exchange rate regime experiences a strong decline in real GDP, the economy under floating exchange rates recovers in the medium-run and reaches a positive output level of 0.05 percentage points. This is in contrast to the findings of the complete sample, where the level of real GDP is negatively affected for both fixed and flexible exchange rate economies. The real exchange rate initially depreciates under flexible and fixed exchange rates. The adjustment process under a floating regime stands in contrast to the case of pegs. Comparing the estimated impact multipliers, the initial real exchange rate response under floats is 94% stronger relative to the response under fixed exchange rates. The strong real depreciation under floating exchange rate regimes might alleviate the negative effect on domestic output. The trade balance moves into surplus by 0.18 percentage points as an instantaneous response to the world real interest rate shock under floats. This is in contrast to fixed exchange rate regimes. Net exports deteriorate by 0.53 percentage points under pegs. The overall adjustment process of the real exchange rate and net exports under floats and pegs is similar to the one found for

[25] The selected countries are obtained from Lane and Milesi-Ferretti (2001). Countries with an Asset plus Liability to GDP ratio of less than 50 percent over the period 1973 to 1998 are excluded. Those countries are Argentina, Brazil, Guatemala, Paraguay, India, South Africa, South Korea and Turkey.

the total sample above.

Trade Openness Economies with a higher trade openness can possibly be strongly affected by a decline in world output but may also be able to adjust more quickly to an external shock.[26] The results of the adjustment process of more open economies are presented in the second part of Table 9. The initial impact on real GDP is negative. Again, the negative effect is more pronounced under fixed exchange rate regimes. The recessionary impact is reversed in the third period of the shock under floats. A comparison with the overall sample suggests that trade openness leads to an improved adjustment process under floating exchange rates. The real exchange rates' behaviour is delineated in the bottom part of Table 9. Given a negative shock to world output, fixed and floating exchange rate economies experience an initial real depreciation. As for the overall sample, the initial depreciation of the real exchange rate is stronger under floating exchange rate regimes. In the following periods the real exchange rate continuous to depreciate under both floats and pegs. The initial response of the trade balance to a decline in world output is positive in floating exchange rate economies. Table 9 illustrates that net exports improve under floats and pegs in the third period after the shock. The finding for pegs stands in contrast to the findings of the complete sample. This suggests that trade openness yields an improved adjustment of net exports in more trade open fixed exchange rate economies.

In summary, the qualitative findings for the overall de jure sample are not altered. The relative responses of real GDP, the trade balance and the real exchange rate across exchange rate regime classifications and sub samples, such as financial and trade openness, support the stability of the findings of the main de jure specification.

4 Conclusion

The relative merits of fixed and flexible exchange rates are of relevance to many international economists and policy makers, but no consensus regarding one system's superiority has been reached. In order to meaningfully add to the debate, this paper examines the theoretical hypothesis that nominal exchange rates act as a shock absorber under floating exchange rate regimes. They mitigate the effects of external shocks and provide a smoother adjustment process in floating exchange rate economies, which helps economies to achieve a steadier adjustment of macroeconomic variables.

[26] Openness is measured by the sum of predicted bilateral trade shares from the geographical determinants in the gravity theory and countries are obtained from Frankel and Romer (1999). The experiment consists of the following countries, whose trade shares are equal to or greater than 20 percent: Botswana, Costa Rica, Dominican Republic, Ecuador, Egypt, Guatemala, Israel, Jamaica, Jordan, Saudi Arabia, South Korea, Malaysia, Mauritius, Morocco, Philippines, Singapore, Sri Lanka, Thailand, Tunisia, Turkey and Uruguay.

Formally, a simple dynamic small open economy model of traded and nontraded goods gives support of the assertion that countries which adopt a floating exchange rate regime insulate themselves better against external shocks in form of changes in the world real interest rate and world output. In the short-run, the floating exchange rate economy experiences a less pronounced impact on output. This is due to the real exchange rate depreciation which adjusts the relative prices and helps to mitigate the effect of the shock. The relative price changes affect the trade balance by shifting consumption and production between traded and nontraded goods. Overall, the impact on the trade balance is more accentuated under fixed exchange rate regimes.

In the empirical part of the paper, the theoretical findings are assessed utilising a Panel VAR approach. The empirical results provide support for the predictions of the literature on exchange rate regimes by confirming Friedman (1953) and Mundell's (1961) formalisation that external shocks affect floating exchange rate regimes in a less contractionary way. Given shocks to the world real interest rate or world output, the paper confirms for the de jure sample that systematic differences across exchange rate regimes exist. More precisely, the adjustment process of real GDP is less pronounced under floats, which is due to real exchange rate movements in form of a real depreciation under floating exchange rates. The overall response of net exports is more pronounced under pegs. These findings are also confirmed by considering only financially or trade open countries. The de facto specification confirms the results for the evolution of real output and the trade balance. Overall, the contrasts between the two exchange rate regimes are less pronounced under this specification.

In conclusion, this paper adds to the controversy regarding the question whether to adopt a fixed or flexible exchange rate regime by providing evidence for the benefits of floating exchange rates. Concentrating on negative external shocks, floating exchange rate regimes are able to utilise the exchange rate as a ´shock absorber´, which helps to stabilise macroeconomic variables in flexible exchange rate economies.

Appendix

The steady state solution provides the reference values (denoted by overbars) around which the model is linearised in order to capture its dynamics. Given the consumption smoothing it follows that $\bar{Y}_T = C_{T,t} = \bar{C}_T$. The relative price of nontraded and traded goods equals $P_N/P_T = \frac{\theta}{\theta-1}\left(\frac{\gamma}{1-\gamma}\right)^{\alpha-1}$ in the steady state. Market clearing for nontradables under symmetric household production implies $C_{N,t} = Y_{N,t}(z)$ for all (z). The nontradable steady state production is determined by the labour supply in the nontraded good sector, which can be obtained from equation (5) and the labour supply constraint, $L = L_T + L_N$:

$$\bar{Y}_N = \left(\frac{\alpha\left(\frac{\theta-1}{\theta}\right)^{\frac{(1-\gamma)\sigma+\gamma}{\sigma}} \gamma^{\frac{\gamma\alpha(\sigma-1)}{\sigma}} (1-\gamma)^{\frac{\sigma-\gamma\alpha(\sigma-1)}{\sigma}}}{\left(\frac{\theta\gamma+(1-\gamma)(\theta-1)}{(\theta-1)(1-\gamma)}\right)^{\nu-1} \kappa} \right)^{\frac{\sigma\alpha}{\sigma(\nu-\alpha)+\alpha}}.$$

It is assumed that domestic households initially hold a zero stock of net foreign assets, $F_0 = 0$. In the long-run, the current account is balanced, in the short-run, however, the home country's current account can move in either way (surplus or deficit). The current account equality, or in other words the consolidated budget constraint, can be expressed by the following equation:

$$F_t - F_{t-1} = rF_{t-1} + TB_t, \text{ where } TB_t = Y_{T,t} - C_{T,t}.$$

To determine the path of the current account the evolution of foreign assets as well as the tradeable consumption are of importance. Since initial foreign asset holdings are zero, $F_0 = F_{t-1} = 0$, the short-run current account identity can be stated as $F_{short-run} = Y_{T,\ short-run} - C_{T,\ short-run}$. However, in the long-run the current account must be balanced and, hence, $F_t = F_{t-1} = F_{long-run}$. Thus, from the current account equation the following long-run relationship is generated: $-rF_{long-run} = Y_{T,\ long-run} - C_{T,\ long-run}$. The implication is that real consumption spending in the traded goods sector needs to equal the interest payments on net foreign assets plus production in the traded goods sector. Putting it differently, any debt repayment can only be generated out of a trade surplus, which is an excess of the traded goods production, Y_T, over traded goods expenditure, C_T.

Log-linearising the system of equations: Utilising the first order conditions of the representative household and accounting for the current account in the short and long-run, it is possible to summarise the illustrative model of section 2 by the set of equations below. Note that short-run deviations of the variables from the steady state are denoted by hats. Hence, for any variable X, $d\ln X = dX_t/\bar{X}_0 = \hat{X}$ holds. By contrast, any long-run deviations from the benchmark value $\bar{X}_0$ are denoted by $d\bar{X}/\bar{X}_0 = \tilde{X}$. If X_0 equals zero the variables are normalised by $C_{T,0}$. Then the endogenous variables $\hat{E}_{Float}$, $\tilde{E}$, $\hat{C}_N = \hat{Y}_N$, $\tilde{C}_N = \tilde{Y}_N$,$\hat{C}_T$,$\tilde{C}_T$,$\hat{Y}_T$,$\tilde{Y}_T$, $\hat{M}_{Fix}$

and $\tilde{M}_{Fix}$ can be explained by the following set of equations:

Equation	Float	Fixed
(A.1) $E = \left(\frac{S}{P_N}\right)^{1-\gamma} \xi$	$\hat{E} = (1-\gamma)\hat{S}$ $\tilde{E} = (1-\gamma)(\tilde{S} - \tilde{P}_N)$	$\hat{E} = 0$ $\tilde{E} = -(1-\gamma)\tilde{P}_N$
(A.2) $F_t = (1+r)F_{t-1} + TB_t$	$\frac{\tilde{Y}_T - \tilde{C}_T}{r} = -\left(\hat{Y}_T - \hat{C}_T\right)$	$\frac{\tilde{Y}_T - \tilde{C}_T}{r} = -\left(\hat{Y}_T - \hat{C}_T\right)$
(A.3) $\frac{C_{T,t+1}}{C_{T,t}} = \left(\frac{\frac{P_{T,t+1}}{P_{t+1}}}{\frac{P_{T,t}}{P_t}}\right)^{\sigma-1}$	$\tilde{C}_T - \hat{C}_T = (1-\sigma)(\hat{E} - \tilde{E})$	$\tilde{C}_T - \hat{C}_T = (\sigma-1)\tilde{E}$
(A.4) $\frac{C_{N,t}}{C_{T,t}} = \frac{(1-\gamma)}{\gamma}\left(\frac{P_{N,t}}{P_{T,t}}\right)^{-1}$	$\hat{C}_N - \hat{C}_T = \frac{\hat{E}}{(1-\gamma)}$ $\tilde{C}_N - \tilde{C}_T = \frac{\tilde{E}}{(1-\gamma)}$	$\hat{C}_N = \hat{C}_T$ $\tilde{C}_N - \tilde{C}_T = \frac{\tilde{E}}{(1-\gamma)}$
(A.5) $\bar{Y}_N = \left(\frac{\left(\frac{\theta-1}{\theta}\right)^{\frac{(1-\gamma)\sigma+\gamma}{\sigma}}(1-\gamma)^{\frac{\sigma-\gamma\alpha(\sigma-1)}{\sigma}}}{\alpha^{-1}\left(\frac{\theta\gamma+(1-\gamma)(\theta-1)}{(\theta-1)(1-\gamma)}\right)^{\nu-1}\kappa\gamma^{\frac{-\gamma\alpha(\sigma-1)}{\sigma}}}\right)^{\frac{\sigma\alpha}{\sigma(\nu-\alpha)+\alpha}}$	$\tilde{C}_N = \frac{((1-\gamma)\sigma+\gamma)\alpha}{(1-\gamma)(\sigma(\nu-\alpha)+\alpha)}\tilde{E}$	$\tilde{C}_N = \frac{((1-\gamma)\sigma+\gamma)\alpha}{(1-\gamma)(\sigma(\nu-\alpha)+\alpha)}\tilde{E}$
(A.6) $\frac{M_t}{P_t} = \mu C_t^{\frac{1}{\sigma}}\left(1 - \frac{1}{(1+r)}\frac{P_{T,t}}{P_{T,t+1}}\right)^{-1}$	$\frac{(\sigma-1)}{\sigma r}\tilde{E} = \frac{\tilde{Y}_T}{\sigma r} + \frac{\hat{Y}_T}{\sigma} + \left(\frac{\gamma\sigma r+(1-\gamma)r+\sigma}{(1-\gamma)\sigma r}\right)\hat{E}$	$\hat{M} = \frac{\hat{C}_T}{\sigma}$ $\tilde{M} = \frac{\tilde{C}_T}{\sigma} + \frac{(1-\sigma)}{\sigma}\tilde{E}$
(A.7) $L_t^i = \left(\frac{\frac{W_t}{P_t}C^{-\frac{1}{\sigma}}}{\kappa}\right)^{\frac{1}{\nu-1}}$	$\frac{(\sigma-1)}{(1-\gamma)\sigma}\hat{E} + \frac{(\alpha-\nu)}{\alpha}\hat{Y}_T = \frac{\nu-1}{\alpha}\hat{C}_N + \frac{\hat{C}_T}{\sigma}$ $\frac{(\sigma-1)}{(1-\gamma)\sigma}\tilde{E} + \frac{(\alpha-\nu)}{\alpha}\tilde{Y}_T = \frac{\nu-1}{\alpha}\tilde{C}_N + \frac{\tilde{C}_T}{\sigma}$	$\frac{(\alpha-\nu)}{\alpha}\hat{Y}_T = \frac{\nu-1}{\alpha}\hat{C}_N + \frac{\hat{C}_T}{\sigma}$ $\frac{(\sigma-1)}{(1-\gamma)\sigma}\tilde{E} + \frac{(\alpha-\nu)}{\alpha}\tilde{Y}_T = \frac{\nu-1}{\alpha}\tilde{C}_N + \frac{\tilde{C}_T}{\sigma}$

Solution and exogenous shocks: A solution to the system of equations is found by solving the following linear equation: $\mathbf{m} = \mathbf{A} * \mathbf{x}$. The vector $\mathbf{x}$ contains the set of n endogenous variables and takes the form $\left[\tilde{C}_T, \hat{C}_T, \tilde{C}_N, \hat{C}_N, \tilde{E}, \hat{E}, \hat{Y}_T, \tilde{Y}_T\right]'$ under floats, while it contains $\left[\tilde{C}_T, \hat{C}_T, \tilde{C}_N, \hat{C}_N, \tilde{E}, \tilde{M}, \hat{M}, \hat{Y}_T, \tilde{Y}_T\right]'$ under pegs. The n x n matrix $\mathbf{A}$ includes all model parameters γ, σ, ν, α and r. The n x 1 vector $\mathbf{m}$ captures the exogenous variables of the system. The exogenous variables reflect the shock to the system. The established system of equations (A.1)-(A.7) can be used to demonstrate the economy's adjustment to temporary changes in world demand, $\hat{\gamma} < 0$, which reflect a world output (demand) shock in the short-run. Thus, equation (A.3) becomes $\tilde{C}_T - \hat{C}_T + \hat{\gamma} = (1-\sigma)(\hat{E} - \tilde{E})$ under floats and $\tilde{C}_T - \hat{C}_T + \hat{\gamma} = -(1-\sigma)\tilde{E}$ under pegs. Similarly, equation (A.4) equals $\hat{C}_N - \hat{C}_T = \frac{\hat{E}}{(1-\gamma)} - \frac{\hat{\gamma}}{(1-\gamma)}$ and $\hat{C}_N - \hat{C}_T = -\frac{\hat{\gamma}}{(1-\gamma)}$ respectively. Equation (A.6) has to be modified as follows: $\frac{(\sigma-1)}{\sigma r}\tilde{E} = \frac{\tilde{Y}_T}{\sigma r} + \frac{\hat{Y}_T}{\sigma} + \left(\frac{\gamma\sigma r+(1-\gamma)r+\sigma}{(1-\gamma)\sigma r}\right)\hat{E} - \frac{\hat{\gamma}}{\sigma}$ and $\hat{M} = \frac{\hat{C}_T}{\sigma} - \frac{\hat{\gamma}}{\sigma}$. Equation (A.7) takes the following form under the two exchange rate regimes: $\frac{(\sigma-1)}{(1-\gamma)\sigma}\tilde{E} + \frac{(\alpha-\nu)}{\alpha}\tilde{Y}_T = \frac{\nu-1}{\alpha}\tilde{C}_N + \frac{\tilde{C}_T}{\sigma} - \frac{\hat{\gamma}}{\sigma}$ and $\frac{(\alpha-\nu)}{\alpha}\tilde{Y}_T = \frac{\nu-1}{\alpha}\tilde{C}_N + \frac{\tilde{C}_T}{\sigma} - \frac{\hat{\gamma}}{\sigma}$.

The system can also demonstrate effects of temporary deviations in the world interest rate, expressed by $\hat{r}$. It is assumed that outside the steady state the world real interest rate, $(1+r)$, is augmented by $\hat{r}$ in the short-run. Note that the condition $\beta(1+r)=1$ is still valid. Equation (A.3) becomes $\tilde{C}_T - \hat{C}_T = (1-\sigma)(\hat{E}-\tilde{E}) + \sigma\hat{r}$ under floats and $\tilde{C}_T - \hat{C}_T = -(1-\sigma)\tilde{E} + \sigma\hat{r}$ under pegs. Equation (A.6) equals $\frac{(\sigma-1)}{\sigma r}\tilde{E} = \frac{\tilde{Y}_T}{\sigma r} + \frac{\hat{Y}_T}{\sigma} + \left(\frac{\gamma\sigma r+(1-\gamma)r+\sigma}{(1-\gamma)\sigma r}\right)\hat{E} - \frac{\hat{r}}{1+r}$ and $\hat{M} = \frac{\hat{C}_T}{\sigma} - \frac{\hat{r}}{1+r}$. The two shocks can be summarised by the table below. The table demonstrates the endogenous variables as functions of Υ and Ψ. Υ and Ψ contain the model's parameter γ, σ, ν, α and r. The Υ_i and Ψ_j, where i =1,...18 and j =1,...,16 are all greater than zero, > 0:

World Real Interest Rate Shock					
Float			Fixed		
$\hat{E} = \Psi_1\hat{r}$	$\Rightarrow$	$\hat{E}\uparrow$	$\hat{E} = 0$		
$\tilde{E} = -\Psi_2\hat{r}$	$\Rightarrow$	$\tilde{E}\downarrow$	$\tilde{E} = -\Upsilon_1\hat{r}$	$\Rightarrow$	$\tilde{E}\downarrow$
$\hat{C}_T = -\Psi_3\hat{r}$	$\Rightarrow$	$\hat{C}_T\downarrow$	$\hat{C}_T = -\Upsilon_2\hat{r}$	$\Rightarrow$	$\hat{C}_T\downarrow$
$\tilde{C}_T = \Psi_4\hat{r}$	$\Rightarrow$	$\tilde{C}_T\uparrow$	$\tilde{C}_T = \Upsilon_3\hat{r}$	$\Rightarrow$	$\tilde{C}_T\uparrow$
$\hat{C}_N = \hat{Y}_N = -\Psi_5\hat{r}$	$\Rightarrow$	$\hat{C}_N = \hat{Y}_N\downarrow$	$\hat{C}_N = \hat{Y}_N = -\Upsilon_4\hat{r}$	$\Rightarrow$	$\hat{C}_N = \hat{Y}_N\downarrow$
$\tilde{C}_N = \tilde{Y}_N = -\Psi_6\hat{r}$	$\Rightarrow$	$\tilde{C}_N = \tilde{Y}_N\downarrow$	$\tilde{C}_N = \tilde{Y}_N = -\Upsilon_5\hat{r}$	$\Rightarrow$	$\tilde{C}_N = \tilde{Y}_N\downarrow$
$\hat{Y}_T = \Psi_7\hat{r}$	$\Rightarrow$	$\hat{Y}_T\uparrow$	$\hat{Y}_T = \Upsilon_6\hat{r}$	$\Rightarrow$	$\hat{Y}_T\uparrow$
$\tilde{Y}_T = \Psi_8\hat{r}$	$\Rightarrow$	$\tilde{Y}_T\uparrow$	$\tilde{Y}_T = \Upsilon_7\hat{r}$	$\Rightarrow$	$\tilde{Y}_T\uparrow$
			$\hat{M} = -\Upsilon_8\hat{r}$	$\Rightarrow$	$\hat{M}\downarrow$
			$\tilde{M} = \Upsilon_9\hat{r}$	$\Rightarrow$	$\tilde{M}\uparrow$
$\hat{C} = \gamma\hat{C}_N + (1-\gamma)\hat{C}_T$	$\Rightarrow$	$\hat{C}\downarrow$	$\hat{C} = \gamma\hat{C}_N + (1-\gamma)\hat{C}_T$	$\Rightarrow$	$\hat{C}\downarrow$
$\tilde{C} = \gamma\tilde{C}_N + (1-\gamma)\tilde{C}_T$	$\Rightarrow$	$\tilde{C}\uparrow$	$\tilde{C} = \gamma\tilde{C}_N + (1-\gamma)\tilde{C}_T$	$\Rightarrow$	$\tilde{C}\uparrow$
$\hat{Y} = \gamma\hat{Y}_N + (1-\gamma)\hat{Y}_T$	$\Rightarrow$	$\hat{Y}\uparrow$	$\hat{Y} = \gamma\hat{Y}_N + (1-\gamma)\hat{Y}_T$	$\Rightarrow$	$\hat{Y}\uparrow$
$\tilde{Y} = \gamma\tilde{Y}_N + (1-\gamma)\tilde{Y}_T$	$\Rightarrow$	$\tilde{Y}\downarrow$	$\tilde{Y} = \gamma\tilde{Y}_N + (1-\gamma)\tilde{Y}_T$	$\Rightarrow$	$\tilde{Y}\downarrow$
$\hat{TB} = \hat{Y}_T - \hat{C}_T$	$\Rightarrow$	$\hat{TB}\uparrow$	$\hat{TB} = \hat{Y}_T - \hat{C}_T$	$\Rightarrow$	$\hat{TB}\uparrow$
$\tilde{TB} = \tilde{Y}_T - \tilde{C}_T$	$\Rightarrow$	$\tilde{TB}\downarrow$	$\tilde{TB} = \tilde{Y}_T - \tilde{C}_T$	$\Rightarrow$	$\tilde{TB}\downarrow$
World Output Shock					
Float			Fixed		
$\hat{E} = -\Psi_9\hat{\gamma}$	$\Rightarrow$	$\hat{E}\uparrow$	$\hat{E} = 0$		
$\tilde{E} = \Psi_{10}\hat{\gamma}$	$\Rightarrow$	$\tilde{E}\downarrow$	$\tilde{E} = \Upsilon_{10}\hat{\gamma}$	$\Rightarrow$	$\tilde{E}\downarrow$
$\hat{C}_T = \Psi_{11}\hat{\gamma}$	$\Rightarrow$	$\hat{C}_T\downarrow$	$\hat{C}_T = \Upsilon_{11}\hat{\gamma}$	$\Rightarrow$	$\hat{C}_T\downarrow$
$\tilde{C}_T = -\Psi_{12}\hat{\gamma}$	$\Rightarrow$	$\tilde{C}_T\uparrow$	$\tilde{C}_T = -\Upsilon_{12}\hat{\gamma}$	$\Rightarrow$	$\tilde{C}_T\uparrow$
$\hat{C}_N = \hat{Y}_N = -\Psi_{13}\hat{\gamma}$	$\Rightarrow$	$\hat{C}_N = \hat{Y}_N\uparrow$	$\hat{C}_N = \hat{Y}_N = -\Upsilon_{13}\hat{\gamma}$	$\Rightarrow$	$\hat{C}_N = \hat{Y}_N\uparrow$
$\tilde{C}_N = \tilde{Y}_N = \Psi_{14}\hat{\gamma}$	$\Rightarrow$	$\tilde{C}_N = \tilde{Y}_N\downarrow$	$\tilde{C}_N = \tilde{Y}_N = \Upsilon_{14}\hat{\gamma}$	$\Rightarrow$	$\tilde{C}_N = \tilde{Y}_N\downarrow$
$\hat{Y}_T = \Psi_{15}\hat{\gamma}$	$\Rightarrow$	$\hat{Y}_T\downarrow$	$\hat{Y}_T = \Upsilon_{15}\hat{\gamma}$	$\Rightarrow$	$\hat{Y}_T\downarrow$
$\tilde{Y}_T = -\Psi_{16}\hat{\gamma}$	$\Rightarrow$	$\tilde{Y}_T\uparrow$	$\tilde{Y}_T = -\Upsilon_{16}\hat{\gamma}$	$\Rightarrow$	$\tilde{Y}_T\uparrow$
			$\hat{M} = -\Upsilon_{17}\hat{\gamma}$	$\Rightarrow$	$\hat{M}\uparrow$
			$\tilde{M} = -\Upsilon_{18}\hat{\gamma}$	$\Rightarrow$	$\tilde{M}\uparrow$
$\hat{C} = \gamma\hat{C}_N + (1-\gamma)\hat{C}_T$	$\Rightarrow$	$\hat{C}\uparrow$	$\hat{C} = \gamma\hat{C}_N + (1-\gamma)\hat{C}_T$	$\Rightarrow$	$\hat{C}\uparrow$
$\tilde{C} = \gamma\tilde{C}_N + (1-\gamma)\tilde{C}_T$	$\Rightarrow$	$\tilde{C}\uparrow$	$\tilde{C} = \gamma\tilde{C}_N + (1-\gamma)\tilde{C}_T$	$\Rightarrow$	$\tilde{C}\uparrow$
$\hat{Y} = \gamma\hat{Y}_N + (1-\gamma)\hat{Y}_T$	$\Rightarrow$	$\hat{Y}\uparrow$	$\hat{Y} = \gamma\hat{Y}_N + (1-\gamma)\hat{Y}_T$	$\Rightarrow$	$\hat{Y}\uparrow$
$\tilde{Y} = \gamma\tilde{Y}_N + (1-\gamma)\tilde{Y}_T$	$\Rightarrow$	$\tilde{Y}\downarrow$	$\tilde{Y} = \gamma\tilde{Y}_N + (1-\gamma)\tilde{Y}_T$	$\Rightarrow$	$\tilde{Y}\downarrow$
$\hat{TB} = \hat{Y}_T - \hat{C}_T$	$\Rightarrow$	$\hat{TB}\uparrow$	$\hat{TB} = \hat{Y}_T - \hat{C}_T$	$\Rightarrow$	$\hat{TB}\uparrow$
$\tilde{TB} = \tilde{Y}_T - \tilde{C}_T$	$\Rightarrow$	$\tilde{TB}\downarrow$	$\tilde{TB} = \tilde{Y}_T - \tilde{C}_T$	$\Rightarrow$	$\tilde{TB}\downarrow$

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Development of the Exchange Rate Regimes

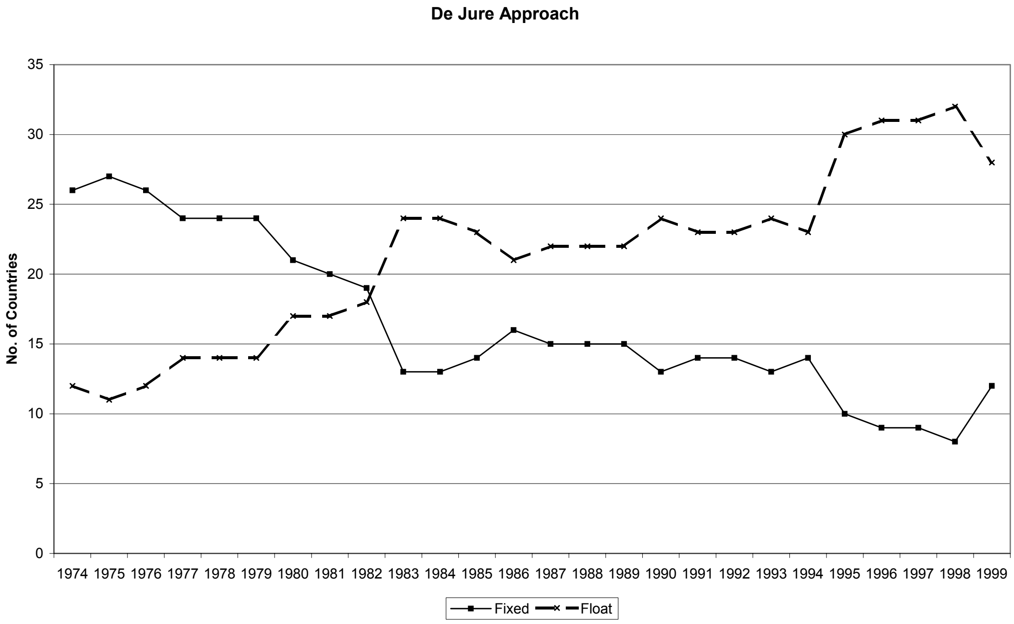

Figure 1: De Jure Regime.

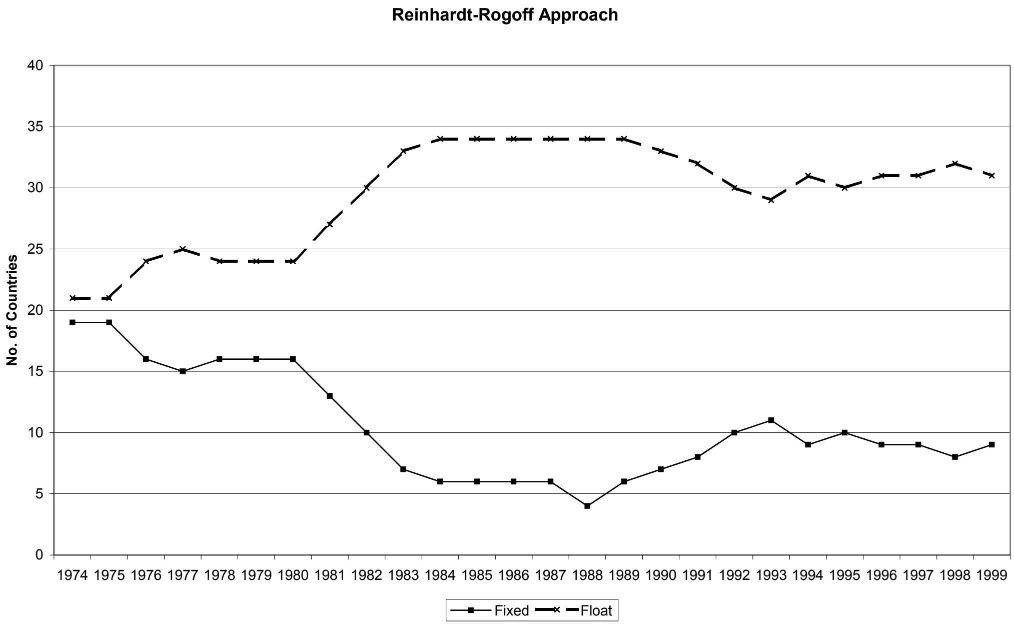

Figure 2: De Facto Regime.

Response to a 100 Basis Point increase in the World Real Interest Rate (De Jure)

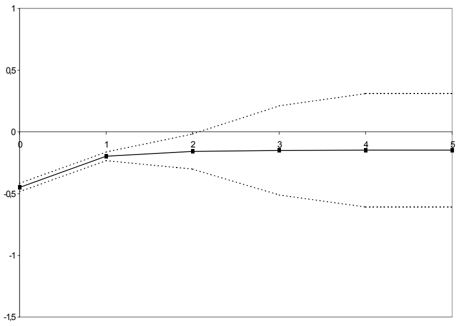

Figure 3: Real GDP (Fixed).

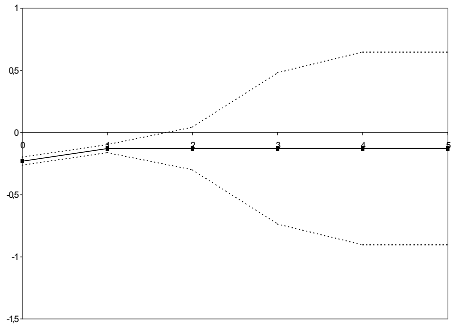

Figure 6: Real GDP (Float).

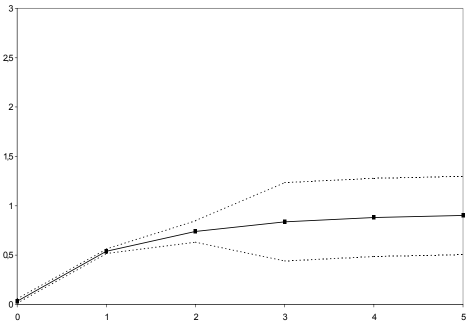

Figure 4: Real Exchange Rate (Fixed).

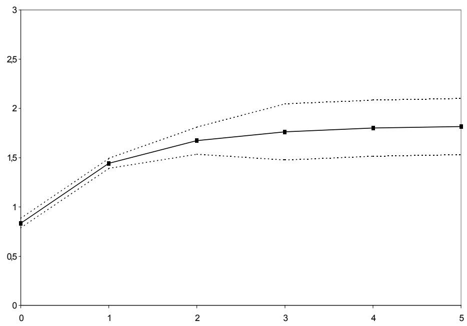

Figure 7: Real Exchange Rate (Float).

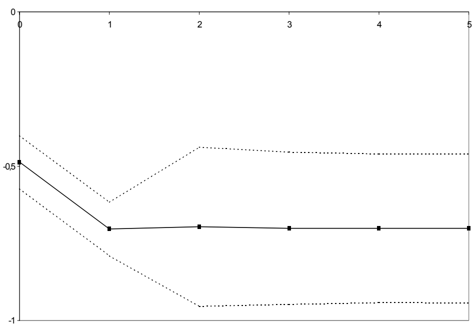

Figure 5: Trade Balance (Fixed).

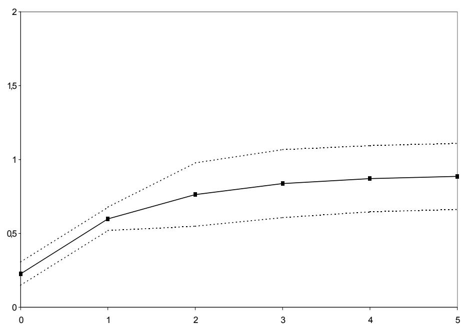

Figure 8: Trade Balance (Float).

Response to a 1 Percent decrease in the World Output (De Jure)

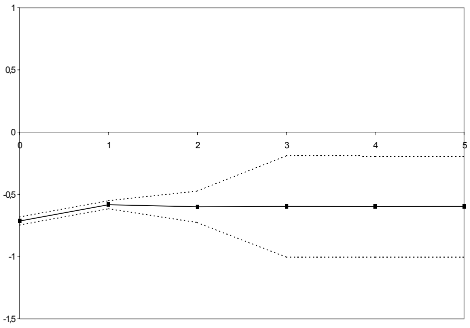

Figure 9: Real GDP (Fixed).

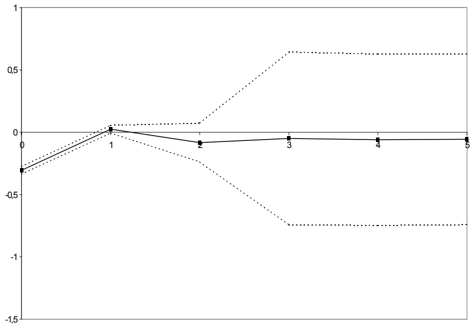

Figure 12: Real GDP (Float).

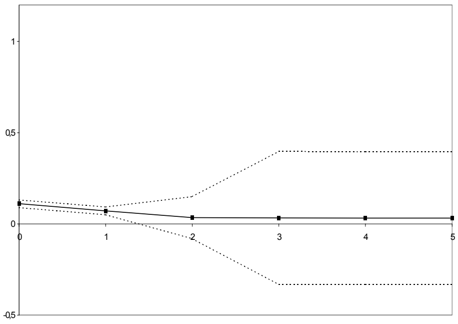

Figure 10: Real Exchange Rate (Fixed).

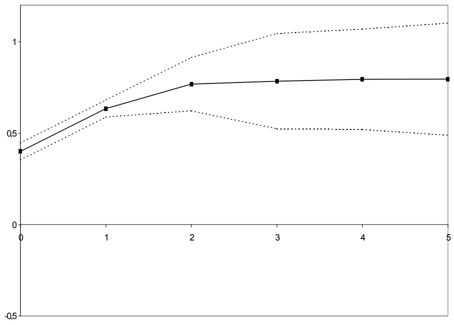

Figure 13: Real Exchange Rate (Float).

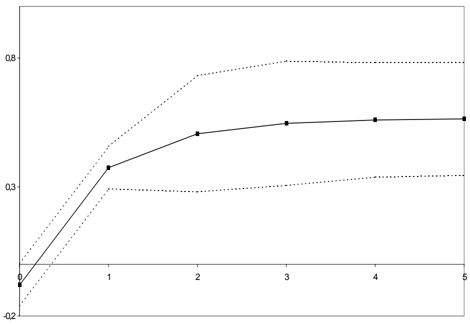

Figure 11: Trade Balance (Fixed).

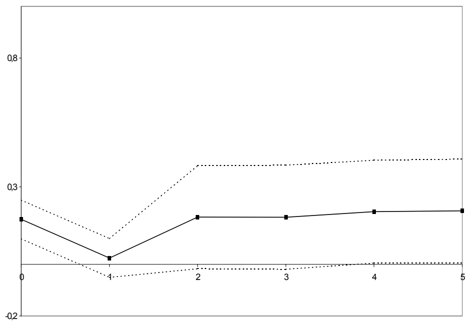

Figure 14: Trade Balance (Float).

	Short-Run			Long-Run		
	Fixed	Float	% Difference	Fixed	Float	% Difference
Real Exchange Rate (E)	-	0.004	-100.0	-0.1	-0.099	1.01
Traded Good Consumption (C_T)	-0.417	-0.420	0.5	0.132	0.131	0.76
Nontraded Good Consumption ($C_N = Y_N$)	-0.417	-0.410	1.95	-0.066	-0.066	0.0
Overall Consumption (C)	-0.417	-0.415	0.72	0.033	0.032	3.13
Traded Good Production (Y_T)	0.736	0.727	1.1	0.017	0.016	6.25
Overall Production (Y)	0.159	0.158	0.63	-0.025	-0.024	4.17
Trade Balance (TB)	1.153	1.147	0.52	-0.115	-0.115	0.0

Table 1: 1 Unit World Interest Rate Innovation under Fixed and Flexible Exchange Rates

	Short-Run			Long-Run		
	Fixed	Float	% Difference	Fixed	Float	% Difference
Real Exchange Rate (E)	-	0.179	-100.0	-0.018	-0.003	500.0
Traded Good Consumption (C_T)	-0.985	-1.087	-9.38	0.024	0.004	500.0
Nontraded Good Consumption ($C_N = Y_N$)	1.015	1.271	-20.14	-0.012	-0.002	500.0
Overall Consumption (C)	0.015	0.092	-83.69	0.006	0.001	500.0
Traded Good Production (Y_T)	-0.778	-1.048	25.76	0.003	0.0005	500.0
Overall Production (Y)	0.118	0.111	6.31	-0.004	-0.0008	400.0
Trade Balance (TB)	0.207	0.039	430.77	-0.021	-0.0035	500.0

Table 2: 1 Unit World Output/Demand Innovation under Fixed and Flexible Exchange Rates

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

Table 3: Country List

Variables					
	Levin, Lin and Chu				
Levels:	t_{Rho}	*criticalProb.*	*First Differences:*	t_{Rho}	*criticalProb.*
Real GDP (Level)	0.30	0.42	ΔReal GDP	-59.01	0.00
Real Exchange Rate (Level)	0.38	0.40	ΔReal Exchange Rate	-153.60	0.00
Net Exports (Levels)	0.83	0.31	ΔNet Exports	-181.57	0.00
World Interest Rate (Level)	0.08	0.48	ΔWorld Interest Rate	-166.1	0.00
World Real GDP (Level)	0.24	0.43	ΔWorld Real GDP	-61.00	0.00

Table 4: Panel Unit Root Test. *Note: The null hypothesis is that the series are nonstationary.*

Variables (Relation)		
	Mc Coskey and Kao *LM Plus Test*	
Real GDP: World Real GDP→World Interest Rate →Net Exports→Real Exchange Rate	28.83 (0.00)	(reject)
Real Exchange Rate: World Real GDP→World Interest Rate →Net Exports→Real GDP	27.69 (0.00)	(reject)
Net Exports: World Real GDP→World Interest Rate →Real Exchange Rate→Real GDP	25.95 (0.00)	(reject)

Table 5: 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	0.05	0.05	0.23	-0.15
Net Exports	0.002	0.07	0.21	-0.24
RER	0.0012	0.10	0.62	-0.4
Float: De Jure				
Real GDP	0.04	0.04	0.12	-0.13
Net Exports	0.003	0.04	0.21	-0.13
RER	0.02	0.14	1.04	-0.37
Fix: De Facto				
Real GDP	0.04	0.045	0.16	-0.14
Net Exports	-0.0004	0.05	0.18	-0.22
RER	0.007	0.07	0.47	-0.19
Float: De Facto				
Real GDP	0.042	0.04	0.16	-0.13
Net Exports	0.003	0.04	0.21	-0.17
RER	0.015	0.13	0.80	-0.38

Table 6: Summary Statistic. *Note: Obtained from first differenced variables in the system.*

	Holtz-Eakin: Test for Individual Effects					
Dependent Variables:	Real GDP		Real Exchange Rate		Net Exports	
	3 lags		*3 lags*		*3 lags*	
	1.67 (5.991)	(accept)	0.32 (5.991)	(accept)	0.12 (5.991)	(accept)
	1 lag		*1 lag*		*1 lag*	
	0.003 (5.991)	(accept)	0.09 (5.991)	(accept)	0.02 (5.991)	(accept)
	Arellano and Bond: Test for Second-Order Serial Correlation					
Dependent Variables:	Real GDP		Real Exchange Rate		Net Exports	
	-0.60	(0.55)	-0.42	(0.68)	-0.25	(0.81)

Table 7: Tests for Residual Based Individual Effects (Holtz-Eakin) and Second-Order Serial Correlation (Arellano and Bond). *Note: Holtz-Eakin Test for the null hypothesis that there is no individual effect. The chi-square critical value for two degrees of freedom and the 5 percent significance level is in parentheses. Arellano and Bond test for the null hypothesis that there is no second-order serial correlation. The critical probabilities are in parentheses.*

	World Real Interest Rate			World Output		
Elasticities	Real Output			Real Output		
	Wald-Test	*Float*	*Fixed*	*Wald-Test*	*Float*	*Fixed*
All Coeff. $\chi^2_{(13)}$	4.69			24.07^{**}		
All WIR/WY Coeff. $\chi^2_{(4)}$	1.40			6.92		
Impact		-0.32	-0.20		-0.46	-0.87
3rd period		-0.40	-0.30		-0.28	-1.15
5th period		-0.40	-0.33		-0.27	-1.15
Elasticities	Net Exports			Net Exports		
	Wald-Test	*Float*	*Fixed*	*Wald-Test*	*Float*	*Fixed*
All Coeff. $\chi^2_{(13)}$	34.27^{***}			49.30^{***}		
All WIR/WY Coeff. $\chi^2_{(4)}$	4.89			6.30		
Impact		0.02	-0.74		0.05	-0.25
3rd period		0.25	-0.56		0.23	-0.12
5th period		0.26	-0.56		0.23	-0.12
Elasticities	Real Exchange Rate			Real Exchange Rate		
	Wald-Test	*Float*	*Fixed*	*Wald-Test*	*Float*	*Fixed*
All Coeff. $\chi^2_{(13)}$	44.24^{***}			46.02^{***}		
All WIR/WY Coeff. $\chi^2_{(4)}$	7.43			1.39		
Impact		0.09	-0.013		0.14	-0.04
3rd period		0.94	0.81		0.49	0.39
5th period		1.16	1.02		0.52	0.48
Sample Size		746			746	
Estimation Period		1974-99			1974-99	

Table 8: 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 and a negative Shock to World Output. *Note: All countries. 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. WY = 'World' GDP and WIR =World Interest Rate. (.) imply the number of restrictions. *** significance at the 1 percent, ** at the 5 percent, * at the 10 percent level.*

	World Real Interest Rate: Financial Openness			World Output: Trade Openness		
Elasticities	Real Output			Real Output		
	Wald-Test	*Float*	*Fixed*	*Wald-Test*	*Float*	*Fixed*
All Coeff. $\chi^2_{(13)}$	29.65***			42.18**		
All WIR/WY Coeff. $\chi^2_{(4)}$	6.64			17.11***		
Impact		-0.03	-0.56		-0.18	-0.69
3rd period		0.05	-0.03		0.01	-0.58
5th period		0.05	-0.03		0.02	-0.48
Elasticities	Net Exports			Net Exports		
	Wald-Test	*Float*	*Fixed*	*Wald-Test*	*Float*	*Fixed*
All Coeff. $\chi^2_{(13)}$	33.94***			34.75***		
All WIR/WY Coeff. $\chi^2_{(4)}$	7.35			7.65		
Impact		0.18	-0.53		0.36	-0.002
3rd period		0.07	-0.89		0.45	0.75
5th period		0.69	-0.92		0.45	0.99
Elasticities	Real Exchange Rate			Real Exchange Rate		
	Wald-Test	*Float*	*Fixed*	*Wald-Test*	*Float*	*Fixed*
All Coeff. $\chi^2_{(13)}$	27.14***			57.11***		
All WIR/WY Coeff. $\chi^2_{(4)}$	3.88			4.59		
Impact		0.68	0.35		0.45	0.32
3rd period		1.37	1.12		1.12	0.69
5th period		1.45	1.12		1.25	0.74
Sample Size		524			385	
Estimation Period		1974-99			1974-99	

Table 9: 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 (Financial Openness) and a negative Shock to World Output (Trade Openness). *Note: All countries. 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. WY = 'World' GDP and W I R =World Interest Rate. (.) imply the number of restrictions. *** significance at the 1 percent, ** at the 5 percent, * at the 10 percent level.*

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