Prospects of Economic Integration and Incompatible Monetary Policies among MERCOSUR Members*

ABSTRACT

This paper shows that incompatible monetary policies in Argentina and Brazil have produced adverse effects on the structures of intra-regional trade and other target variables of economic integration in the MERCOSUR. The long-term coexistence of a foreign-reserve-oriented regime in Argentina with more flexible policies in Brazil has led to the development of a fundamental asymmetry in the adjustment mechanisms of both economies to common shocks. In several steps of modelling and econometric analysis the paper provides evidence for economic disintegration that has been caused by this lack of monetary integration.

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Introduction

The year 1991 marked the beginning of two policy experiments in South America that were to have far-reaching consequences for the economic development in the region. On 26 March 1991, Argentina, Brazil, Paraguay and Uruguay signed the Treaty of Asuncion by which the four countries created the institutional framework for MERCOSUR, the Common Market of the South. A few days later, on 1 April, Argentina's Congress approved a law to guarantee the full convertibility of the newly created currency, the peso, to the US dollar at the rate of one-to-one. Since the law confined the issue of pesos almost exclusively to the official dollar reserves, monetary policy in Argentina was subject to a (quasi-)currency-board rule.

The formation of the MERCOSUR bloc, embedded the idea that economic integration could foster economic growth in South America by intensifying trade and financial relations, in particular between Argentina and Brazil, the two dominant economies in the region.[1]

The Argentinian currency board was interpreted as a precondition for macroeconomic stability and growth. It aimed at curbing the hyperinflation process that had plagued the country throughout the 1980s. By the mid-1990s, both reforms seemed to be successfull. Argentinian inflation was under control, and the growth rates of Argentinian GDP as well as intra-MERCOSUR trade rose faster than expected. Despite some disturbances, in the wake of the 1995 Mexican crisis, Brazil, too, had succeeded in getting rid of hyperinflation by pegging its new currency, the real, to the US dollar.

Referring to Europe, where the 1991 Treaty of Maastricht had set the members of the European Common Market on the path towards monetary union, both politicians and economists began to speculate about combining economic integration in the MERCOSUR with monetary integration in the not too distant future.

At present, those past debates look very distant. The Argentinian currency board collapsed in January 2002, in the middle of a deep and protracted crisis whose beginnings date back to the Asian crisis in 1997 and the devaluation of the Brazilian real in early 1999. With hindsight, it seems almost trivial to say that the two experiments of the 1991 vintage – MERCOSUR and the Argentinian currency board – proved to be incompatible with each

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[1] The GNPs and populations of Argentina and Brazil amount to more than 96 per cent of the total figures for the MERCOSUR. In 1999, Argentina's GNP share was 26.5 per cent, its population share 17.3 per cent. The figures for Brazil were 70.8 and 79.0 per cent, respectively. Due to this dominance, MERCOSUR will henceforth largely be taken as synonymous with Argentina and Brazil, neglecting the other two member countries, Paraguay and Uruguay.

other. Since 1999 Brazil had gone over to inflation targeting under floating exchange rates. The concomitant depreciation of the real against the peso contributed (together with other factors) to a catastrophical decline of industrial production in Argentina. This undermined the credibility of the currency board rule and created, at the same time, tensions within the MERCOSUR that have threatened to halt the whole project of creating a common market in the region. In the end, the "boarded peg" of the peso to the dollar had to be abandoned.

Yet it would be misleading to consider the period between 1999 and 2002 as an *exceptional* episode of inconsistent macroeconomic policies in an otherwise consistent story of economic integration. In our paper we show that fundamental differences in the monetary policies of Argentina and Brazil have existed even at times, when both countries had their currencies pegged to the dollar. We argue that these policy differences have led to asymmetries in the mechanisms by which the Argentinian and Brazilian economies adjust to common shocks, and that the asymmetries tend to have adverse effects on the volumes and sectoral patterns of trade between the two countries.

The general idea behind this "joint hypothesis" can be described with reference to the recent discussion about the endogeneity of Optimum Currency Areas (OCA). In the tradition of Mundell (1961), the standard OCA criteria for successful monetary integration through hard pegs or currency union are either *(a)* the symmetry of shocks in their impact on the subregions of the currency area in question, or *(b)* the existence of adjustment mechanisms (such as factor price flexibility, factor mobility and fiscal federalism) that would compensate for the loss of exchange rate flexibility. In their seminal paper, Frankel and Rose (1997) have pointed out that the symmetry of shocks may be an outcome rather than a precondition of monetary integration. Exchange rate certainty or the use of a common currency lead to more integrated trade (indicated by rising shares of intra-industry trade), which in turn synchronizes business cycles between the subregions. In this sense, shocks are made more symmetric and the optimality of a currency area could be considered as endogenous.

Conversely, we would argue that incompatible macroeconomic policies produce adverse structural effects on trade by making business cycles in the subregions less synchronous and more asymmetric in the impact of the underlying shocks. In other words, the lack of monetary integration between Argentina and Brazil has led to economic disintegration in the MERCOSUR. Following this introduction, the paper is organized in five further sections. In section 2 we make use of a simple macroeconomic model of the Mundell-Fleming type to describe various scenarios in which the policy differences translate into asymmetric transmission of common shocks. In section 3 we present results of cointegration

analysis and error correction modelling that give evidence of the relevant differences in the monetary and exchange rate policies of Argentina and Brazil in the 1980s and 1990s. In section 4 we present a structural VAR model for the period 1980-2001 that provides empirical support for our hypothetical conclusions from section 3, showing a lack of synchronization in the macroeconomic policies of Argentina and Brazil. In section 5, we describe the behaviour of the Grubel-Lloyd index of intra-industry trade at high levels of sectoral disaggregation and present estimation results that suggest a strong influence of macroeconomic policies on trade structures in Argentina and Brazil. In section 6 we sum up our arguments, concluding that monetary policies in the two countries are unlikely to be neutral in the long run, since their repercussions affect the trade pattern and other real target variables of economic integration in the MERCOSUR.

2 Macroeconomic policy asymmetries: Hypothetical transmission mechanisms

In this section, we employ a Mundell/Fleming-type model to demonstrate how the differences between the monetary policies in Argentina and Brazil in the 1990s can be understood to have led to asymmetries in the transmission of common shocks to the MERCOSUR region. Despite its well-known limitations, the Mundell/Fleming framework helps to highlight the problems that incompatible monetary and exchange rate policies create for trade integration.[2]

We consider two scenarios with alternative exchange rate arrangements between the economies *A, B* and *C*. [3] Countries *A* and *B* are neighbours, with plans of further trade integration, whereas *C* is a big economy outside the region. The three economies may thus be taken to represent Argentina *(A),* Brazil *(B)* and the USA, or simply the rest of the world *(C).* The scenarios differ by the constellations of exchange rate arrangements, as shown below:

	exchange rates		
	A/C	B/C	A/B
Scenario 1	fixed	fixed	fixed
Scenario 2	fixed	floating	floating

The underlying model is described by the following equations (with subscripts *A, B* and *C* for the respective economies):

$$Y_A = D_A(Y_B, r_A, Y_C^*, e, f_A) \qquad (1)$$

[2] See Argy (1994, pp. 150-93). Those who are in need of some rough cost-benefit analysis of the Mundell/Fleming framework might want to consult Krugman (1995) and (2000).

[3] The following draws on Falcão Silva, Andrade and Trautwein (2002). There a third scenario is considered, extending scenario 2 to a semi-flexible exchange rate arrangement (moving target zones) between *B* and the

$$Y_B = D_B(Y_A, r_B, Y_C^*, e, f_B) \quad (2)$$

$$M_A = L(Y_A, r_A) \quad (3)$$

$$M_B = L(Y_B, r_B) \quad (4)$$

$$M_B = \overline{M}_B \quad (5)$$

$$r_A = r_B \quad (6)$$

$$0 = BP_B(Y_B, Y_A, Y_C^*, e, r_B - r_c) \quad (7)$$

$$e = \overline{e} \quad (8)$$

where *Y* denotes output, *M* the real money supply, *r* the interest rate, f the fiscal variable, and *e* the real exchange rate. The first two equations represent goods market equilibria (IS curves), whereas equations (3) and (4) are equilibrium conditions for the financial markets (LM curves). Equation (5) states that country *B* controls the money supply, under floating as well as fixed exchange rates; in the latter case, monetary control is based on sterilization policy. Equation (6) is for perfect capital mobility between A and B. Equation (7), the condition for balance-of-payment equilibrium, is required for the determination of *B*'s exchange-rates under floating. The last equation states the target level of the exchange rate under a fixed exchange-rate system. It is assumed that domestic prices in *A* and *B* are fixed or sticky in the short run. It is further assumed that capital is perfectly mobile between the two countries, but that it is less than perfectly mobile in relation to *C.* This sets the focus on the relationship between *A* and *B.*

Scenario 1 Exchange rates are credibly fixed between the currencies of all three countries. In the integration area *(A+B),* monetary and fiscal policies of *B* should generally have a stronger impact on *A* than *vice versa,* since *B* is the bigger economy (note that Brazilian GDP is about 2.5 times the size of its Argentinian counterpart). Moreover, monetary policies in *A* and *B* differ. The authorities in *B* use open-market operations to sterilize the effects of foreign reserve flows on the domestic money supply, whereas *A* has a currency-board arrangement. In this scenario, *B* will dominate in terms of monetary policy. Changes in the money supply of *A* will affect *B*'s level of reserves, but not its money supply. This has further implications which can be seen from the discussion of various types of shocks and their transmission through the two economies.

Shocks from Brazil Monetary expansion in *B* will feed through to *A* . The new equilibrium positions display a lower level of interest rates and higher output in both countries. Fiscal expansion in *B,* on the other hand, will have a contractionary effect on *A.* The reason is sterilization policy in *B.* Starting from the initial equilibrium the fiscal shock originating in *B*

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other two economies.

shifts the IS curve of B - IS_B - to the right, towards a new equilibrium in which both output and interest are higher. *B*'s increased demand for imports raises net exports of *A,* shifting IS_A to the right. This positive spillover is outweighed, however, by outflows of reserves from *A* to *B* that are induced by *B'*s higher interest rate. Since *B* sterilizes the reserve inflows, the equilibrium interest rate in the region will raise, leading to a decline in *A'*s output, as the LM curve of A - LM_A – shifts to the left.

Shocks from Argentina Monetary shocks originating in *A* will be dampened in *B* and thereby lose force in *A* as well. Since *A* sticks to its exchange rate target and refrains from making use of sterilization practices, it cannot, at any rate, conduct independent monetary policy. Hence the only remaining option (in this simple macroanalytical framework) is fiscal policy. Fiscal expansion in *A* leads to a rightward shift of IS_A. Both output and interest rise, leading to positive spillovers from *A* to *B* through trade, but also to negative spillovers through interest arbitrage. IS_B shifts to the right, whereas LM_B shifts to the left. However, the new equilibria are not stable, because the reserve outflows from *B* are neutralized by open-market operations. These leakages will reinforce the positive impact of *A'*s fiscal expansion and, together with capital flows from *C* to *A,* they will make the interest rate return to its initial in the final equilibrium. Accordingly, fiscal expansion in *A* does not lead to any crowding out of private investment. Due to fixed exchange rates, there is no crowding out by way of appreciation, and sterilization policy in *B* eliminates the negative interest rate effects. In their spillovers to and feedbacks from *B,* the fiscal shocks coming from *A* are amplified. Scenario 1 thus shows a peculiar trade off in Argentinian stabilization policy: What the country lost in terms of monetary policy independence, it gained – at least for a while – in terms of fiscal policy effectiveness. Note that the same logic applies to fiscal contraction.

Shocks from the rest of the world While the sterilization policy of *B* contributes to making the macroeconomic policy options for *A* more asymmetric, it can be shown to produce greater symmetry in the effects of external shocks to the *A+B* region than would otherwise be the case. In general, one might argue that any change in the net capital flows between *C* and the *A+B* region affects the money supplies both in *A* and *B*. However, sterilization in *B* insulates the domestic money supply from reserve shocks caused by capital flows to or from *C*. Moreover, in the case of a negative reserve shock, outflows from *A* to *C,* which normally would lead to a contraction of output in *A,* are mitigated by arbitrage-related inflows of capital from *B*. Consider, for example, the reserve shock on the region that followed from the Mexican "tequila crisis" 1994-95. Both Argentina and Brazil lost nearly one third of their foreign reserves within a few weeks. By neutralizing some of the contractionary effect of this

loss on the domestic money supply, the Brazilian Central Bank helped to dampen the effects of the reserve shock on Argentina: directly by way of arbitrage-related capital flows, and indirectly by preventing Brazilian output and demand for imports from Argentina from declining in proportion to reserve holdings.

However, in the wake of the Asian and Russian crises 1997-98, worldwide investor uncertainty about financial prospects in emerging markets increased dramatically. Intra-Brazilian haggling over the stance of fiscal policy contributed to sudden and strong outflows of foreign reserves that the Brazilian Central Bank was no longer willing nor able to neutralize. In early 1999, Brazil decided to switch from exchange rate targeting to inflation targeting under floating exchange rates, whereas Argentina preferred to stick to its dollar-based currency-board rule.This made Argentina much more vulnerable to external shocks, as shown in the next scenario.

Scenario 2 Country *B* lets the exchange rates of its currency float *vis-à-vis* the currencies of *A* and *C*. The exchange rate between the currencies of *A* and *C* remains fixed. In comparison with Scenario 1 this constellation reveals fundamental differences in the adjustments to negative external shocks (such as unexpectedly high reserve outflows). The currency board arrangement in *A* relies mainly on quantity adjustments in the domestic financial markets (LM shifts) that tend to produce output changes. The floating rate regime in *B* allows for compensating price adjustments through the foreign exchange and goods markets (IS shifts) that help, to some extent, to keep output stable. However, the interaction of quantity adjustments in one economy and price adjustments in the other may develop into a vicious circle that destabilizes output and trade in the region.

The core problem is the double impact of external shocks on *A*. The transmission of common negative shocks through the economy *B* leads to a depreciation of *B*′s currency, which now amplifies the effects of the original shock on *A* by reducing net exports to *B,* i.e. *A* tends to import more from and to export less to *B*. The economy of *A* is hit twice: first through the reserve flows from *A* to *C,* then through the effects of the depreciation of *B*′s currency. It may be argued that the counterveiling effect of sterilization in *B* carries over to Scenario 2 insofar as the rise in the interest rate of *A* (following from the leftward LM shift) attracts capital from *B*. However, this adds only further momentum to the depreciation of *B*′s currency. The project of regional trade integration will be at risk, because the depreciation implies not only a decline in *A*′s net exports. The level of trade will also be affected, if the contraction in *A*′s output and income leads to lower imports from *B*.

3 Monetary policies in Argentina and Brazil

In the 1980s and early 1990s both Argentina and Brazil went through several episodes of hyperinflation and failed experiments with currency reform. It was only with the introduction of the quasi-currency-board rule for monetary policy in April 1991 that the Argentinian authorities succeeded in restoring monetary stability. The core element of the rule was the guarantee of completely unrestricted one-to-one convertibility of the newly created peso (notes and coins) into US dollars. In this way, the Central Bank of Argentina committed itself to limiting the supply of base money to the equivalent of its official dollar reserves.

In Brazil, the return to low inflation took even longer, despite the emergency measures against hyperinflation that had been taken in connection with the Planos Collor I and II in 1990. The Plano Real of July 1994 met with more success, as the authorities followed the Argentinian example in making the newly created currency unit, the real, fully convertible into the US dollar at a one-to-one exchange rate. Monetary policy was designed to keep the money supply in line with the dollar reserves. However, unlike its Argentinian counterpart the Brazilian Central Bank did not explicitly state the relationship between changes in monetary base and movements in foreign reserves. Moreover, the Plano Real allowed of some degree of discretion in that the exchange rate was permitted to move within a target band. The Bank of Brazil thus had some leeway to neutralize changes in official reserve holdings in their effects on the monetary base and domestic credit. This raises the question in how far it actually made use of this freedom to sterilize inflows and buffer outflows of foreign reserves.

Thus it is interesting to compare Brazilian monetary policy after the realization of the "Real Plan" with the stance of Argentinian monetary policy. Did the differences in the formal design of monetary policies in the two countries really make a difference? To see this, we have investigated the long-run properties of the relevant time series by making use of cointegration analysis. The main results are presented in the following.[4]

For Argentina, we have estimated the relationship between foreign reserves and monetary base for the period 1991:M3 to 2001:M5.[5]

The Johansen procedure with one lag yielded the following cointegration vector.

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[4] The following draws on Andrade, Falcão Silva and Carneiro (2000), and Falcão Silva, Andrade and Trautwein (2002), where the institutional developments of the monetary policies, further relevant facts and procedures of our econometric analysis are spelt out in greater detail.

[5] The variables are measured by end-of-period monthly values, taken from reports of the Argentinian Central Bank. They yield an *I(1)* process under both the ADF and the Phillips-Perron tests. The series present several breaks in the period that goes from 2001:M6 to 2003:M3 that comprehends the economic turmoil that Argentina went through and for that reason this period was not included in the sample.

$$M_t = \underset{(0.00895)}{0.915}\ R_t \qquad (9)$$

where M denotes the monetary base and *R* the foreign reserves both expressed in dollar values.

The results of our cointegration analysis suggest that Argentina followed the quasi-currency-board rule closely throughout the period examined.

It is interesting to note that the relationship between domestic credit CR and reserves R can be derived from the above relationship taking into account that: $CR = M - R$[6]. Indeed the cointegration exercise shows that there is one cointegration vector between CR and R as the following: $CR_t = \underset{(0.00895)}{0.085}\ R_t$

Turning to Brazil, we considered the relationship between foreign reserves and domestic credit to be most relevant for an examination of the sterilization policy of the Central Bank. Here, as in the Argentinian case, we have made use of cointegration analysis. To preserve uniformity we chose the same period of analysis. Johansen method provided us with one cointegration vector:

$$CR_t = \underset{(0.060)}{-0.814}\ R_t \qquad (10)$$

Where CR and R are the amount of domestric credit and foreign reserves in dollar value.

Similarly, because of the definition of domestic credit as before, the relationship between monetary base and foreign reserves presented a long run relationship complementary to the previous one with the following result:

$$M_t = \underset{(0,07)}{0,186}\ R_t$$

On the whole, these results confirm that the Brazilian monetary authorities have consistently pursued a policy of insulating the development of domestic monetary aggregates from changes in foreign reserves throughout the whole sample. The existence of a negative long-run relationship between currency reserves and domestic credit suggest that there was some scope for independent monetary policy even when Brazil officially changed to a regime of exchange rate targeting to subdue inflation. These findings stand in stark contrast with our results for Argentina where the monetary base (as the relevant cointegrated variable) was shown to have closely followed the movements of the official reserve holdings.

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[6] Domestic credit used in this experiment should be understood as one of the two assets of the Central Bank, namely Net domestic-currency bonds. These are the assets that are used in sterilization policies. (Obstfeld and Rogoff, Foundations of International Macroeconomics, 1996)

The previous analysis suggests strongly that the monetary policy of Argentina and Brazil was starklingly distinct during the period considered. In addition to that we should note that from February 1999 on Brazilian exchange rate regime became more flexible tending towards a dirty floating type, while Argentina was still trying to keep its currency board system. Shortly after that Argentinian system started to fall apart, and by the second half of 2002 it was bound to float.

This section supports the idea that the scenarios we have analysed in the section 2 of the paper are not entirely abstract and have been partly enforced during the recent past of Argentina's and Brazil's economies.

4 Asymmetric transmission of shocks: Empirical evidence

One of the core propositions of OCA theory is that a region could be considered fit for monetary integration if shocks affect the different economies in the region in a symmetric fashion. In the earlier sections we have shown *(a)* that there have been notable differences between the monetary policies in Argentina and Brazil ever since the foundation of MERCOSUR, and *(b)* that these differences may have produced asymmetries in the effects of common intra-regional and external shocks on these two MERCOSUR economies. The asymmetries in the transmission of shocks are likely to be strongest if the countries in the region pursue extremely different exchange rate policies, as they have done between 1999 and 2002. But they exist even when only the underlying monetary policies differ in terms of the sterilization of foreign reserve flows. So far, our argumentation concerning *(b)* has been a purely speculative exercise. We now proceed to provide some empirical evidence for those conclusions.

Since the comovement of economies (in terms of output and other macrovariables) in their reactions to shocks can be considered as an OCA criterion, we started our analysis by comparing the income cycles of Argentina and Brazil for the period ranging from 1980 to 2001. We used different filters to extract the cyclical components from quarterly data.[7] Three out of five filters suggest that there is a slight co-movement between the series, with cross correlation between contemporaneous values in the range of 0.2 to 0.4 (see Table 1). However, the Box-Jenkins white noise filter yields a much lower value and the Beveridge-Nelson procedure produces a negative correlation.

[7] The sources for the quarterly GDP data are *ipeadata* in the case of Brazil, and *Ministério de Economia* in the

Table 1 - Cross Correlation Cycles

Lags	-1	0	1	2
Linear Filter	0.220	0.197	0.147	0.085
Box Jenkins	0.029	0.051	0.010	-0.114
Hodrick-Prescott	-0.066	0.468	0.141	-0.169
Baxter-King	-0.152	0.405	0.055	-0.241
Beveridge-Nelson	-0.382	-0.544	-0.397	-0.092

After this first appraisal of the nature of the cycles we examine the behaviour of domestic and external shocks to both economies by estimating a structural VAR model. The proposed VAR considers as domestic variables the GDPs and inflation rates of Argentina and Brazil (*ya,yb,pa* and *pb*).[8] As for the external factor we chose the change of the US interest rate *(iu)*. Instead of the prime we used the libor that has an homologous behaviour but presents larger variance. Differently from the practice of estimating two separate VARs, one for each country, we decided to estimate only one VAR in which the effects of the other country are considered directly into the model and hence are interpreted as part of the external shocks. [9]

The analysis uses monthly data and the period goes from June 1994 to March 2003. A larger period starting in 1980 was considered, however significant structural changes in the beginning of the 1990s in Argentina and in 1994 in Brazil led us to focus the estimation for the shorter period. The definition of the sample is related to the regime switches that occurred in Argentina, after the Currency Board and in Brazil after the Real Plan . Augmented Dickey Fuller and KPSS tests (Kwiatowski *et al.* 1992) suggest that the GDPs Inflation rates of Argentina and Brazil, and the change in US interest rate series are *I(0)* processes

In order to identify the structural shocks in the different variables of the model we had to specify some restrictions. We used the method of Sims (1986) and Bernanke (1986) – instead of the Cholesky ortoghonal decomposition – based on a model in the structural form:

$$BX_t = B(L)X_{t-1} + \mu_t$$

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case of Argentina. The deflators used were wpi in both cases.

[8] The sources of the data are the following: GDP Argentina = *ya*: INDEC, Dirección Nacional de Cuentas Nacionales*:* GDP Brazil = *yb Central Bank, , pb - ipeadata;* interest rate USA = *iu - IFS statistics.*

[9] A similar model was estimated by Carrera et all (1988) for a different period (1980-1996). Differently from our model Carrera et all estimated two VARs, one for each country, and similarly used the USA rate of interest as one of the variables representing external shocks.

where X_t is the vector of the variables to be jointly explained by the VAR, which is $X_t = \{ iu_t, ya_t, yb_{tt}, pa_t, pb_t \}$, and where μ_t are the structural errors. The standard form of the VAR becomes:

$$X_t = A(L)X_{t-1} + e_t \tag{11}$$

To identify the vector μ_t from the vector e_t, it should be noted that the errors are related by the following identity:

$$B^{-1}\mu_t = e_t \text{ or } \mu_t = Be_t \tag{12}$$

Following the Sims (1986) methodology, we formulated *a priori* restrictions on these relationships and combined them with the above identity in order to identify the structural shocks μ_t. The *a priory* restrictions are:

the US interest rate *(iu)* is exogenous; Argentina's domestic income is related to contemporaneous Brazil's income and to the external variable *(iu)*;Brazil's domestic income is related to the contemporaneous external variable *(iu)*;the inflation rate of each country is related to its own income.

The relationship between reduced and structural shocks can be presented in the following matrix form:

The basic structural model reduces to IS relationships and augmented Phillips Curve relationships for each country, and can thus be interpreted as a model of aggregate demand and aggregate supply. The US interest rate that accounts for the external effects does not present any contemporaneous relationship with the other variables.

The first line of matrix *B* represents the restrictions to the behaviour of the interest rate. The next two lines define the aggregate demand for Argentina in an IS type equation, where Argentina's aggregate demand is presented as dependent on the foreign shocks and on Brazilian aggregate demand. The same specification is adopted for Brazil's aggregate demand, though in this case we had to drop its contemporaneous relationship to Argentina, otherwise the matrix would become singular. After the estimation of the standard model and the identification of the structural VAR through the Sims-Bernanke decomposition we proceeded to the analysis of the variance decomposition of the innovations. The main results are displayed in Table 2 below.

Table 2 – Variance Decomposition of the Variables to Structural Shocks

		Innovations from Structural VAR with Bernanke-Sims decomposition				
	Step	ε^{iu}	ε^{ya}	E^{yb}	ε^{pa}	ε^{pb}
iu	24	74.81	6.72	13.43	1.13	3.90
ya	24	16.39	50.25	27.98	2.36	3.01
yb	24	7.85	21.38	67.83	1.57	1.36
pa	24	13.14	2.50	1.01	82.85	0.49
pb	24	7.26	17.91	8.52	2.48	63.82

The results suggest that Argentina is more vulnerable to external shocks than Brazil. Taking Argentina's GDP (at the 24th step), 16 per cent of its variance is explained by shocks coming from US interest rate innovations. Considering additionally the shocks coming from Brazilian GDP (30,98%) and inflation (6,39%), this share rises to about 47 per cent. In the case of Brazilian GDP, only 8% per cent of the variance is explained by shocks coming from US interest rate innovations. Adding Argentinian GDP (21,38%) and inflation (1,57%), the share goes up to 31 per cent. Hence, common external shocks affect Argentina much more than Brazil, whereas the difference between Argentina and Brazil is less pronounced, if all non-domestic influences are taken into account. The converse applies to inflation. The innovations associated with Argentina's income affect more Brazilian inflation than innovations associated with Brazilian income itself.[10] Turning to the Phillips curve block (the two last lines), the innovations associated with Brazilian inflation become even more important. Argentina's inflation is highly affected by inflation in Brazil (61 per cent).

The structural innovations estimated by the VAR (using the Sims-Bernanke decomposition) reveal that the shocks of the aggregate demand equations of these countries present very small cross contemporaneous correlations. (see Table 3)[11]. This suggests that the domestic policies were far from symmetric in the sense that the structural shocks did not commove. The contemporaneous correlation of the shocks of the aggregate supply equations (Phillips Curves) indicates the existence of a comovement. In addition to that the impulse

[10] This result may come from the fact that Argentina's exchange rate is fixed while Brazilian exchange rate was crawling peg in the beginning and became floating in the last three years.

[11] The test of the correlations with the null hypothesis of zero correlation relies on the property that the covariance between X and Y S_{XY} is asymptotically $\mathrm{N}\left[\sigma_{XY}, \left(\mu_{22} - \mu_{ii}^2\right)/n\right]$. We tested the null hypothesis that $S_{XY} = 0$

response functions indicate that the response of the Argentinian output to the structural shock associated to the Brazilian demand is in the opposite direction of the response of Brazilian output to the structural shock associated to the Argentinian demand.

Table 3 - Cross Correlation between the Structural Shocks

	ε^{us}	ε^{ya}	ε^{yb}	ε^{pa}	ε^{pb}
ε^{us}	1	2.63e-11	-2.48e-14	-0.145	-0.187
ε^{ya}	2.63e-11	1	8.71e-08	-0.007	-0.036
ε^{yb}	-2.48e-14	8.71e-08	1	0.025	-0.0118
ε^{pa}	-0.145	-0.007	0.025	1	0.148
ε^{pb}	-0.187	-0.036	-0.0118	0.148	1

The main result of this analysis is the lack of symmetry between the effects of intra-regional shocks on the two countries and the differences in the transmission of these shocks. Moreover, there is a clear difference in the impact of common external shocks on Brazil and Argentina. The empirical analysis in this section thus supports our conclusions from the preceding section: The differences in the macroeconomic policies of Argentina and Brazil have led to asymmetries in the transmission of shocks that do not make the MERCOSUR an area that is fit for monetary integration. One might rather speak of a process of monetary disintegration.

5 The Effects of Incompatible Monetary Regimes upon Trade Integration

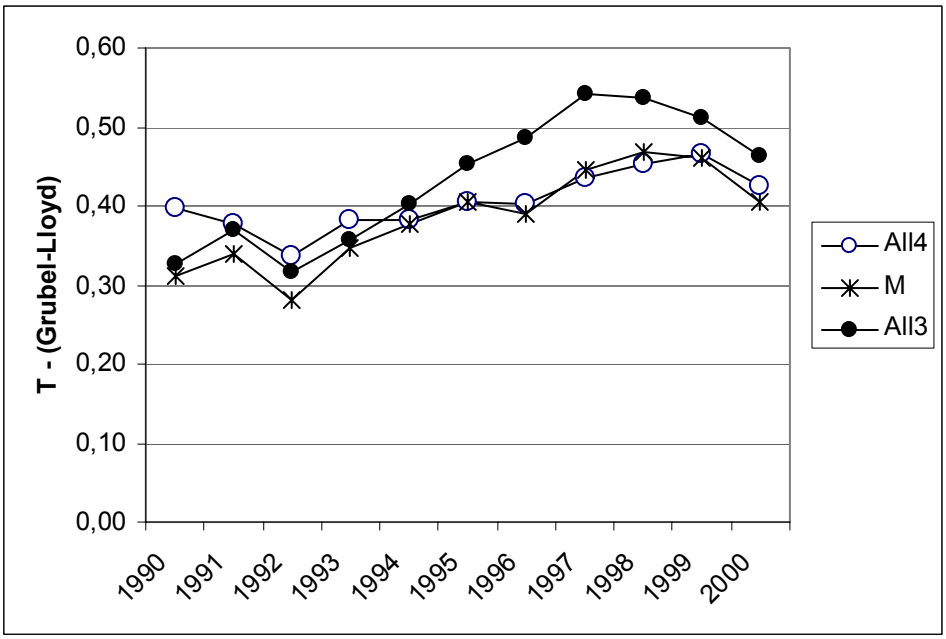
Has monetary disintegration in the MERCOSUR had adverse effects on economic integration? Economic integration is frequently measured by shares of bilateral trade between the respective countries and, in particular, by the shares of intraindustry trade in total bilateral trade. An increasing share of intraindustry trade signals progress in the process of economic integration in the sense that the underlying structures of production in the respective economies become more similar to each other. Frankel and Rose (1997) propose that the factors that explain trade integration in this sense are, to a significant extent, endogenous to monetary integration. If that is the case, we would expect a negative effect from monetary disintegration on intraindustry trade.

In the following we take a look at the development of intraindustry trade between Argentina and Brazil, using the well-known index developed by Grubel and Lloyd (1971) in the following form:

$$T_i = 1 - \frac{|Ex_i - Im_i|}{Ex_i + Im_i} \qquad (13)$$

where T denotes the share of intraindustry trade, Ex_i the exports and Im_i the imports of sector i.

Figure 1 - Intraindustry Trade Index



Note: all4 and all3 are average index at 4 digits and 3 digits respectively of all sectors; M represents the average index at 4 digits of manufacture sectors only.

Our illustration of this development in the years between 1990 and 2000 in Figure 1 is based on the construction of two pseudo panels at different levels of SITC sector disaggregation: at the 3-digit level with 173 sectors, and at the 4-digit level with 1017 sectors.[12] The 3-digit data suggests that intraindustry trade increased substantially until 1997 and then declined. The average 4-digit data suggests a slight increase of the index until 1999 and a decline towards to its initial value after that. The result for the subdivision of manufacturing sectors is homologous.[13] This analysis suggests that the formal process of

[12] The data source is *Trade Office (SECEX),* Brazilian Ministry of Development, Industry and Foreign Trade (MDIC). The data for manufacturing are aggregated from the 99 main industrial sectors (see *Norma Comum de Mercadorias - NCM*).

[13] For better understanding, we also ranked the sectors according to the period average intraindustry trade. Two partitions were considered, the first including all sectors with average index values between 0.2 and 0.4, the second including the sectors in the interval from 0.4 to 1.0. Considering the different partitions, the picture

MERCOSUR integration did not produce a large durable change in the degree of intraindustry trade between Argentina and Brazil.

It is well known that the intraindustry trade index may be affected by macroeconomic policy. Examining the formula for the Grubel-Lloyd index (equation 13), we can see that it depends largely on the absolute value of net exports. Net exports are codetermined by changes in the bilateral exchange rate. Such changes may, in turn, be generated by interest rate differentials between the two countries. Concerning the levels of trade, the index depends also on the development of the incomes in both countries. If they develop in an asymmetric or asynchronous fashion, their individual effects on trade may cancel each other out.

Based on the above considerations we specified the following model in which the index was assumed to depend on macroeconomic policy variables:

$$T = \beta_0 + \beta_1[r_b - r_a] + \beta_2[\varepsilon_{ba}] + \beta_3 Y_b + \beta_4 Y_a$$

where T is the index, r_b and r_a are the real interest rates, ε_{ba} is the bilateral real exchange rate (real/peso), and $Y_{b,}\, Y_a$ are the incomes of Argentina and Brazil, respectively.

Table 4 - Model of the Intra Industry Trade 3 digits sample(Random Effects)

	A	B	C	D	E	F
constant	-3.825 (-2.41)	-10.771 (-6.47)	-8.264 (-5.94)	-1.221 (-9.56)	-5.341 (-3.27)	-6.456 (-2.16)
$r_b - r_a$	-0.250 (-6.04)			-0.218 (-5.29)	-0.160 (-3.40)	-0.137 (-1.93)
ε_{ba-1}		1.473 (5.63)	1.649 (6.36)	1.005 (3.47)	1.159 (3.92)	1.173 (3.94)
Y_a	0.588 (1.76)		1.424 (4.77)		0.863 (2.53)	0.432 (0.42)
Y_b		1.987 (5.48)				0.668 (0.44)
RSq	0.504	0.508	0.505	0.507	0.509	0.509
Adjusted RSq	0.503	0.507	0.505	0.507	0.508	0.508
S.E. of regression	1.1853	1.1804	1.183	1.1812	1.1795	1.1801
F-statistic						
Mean dependent	-1.5306	-1.5306	-1.5306	-1.5306	-1.5306	-1.5306
S.D. dependent	1.6818	1.6818	1.6818	1.6818	1.6818	1.6818
Sum Squared resid	2254.8	2236.3	2248.0	2239.2	2231.6	2.232.4
N of Cross sections	172	172	172	172	172	172
N.of Observations	1608	1608	1608	1608	1608	1608

does not change much. The sectors that present a high average degree of integration show a substantial rise in the index before the implementation of the Plano Real in 1994, and stagnation thereafter. The other partition closely corresponds to the development in the average panel.

The panel data with 3-digit disaggregation fit the suggested model quite well. The estimation method used was GLS; random effects were not rejected. [14] The main results are presented in Table 4 and can be summarized as follows:

(a) The real exchange rate of the previous period and the interest rate differential have opposite signs, as might be expected. Despite the close relationship between the two variables, interest differentials add explanatory power.

(b) The incomes of Argentina and Brazil play each a significant role; but when taken together (in F), their *t* values do not reject the null hypothesis of zero coefficients. This result may be explained with the lack of comovement indicated in the previous section.

These findings suggest that macroeconomic policies are strongly relevant for the explanation of the behaviour of the intraindustry trade index for Argentina and Brazil.

Next we used the panel data with 4-digit disaggregation to estimate the model for sectors with average index values of more than 0.2, to exclude all sectors with insignificant trade integration (Table 5). The Hausman test supported the use of fixed effects.[15]

Table 5 - Model of the Intra Industry Trade, 4-digit sample

	A	B	C	D	E	F
$r_b - r_a$	0.163 (-5.13)		-0.009 (-0.20)	-0.175 (-6.94)		-0.106 (-3.74)
ε_{ba-1}		1.529 (9.86)	1.458 (8.56)	1.228 (7.39)	1.682 (10.86)	1.389 (8.26)
Y_a			-0.654 (-1.152)		1.433 (7.77)	1.053 (5.08)
Y_b	1.231 (3.94)	2.013 (8.76)	2.693 (3.08)			
RSq	0.258	0.269	0.269	0.263	0.265	0.267
Adjusted RSq	0.147	0.159	0.159	0.153	0.155	0.158
S.E. of regression	1.3163	1.3068	1.3068	1.3114	1.3098	1.308
F-statistic	1534.7	1621.7	541.3	1579.7	1594.4	806.2
Mean dependent	-1.3925	-1.3925	-1.3925	-1.3925	-1.3925	-1.3925
S.D. dependent	1.4253	1.4253	1.4253	1.4253	1.4253	1.4253
Sum Squared resid	7651.9	7575.8	7537.9	7594.4	7537.9	7552.8
N of Cross sections	659	659	659	659	659	659
N.of Observations	5077	5077	5077	5077	5077	5077

[14] The Hausman test did not reject the random effects. *Chsq* = 1.287 and the critical values for *Chsq(3)* are 9.35 and 11.34 at 5 and 1 per cent levels, respectively.

[15] The value of the Hausman test is 475, and the critical value of the chi-square (3) is 9.35 and 11.34 at 5 and 1

The results confirm the previous findings, showing that the bilateral exchange rate, the interest rate differentials and the incomes of the countries are all relevant factors in determining the development of intraindustry trade. We conclude that the average behaviour of the Grubel-Lloyd index in the period from 1990 to 2000 can to a significant extent be explained by macroeconomic policy variables.

6 Conclusion

Our analysis of the differences between the monetary policies in Brazil and Argentina and their consequences for macroeconomic developments suggests that monetary disintegration in the MERCOSUR has created obstacles to economic integration, and in particular to trade integration in the region. It may seem trivial to state that, with a view to economic integration, the exchange rate regimes of Argentina and Brazil were absolutely incompatible in the years between 1999 and 2002, when Brazil had switched to floating, whereas Argentina preferred to stick to its currency board arrangement. However, we have shown that the incompatibility problems were present even in the period from 1994 to 1999, when both countries had their exchange rates pegged to the US dollar. To put it simply, sterilization of foreign reserve flows to and from Brazil made the difference that created various asymmetries in the effectiveness of domestic macroeconomic policies and in the impacts of external shocks on the two economies. In this way, the lack of comovement between the national incomes of Argentina and Brazil that had existed prior to the foundation of MERCOSUR, because both economies were much less open and went through different cycles of stagflation in the 1980s, was perpetuated by a lack of macroeconomic policy coordination in the MERCOSUR.

However, in the all-fixed exchange rates constellation of the mid-1990s (Scenario 1 in section 3), trade integration would at least be favoured by monetary expansion in Brazil or by fiscal expansion in Argentina. The difference in the monetary policy regimes may, moreover, have helped to buffer external shocks, as in the case of the Mexican crisis of 1994-95. Yet, these two types of expansionary policies did also contribute to undermining the constellation of intraregionally fixed exchange rates, when the increasing force of external shocks in the wake of the Asian and Russian crises in 1997-98 made the region's currencies look more and more overvalued, thus provoking demands for active stabilization policy.

The underlying asymmetries of policy effectiveness and shock impacts were exacerbated, when Brazil switched to floating in 1999. Now even external shocks had clearly adverse effects on trade integration and the synchronization of economic development in the

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per cent levels, respectively.

region. They worked their way through the two economies in a fashion that made Argentina being hit twice – first by the original shock and thereafter by its repercussions through the depreciation of the Brazilian currency.

The filter analysis and the structural VAR model of section 4 suggest that much of the observable divergence in the pattern of output fluctuation is explained by the above described asymmetries. The lack of macroeconomic policy coordination in the MERCOSUR has led to setbacks in the process of trade integration. The Grubel-Lloyd index of intraindustry trade between Argentina and Brazil shows (at 3 and 4-digit levels of disaggregation) that the shares of intraindustry trade increased up to the year 1997 and declined thereafter. Our corresponding analysis of pseudo panel data suggests that the index is very sensitive to bilateral exchange rate, interest rate differentials and income developments. This conforms with general observations that, since 1999, the depreciation of the Brazilian real and the severe contraction of aggregate demand in Argentina has produced strong negative effects on the productive capacity of the Argentinean economy – an experience that hardly makes a good base for further economic integration. On the contrary, monetary disintegration has spurred conflicts over remaining trade barriers in the region that might otherwise have been eliminated long ago. Argentina has accused Brazil of pursuing a "beggar thy neighbour" policy, but it has finally had to accept that its own policy of "beggaring the IMF" by sticking to the currency board was unsustainable. In January 2002, convertibility law was suspended and the peso quickly lost much of its value against the dollar. Since then, the obstacles to macroeconomic policy coordination and monetary integration in the MERCOSUR may have become smaller. Yet, the monetary disintegration of the past has had so many detrimental effects on the levels and structures of production and trade in the region that the current prospects of economic integration in the MERCOSUR can hardly be considered favourable.

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