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Trade Agreements, Exchange Rate Disagreements

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1. Introduction

The recent events in Mercosur have brought to the forefront the problems that may arise when countries that are partners in Regional Integration Agreements (RIA) have divergent exchange rate policies. The January 1999 devaluation of the Brazilian real strained the relationship between Argentina and Brazil, and set off a series of events. These included protectionist pressures – and protectionist measures – in Argentina, Argentine businesses threatening to relocate – or actually relocating – to Brazil, and additional pressures on the Argentine peso, which contributed to the ultimate demise of convertibility in December 2001.

Developments such as these, however, are not unique to Mercosur. They are typical of the problems that emerge when countries have trade agreements but exchange rate disagreements. Similar developments have occurred repeatedly between Venezuela and Colombia, or even in the European Union after the ERM crisis of 1992. But there is a difference. In Europe, the crisis occurred in spite of –or as a result of the failure of– attempts to coordinate exchange rate policy among member countries.¹ In Mercosur, as in the great majority of regional integration agreements in the Americas and around the world, efforts to coordinate exchange rates have not taken place.²

In this paper, we will examine in detail the problems posed by exchange rate disagreements among countries bound by trade agreements. We will look at the circumstances and the type of regional integration agreement under which these problems may arise, and the policy responses that may help alleviate them. Throughout the discussion of the potential problems, it is important to ask whether there is something special about being members of the same regional integration agreement that makes exchange rate disagreements particularly damaging, or whether similar problems can be expected following devaluation in non-member trading partners.

The classes of problems we will discuss are the following:

Increased protectionism/Scaling back or elimination of trade arrangements: The country that loses competitiveness as a result of a real exchange rate appreciation vis-a-vis its trade partners may resort to increased protectionism. The existence of a regional integration agreement may preclude the country from increasing tariffs within the bloc. As a result, the country may increase protection vis-a-vis the rest of the world, resulting in trade diversion, or it may increase protection vis-a-vis the bloc partners, resorting to less transparent methods such as antidumping or other administrative measures. This last

¹ In the case of the European Economic Community (later European Union), the concern regarding exchange rate coordination was present from the very beginning. The 1957 Treaty of Rome already identified the exchange rate among its member states as a matter of common interest (Eichengreen, 1997). Thirty years before the start of the EMU, with the Bretton Woods system dwindling after the devaluations of the sterling and the French franc, the heads of the EC states announced in 1969 for the first time their desire to move to a monetary union.

² A lot has been written about desirability of exchange rate policy coordination in Mercosur (see, for instance Eichengreen, 1998, Levy-Yeyati and Sturzenegger, 2000 and Zahler, 2000), but not much has been done at a policy level.

course of action defies the objective of increased trade integration within the bloc, an objective that may be hurt further if increased protection brings about retaliation. Countries may also choose to scale back or abandon their trade arrangements.

Reduction in trade flows: Exchange rate disagreements could lead to reduced exports from the country that loses competitiveness to its partner. If the disagreement occurs in the context of a regional integration agreement with high external protection, trade among partners may not reflect true comparative advantage, and it may be difficult for the country that loses competitiveness to redirect at least some of its exports to alternative markets. The protectionist pressures discussed above may also contribute to reduce trade flows.

Relocation of investments: Regional trade arrangements may spark intense competition for the location of investment. Provided there are economies of scale, eliminating trade barriers will induce firms to produce in just one location within the bloc, and serve the extended market from this location. This intensifies competition for FDI. Under these conditions, important swings in the bilateral real exchange rates may have important consequences for the location of new investment, and in many cases may shift the location of existing investment as well. This can result in loss of spillovers, and more unemployment in the country that has lost competitiveness.

Exchange rate crises: The depreciation in one of the partner countries may lead to an exchange rate crisis. In particular, it can reduce the credibility of the partner's commitment to a fixed parity, and can generate speculative attacks on its currency. A country may thus be forced to abandon its preferred exchange rate policy due to the exchange rate disagreement. This problem may be particularly relevant during periods of financial turmoil, when access to financial markets is hindered.

In order to study these problems, we will draw from the experience of 37 countries that belong to six different Regional Integration Agreements: NAFTA, Mercosur, the Central American Common Market, the Andean Community, ASEAN and the European Union.³ Our sample, which covers the period 1989 through 2000, thus includes several South-South regional integration agreements, as well as a North-South one (NAFTA) and a North-North one (the EU). This will allow us to study whether the set of problems identified above are equally relevant for all types of regional integration agreements, or whether they are particularly damaging in some of them. This, in turn, may provide useful insights regarding potential problems and policy issues for the Free Trade Area for the Americas (FTAA). In general, we find that exchange rate disagreements are in fact more costly when they occur among partners in regional integration agreements; they have a greater effect on the balance of payments (both trade and FDI flows), and increase the risk of currency crises.

The rest of the paper is organized as follows: In section 2, we look at the potential impact of exchange rate disagreements on the degree of protectionism. We show how important realignments of the exchange rate can generate pressures to scale back regional

³ The list of countries included in the study is presented in the appendix.

integration agreements, or to impose protectionist measures, which defeat its purpose. In sections 3 through 5, we will discuss the impact of exchange rate disagreements on trade, FDI, and currency crises. In section 6, we discuss a variety of policy issues. The focus will be more on raising the relevant policy questions, and less on providing definitive answers.

2. Exchange Rate Disagreements and Protectionism

One of the reasons why exchange rate disagreements can be damaging to members of regional integration agreements is that they may lead to protectionist pressures that prevent the gains from trade from being realized, thereby defeating the purpose of the RIA. In the context of the European Union, in fact, Eichengreen (1993) has argued that this political economy argument represents the only compelling reason for monetary unification to follow the Single European Act. In his own words:

“...wider exchange rate swings would compound the adjustment difficulties associated with completing Europe’s internal market. If national industries under pressure from the removal of barriers to intra-European trade find their competitive position eroded further by a sudden exchange rate appreciation, resistance to the implementation of the Single European Act would intensify. The SEA might be repudiated. In this sense, and this sense alone, monetary unification is a logical economic corollary of factor- and product-market integration.”

There are plenty of examples of protectionist pressures following large exchange rate swings in the context of the European Union. Perhaps the most notable are those that followed the September 1992 EMS crisis, which gave rise to considerable tensions among the EU member countries. At least partly, these tensions were a response to the relocation of several production plants to the United Kingdom following the depreciation of the sterling. Perhaps the most prominent case was that of Hoover Co., which moved a vacuum cleaner plant from Dijon to Scotland.⁴ France accused the United Kingdom and Italy of harming the overall stability of the European Union. Eichengreen (1993) reports that French public officials went as far as to threaten the British with exclusion from the single market, and even EC Commission president Jaques Delors got into the act, warning the British about the incompatibility of their exchange rate policies with the single market. Several French entrepreneurs (the most vocal being Jacques Calvet, chairman of Peugeot Citroen) started calling for protectionist measures, while Belgium’s Finance Minister, Philippe Maystadt, warned of retaliatory trade actions against countries resorting to competitive devaluations. Another peak in the tensions occurred during the EU summit held in Cannes in June 1995, when French president Jacques Chirac publicly complained that the devaluation of the Italian lira had seriously harmed the traditional export of French products (he explicitly mentioned calves) to Italy.⁶

⁴ Other cases included S.C. Johnson & Son, a US firm which shifted production of household products from France to Britain, and Phillips Electronics, which relocated the production of cathode tubes from the Netherlands to the UK. See Eichengreen (1993) and Eichengreen and Wyplosz (1993).

⁶ See European Dialogue magazine article on European Monetary Integration, Nov-Dec Issue, 1995.

While in his 1993 piece, Eichengreen presents the danger of a protectionist backlash as the main justification for the European Monetary Union, in a more recent paper (Eichengreen, 1997) he argues that this justification does not necessarily carry over to other regional integration agreements such as Mercosur, which is the focus of his study. While Mercosur is an imperfect customs union, the EU is a full-blown single market in which no restrictions on factor flows, no subsidies for domestic industries, and no national preferences for public procurement are allowed. For this reason, the impact of similar currency swings on the profitability of national industries should not be as large in Mercosur as it is in the EU.⁷ Thus, other things being equal, such swings should not result in comparable lobbying for protection and subsidies.⁸ Eichengreen argues that the case of Mercosur would probably be closer to that of NAFTA, where Mexico's 1994 depreciation led to complaints in the United States, but no protectionist measures were adopted. Furthermore, since countries in Mercosur can impose controls on capital mobility that are not allowed in the context of the EU, they should be more able to keep their exchange rates stable.

With the benefit of hindsight, it now seems clear that these arguments have some problems. While it is true that other countries could potentially impose capital controls, the effectiveness of these controls can be limited.⁹ Furthermore, the availability of capital controls in non-EU countries may be more than offset by the much more limited access to financial markets in developing countries, particularly in periods of financial turmoil when capital inflows tend to come to a sudden stop.¹⁰ Therefore, while it remains true that *similar* swings in exchange rates may give rise to less protectionist pressure under conditions of shallow integration, the recent experience shows that exchange rate swings have not really been similar.¹¹ In Figure 1, we compare the evolution of bilateral real exchange rates around episodes of exchange rate disagreements for France relative to the UK, and for Argentina and Uruguay relative to Brazil. Figure 2 compares the evolution of real effective exchange rates in France, Argentina and Uruguay. These exchange rates are centered around September 1992, in the case of France, and around January 1999 in the case of Argentina and Uruguay. The figures show clearly that the real exchange rate realignment was much larger for Argentina and Uruguay, whether we consider the multilateral or the bilateral real exchange rate.

The comparison to NAFTA is not a very useful one. Mexico is very small compared to the United States, whose real effective exchange rate suffered only a minor blip in

⁷ In addition, in the European Union the Common Agricultural Policy (CAP) provides another reason for exchange rate coordination which is absent from other RIAs.

⁸ On the other hand, the EU has much more power to enforce trade rules among its member countries than does a trading agreement such as Mercosur. Thus, more lobbying need not result in more protectionism (see Obstfeld, 1997, p. 271, who makes a similar point comparing the enforcement power of the EU to that of the WTO)

⁹ Edwards (1999) shows that controls on capital outflows tend to introduce major distortions and corruption and are seldom effective. At the same time, controls on capital inflows may lengthen the maturity of foreign debt but are not effective in increasing a country's degree of monetary autonomy.

¹⁰ See Calvo (1998).

¹¹ To be fair, Eichengreen (1997) does predict that in time capital mobility in Mercosur would increase, stabilization of currencies would become more difficult, and protectionist backlash would mount as a result. In turn, this would result in efforts to coordinate exchange rates.

December 1994. In contrast, Brazil is very large in comparison to Argentina and Uruguay. The Brazilian devaluation of 1999 did produce substantial protectionist pressures, as well as a drastic drop in public opinion's support for Mercosur in these countries. While none of the countries has threatened to leave Mercosur, there were talks in Argentina during the recent tenure of Minister Cavallo of scaling the Customs Union back to an FTA, and recently Uruguay, who has been hit by the double whammy of Brazil and Argentina, tried to negotiate an FTA with the United States independently of its Mercosur partners.¹² In what follows, we will discuss some of the protectionist measures adopted by Argentina following the 1999 devaluation of the real.

Protectionism in Argentina Following the Real Crisis¹⁴

Since the Brazilian devaluation of January 1999, Mercosur has been the scene of a great number of disputes that have placed its two largest members in a state of near permanent conflict. In addition to the devaluation of the real, which produced a large swing in the bilateral real exchange rate, there were other factors that contributed to these disputes:

- Contraction of aggregate demand in all Mercosur countries following the depreciation of the Real;
- Elimination of residual tariffs between Argentina and Brazil, as mandated by the transitory "régimen de adecuación," which allowed for a more gradual reduction of tariffs in sensitive sectors;
- Absence in the Mercosur agreements of transitory escape clauses, or other mechanisms that could be invoked in case of strong trade imbalances.

In this context, the Brazilian devaluation generated great concern among Argentine entrepreneurs. In the months following the devaluation, Argentine exports to Brazil collapsed, and fears of an "avalanche" of Brazilian products (which did not materialize) were common among import-competers. One week after the devaluation, the Unión Industrial Argentina was already publicly lobbying for a compensatory tariff mechanism on Brazilian imports, accompanied by drawbacks on exports to Brazil. This, in effect, would have meant having a special exchange rate for commercial transactions with Brazil. While Argentina did not attend to this request by the UIA, it did resort to a variety of protectionist measures in response to the industrial lobbies.

The conflicts and disputes that followed were quite generalized, and involved many sectors.¹⁵ Here we will discuss a few cases, to provide an idea of the type of protectionist pressures and measures involved.

The pork sector: Argentine producers had been complaining for years about Brazilian subsidies for production and export of pork. Following the devaluation of the real, the

¹² These talks of scaling back Mercosur have the support of a variety of academics and policy analysts. See for example Sebastian Edwards recent article in the Financial Times, January 21, 2002.

¹⁴ This section draws heavily on background work by Rozemberg and Svarzman (2002).

¹⁵ See Rozemberg and Svarzman (2002)

Argentine government submitted the case to arbitration, in accordance with the dispute settlement mechanism agreed upon in Mercosur. After an unfavorable ruling, Argentine pork producers asked the government to set sanitary restrictions in order to impede imports of pork from Brazil. The Argentine government instead encouraged producers to reach a private agreement of voluntary export restraints with their Brazilian counterparts. An agreement was not reached, and in March 2000, the Argentine Association of Pork Producers accused their Brazilian counterparts of dumping. They asked for quotas on pork products originating in Brazil, countervailing duties on those imports, and an increase from 15% to 35% in the Common External Tariff for imports of pork products from outside the region. Ultimately, only this last measure was implemented. As a result, the “solution” ended up diverting trade away from other suppliers, in particular Italy and Spain.

The iron and steel sector: This sector had been the center of repeated disputes even before the Brazilian depreciation. However, disputes intensified following the devaluation of the real, which coincided with the end of residual tariffs that protected Argentina firms from more efficient Brazilian producers, and a drop in aggregate demand. In April 1999, the Economics Ministry of Argentina ruled in favor of an anti-dumping demand by Argentina’s Siderar S.A., against the Brazilian Companhia Siderurgica Nacional for imports of hot rolled steel. The measure imposed minimum prices of US\$ 410 per ton, below which other duties would apply. Brazilian Foreign Affairs Minister Lampreia objected to the measure, and threatened to initiate a complaint in the WTO. The Brazilian firm, in turn, presented a formal note to the Argentine President, arguing that at that price, Argentine importers would be able to import cheaper steel laminates from outside producers, even paying for the 15.5% common external tariff. Ultimately, in December 1999, the Argentine Government approved an agreement by which the Brazilian producers would voluntarily agree to limit exports to Argentina and impose minimum prices (between US\$ 325 and US\$ 365 per ton), in exchange for the elimination of anti-dumping duties.

The shoe sector: As a result of its inclusion in the “régimen de adecuación”, this sector had been protected from intra-Mercosur trade since the formation of the customs union. The devaluation of the real, and the end of the “régimen de adecuación” resulted in a substantial surge in Argentine shoe imports from Brazil, which increased nearly 30% with respect to 1998. This, in turn, generated important protectionist pressures on the part of Argentine shoe manufacturers, who requested measures to compensate them for the generous subsidies that, in their view, their Brazilian counterparts enjoyed. While both private sectors were unsuccessfully trying to negotiate voluntary export restraints, the government of Argentina introduced a requirement that all shoes carry a label with information regarding materials used, as well as information about the manufacturer and importer of the shoe. It also introduced a system of import licenses, and allowed up to three months for the approval of the licenses, a measure that in effect would have paralyzed imports of shoes for a while. Brazil reacted immediately, announcing its decision to re-impose license requirements on 400 products of Argentine origin including chemicals, food products and autos. At the same time, it included Argentina among a list of countries whose exporters would be subject to inspections by the Brazilian Secretary

of Sanitary Defense. In the end, cooler heads prevailed, as both governments encouraged their respective private sectors to negotiate a temporary voluntary export restraint.

The above discussion shows that the depreciation of the real generated very substantial protectionist pressures. The exchange rate disagreement elicited very different views from policymakers in each country. In Brazil, the view was that Argentina was mining the playing field with protectionist measures, as a way to defend its questionable exchange rate regime. In Argentina, the view was that Brazil was refusing to take any responsibility for the effects of its devaluation on the rest of the partners. In a way, each blamed the other for the negative effects associated with the incompatibility of their exchange rate policies.

Real Exchange Rate Misalignments and Trade

Most of the literature on the links between exchange rates and trade has focused on the role of exchange rate volatility. In general, studies find that volatility has negative effects on trade, although the impact is quite small, and declining over time.¹⁶ This decline, combined with evidence showing that effects are larger in developing countries has been explained by the growing availability of hedging mechanisms, particularly for developed countries.¹⁷ Currency Unions, on the other hand, have been shown to have large effects on trade.¹⁸ Rather than focusing on the effects of volatility, in this section we focus on the effects of exchange rate misalignments on exports.

The concerns regarding exchange rate disagreements on the part of tradable producers in the country that “suffers” the disagreement is generally two fold: they worry about an avalanche of imports from the depreciating country; and they worry about the effect of the exchange rate swing on their capacity to export. Are these concerns justified? A look at the behavior of bilateral trade during episodes of exchange rate realignments suggests that the concern regarding an avalanche of imports seems unwarranted. Figures 3 through 6 show the evolution of exports between Argentina and Brazil, Uruguay and Brazil, France and the UK, and France and Italy. The pattern is similar in all cases. As expected, exports from the country that loses competitiveness fall quite substantially. However, in none of the cases shown do we see an increase in exports from the depreciating country to its partner. In all cases these exports fall considerably, although in most cases by a smaller percentage, compared to exports in the other direction.¹⁹

The figures also suggest that concerns about export capacity seem to be justified. Exports to Brazil from Argentina and Uruguay fell by 28 percent and 40 percent, respectively. Likewise, exports from France to Italy and the UK fell by 8 percent and 23 percent. But how costly is this reduction in exports? The answer is that it depends. If a country that

¹⁶ See for example Frankel and Wei (1997).

¹⁷ See for example, Panizza, Stein and Talvi (2001)

¹⁸ See Rose (2000), and Glick and Rose (2001)

¹⁹ Exports from the depreciating country may fall due to valuation effects (if prices are set in domestic currency, prices in dollars will fall), to protectionist measures by the partner, or to the recessionary effects of the depreciation on the county's partners.

suffers an exchange rate realignment by a trading partner is able, at a reasonable cost, to shift its exports to other markets, then the consequences for exporters should not be as serious. If, on the contrary, exports to the partner cannot easily be relocated to other markets, exporters will suffer. This suggests that what is crucial is the evolution of total exports, not just bilateral exports, around these episodes of exchange rate disagreements. It is to this matter that we turn next.

Our general focus will be on the impact of real exchange rate misalignments on exports. In particular, we are interested in testing whether a country's misalignment vis-a-vis their RIA partners has a larger impact, other things being equal, than a similar misalignment vis-a-vis nonmembers. In other words, we want to study whether exchange rate disagreements are potentially more harmful among countries with regional integration agreements.

Why would the impact be any different? Our main hypothesis is that Regional Integration Agreements, depending on their nature, can affect the degree to which exports can be relocated in the event of an exchange rate disagreement. By virtue of the preferential access with its RIA partners, it is possible for a country to export goods in which it is not internationally competitive. If suddenly these exports are curtailed due to a depreciation in the RIA partner, it may be very hard to find alternative markets for these goods. Following Bergara et al (1995) and Bevilaqua et al (2001), we label these exports that cannot easily be relocated "regional goods." Consider the case of trade in agricultural products in the European Union, or automobile trade in Mercosur. Argentine car exports to (and from) Brazil are made possible by the preferential access, and by a special regime that translates into high protection on car imports from the rest of the world. It would be hard to argue that Argentina is internationally competitive in cars. If for whatever reason (say, a depreciation) Brazil stops demanding Argentine cars, it will be tough for Argentine producers to find alternative markets. Consider instead a commodity such as oil, another one of Argentina's main exports to Brazil, and a product in which Argentina is internationally competitive. If for whatever reason Brazil's demand for oil declines, oil producers in Argentina will be able to relocate these exports somewhere else, even if this relocation is not costless.²⁰

It should be pointed out that regional goods may also exist in the absence of regional integration agreements. Some goods, such as fresh milk, may only be tradable regionally. Services provided to Argentine tourists in the Uruguayan resort of Punta del Este are a regional good as well. In these cases, the regional character of the goods is due not to preferential access, but to geographical proximity. However, regional integration agreements are likely to increase the importance of regional goods for several reasons. First and foremost, preferential access may create a demand for goods that are not

²⁰ The example of cars and oil in trade between Argentina and Brazil was taken from Bevilaqua et al. (2001) who discuss how the Brazilian devaluation had a very limited impact on Argentina's total oil exports but a large impact on Argentina's automobile exports. Through this channel, these authors show that "regional goods" amplify the transmission of the business cycle in one country to other countries that belong to the same RIA. In particular, they show that the presence of regional goods amplifies the impact on Mercosur of exchange rate and output volatility in Brazil.

internationally competitive, either through trade creation (Argentine cars displacing demand for domestic cars) or trade diversion (Argentine cars displacing Brazil’s imports from Korea). In addition, the regional integration agreement may lead to the adoption of common standards and regulations, or –through its effect on trade – to more taste uniformity among member countries. Either of these factors would make relocation of exports more costly, and thus increase the degree of “regionality” of trade.

If regional integration agreements increase the importance of regional goods, we would expect the elasticity of total exports with respect to exchange rate misalignments to be higher when the source of the misalignment lies within the RIA. To test this hypothesis, we start from a basic model in which a country’s level of total exports depends on the misalignment of its real exchange rate and a set of other controls:

$$\ln(EXP_{i,t}) = \mathbf{a} + \mathbf{b}RER_{i,t} + \mathbf{q} \ln(Y_{i,t}) + a_i + t_t + u_{i,t} \quad (1)$$

Where $EXP_{i,t}$, $RER_{i,t}$, and $Y_{i,t}$ are total exports, multilateral real effective exchange rate misalignment, and total GDP for country i at time t (exports and GDP are measured in current dollars), a_i is a country fixed effect that controls for country specific factors that do not vary over time and t is a time fixed effect that controls for dollar inflation and for the fact that trade has been increasing over time. We compute real exchange rate misalignments as the percentage difference between the actual real exchange rate and the trend exchange rate, using a Hodrick-Prescott decomposition.²²

Equation (1) implicitly assumes that the elasticity of exports with respect to real exchange rate misalignments is independent of the source of the misalignment (within or outside the regional integration agreement). As we are interested in testing whether these elasticities differ, we decompose the multilateral real effective exchange rate misalignment into a within-RIA (or regional) component and an outside-RIA (or non-regional) component as follows:

$$RER_{i,t} \cong w_i R_RER_{i,t} + (1 - w_i) NR_RER_{i,t} \quad (2)$$

²² In particular, $RER_{i,t} = \frac{RE_{i,t} - \overline{RE}_{i,t}}{\overline{RE}_{i,t}}$, where $RE_{i,t}$ is the level of the real exchange rate in country i

at time t and $\overline{RE}_{i,t}$ is the equilibrium level (as predicted by the trend in a Hodrick-Prescott decomposition) of the real exchange rate for country i at time t (this methodology is identical to that used by Goldfajn and Valdés, 1999).

Where w_i is the share of RIA partners in total trade of country i and $R_RER_{i,t}$ and $NR_RER_{i,t}$ are the exchange rate misalignments of country i with respect to regional and non-regional trading partners respectively.²³ Next, we define $REG_{i,t} = w_i R_RER_{i,t}$ and $NOREG_{i,t} = (1 - w_i) NR_RER_{i,t}$. By weighting the regional and non-regional misalignments by their respective shares in total trade, we can interpret $REG_{i,t}$ as the contribution of the regional misalignment to the multilateral misalignment, and $NOREG_{i,t}$ as the contribution of the non-regional misalignment to the multilateral misalignment of country i at time t . We then estimate the following model:

$$\ln(EXP_{i,t}) = \mathbf{a} + \mathbf{b}REG_{i,t} + \mathbf{g}NOREG_{i,t} + \mathbf{q} \ln(Y_{i,t}) + a_i + t_t + u_{i,t}, \quad (3)$$

and test whether $\mathbf{b} > \mathbf{g}$. In other words, we test whether the impact of an overall misalignment originated within the regional integration agreement (\mathbf{b}) is larger than that of a similar overall misalignment originated outside the region (\mathbf{g}).

We estimate equations (1) and (3) using annual data for the 1989-2000 period for a sample of 37 countries that belong to six regional integration agreements. GDP and trade data are from the IMF International Financial Statistics and Direction of Trade Statistics, respectively. The results are reported in Table 1. The first column of the table reports the results obtained by estimating Equation (1) and confirms that real exchange rate misalignments are a statistically significant and quantitatively important determinant of exports. In particular, the results indicate that a 1 percent appreciation is associated with a 0.6 percent decrease in exports. Columns 2 through 4 report the results obtained by estimating Equation (3) and confirm that there are large and significant differences in the effect of regional and non-regional misalignments over exports. Column 2, which includes the whole sample, shows that a one-percentage point contribution of the regional real exchange rate to multilateral appreciation is associated with a significant decrease in exports of approximately 1.4 percent. In contrast, the correlation between non-regional misalignments and exports has the expected sign, but is not significant. The lower panel of Table 1 shows that the difference between the coefficients attached to regional and non-regional misalignments is statistically significant at the ten-percent confidence level.

Next, we split the sample into developed and developing countries. To the extent that regional integration agreements involving countries in the North tend to have lower (common or individual) external tariffs, the preference granted to their RIA partners will be smaller, and the importance of regional goods should be smaller as well. For this reason, we expect the impact of regional misalignments on total exports to be particularly

²³ $R_RER_{i,t}$ and $NR_RER_{i,t}$ are weighted averages of bilateral exchange rate misalignment, with

$\sum_i \mathbf{w}_{fja,i} = 1$ and $\sum_i \mathbf{w}_{nofta,i} = 1$, where $\mathbf{w}_{fja,i}$ and $\mathbf{w}_{nofta,i}$ are weight within and outside RIA respectively. The misalignments are measured as percentage of the multilateral equilibrium level, i.e.,

$$R_RER_{i,t} = \frac{R_RE_{i,t} - \overline{R_RE}_{i,t}}{\overline{RE}_{i,t}}, \text{ and } NR_RER_{i,t} = \frac{NR_RE_{i,t} - \overline{NR_RE}_{i,t}}{\overline{RE}_{i,t}}.$$

large in the case of countries in the South, less so in the North. In Column 3, we restrict the sample to developing countries. The coefficient attached to the regional misalignment is statistically significant and economically important. In this case, a one-percentage point contribution of the regional real exchange rate to multilateral appreciation is associated with a 2.6 percent decrease in exports, much larger than that for the whole sample. The coefficient attached to the non-regional misalignment is not statistically significant, while the difference between the two becomes significant at 5 percent. Column 4 shows that when we focus on developed countries, the coefficient for the regional misalignment is much smaller, and not statistically significant.

Table 1: Exports and Real Exchange Rate Misalignments

Dependent variable: log(exports)	(1)	(2)	(3)	(4)	(5)
	All Countries	All Countries	Developing Countries	Developed Countries	All Countries
Log(GDP)	0.433 (6.89)***	0.433 (6.85)***	0.230 (1.93)*	0.420 (7.30)***	0.429 (6.81)***
Total Misalignment	0.613 (3.09)***				
(a) Regional Misalignment	1.449 (2.19)**				0.602 (1.20)
(b) Non Regional Misalignment	0.347 (1.35)				-0.304 (0.86)
(c) High Protection * Regional Misalignment					2.900 (2.93)***
(d) Low Protection * Regional Misalignment					0.572 (0.72)
Constant	-1.263 (0.81)	-1.255 (0.80)	2.772 (0.98)	-0.010 (0.01)	-1.159 (0.74)
Observations	394	394	208	185	394
Number of	36	36	19	17	36
R-squared	0.79	0.80	0.79	0.91	0.80
<i>Tests on difference between coefficients</i>					
(a)-(b)	1.102 [0.09]*				0.906 [0.09]*
(c)-(d)					2.328 [0.025]**
(c)-(b)					2.579 [0.009]***
(d)-(b)					0.251 [0.39]

Absolute value of t-statistics in parentheses, one tail p-values in brackets. *significant at 10% level; ** significant at 5% level; *** significant at 1% level. Year dummies and country fixed effects included in all regressions not reported

While the results of columns 3 and 4 confirm that regional misalignments are more important for developing countries, they do not provide a direct test of how the presence

²⁵ The one used by Bevilaqua et al (2001), which counts as regional those non-commodity exports from Argentina that are predominantly (more than 50%) exported to Brazil, while adequate for the purposes of that paper, is clearly inadequate for a cross-section exercise like the one we carry out here. With such a rule, for example, nearly all of Mexico's non-commodity exports would be counted as regional.

of regional goods affects the impact of regional misalignments. Ideally, we would like to examine this link directly by building an index of regional goods for each country in the sample. It is not easy, however, to come up with a good index of regionality.²⁵ But if, as we argued above, the presence of regional goods is a function of the degree of preferential access a country has vis-a-vis its RIA partners, then the impact of regional misalignments on total exports should be a function of this preferential access.

In order to test this, we build an index that measures, for each country, the average level of protection of its RIA partners. The index is constructed as follows:

$$P_i = \sum_{j=1}^{n-1} t_{j,1995} \times \frac{trade_{ij}}{\sum_{j=1}^n trade_{ij}}$$

where $trade_{ij}$ is the average trade between country i and country j between 1989 and 2000, $t_{j,1995}$ is the average external tariff of country j in 1995, and n is the number of countries that form the RIA of which country i is a member.²⁶ Data on trade are from the IMF, data on tariffs are from the World Bank.

Next, we compute the sample mean of P_i and generate a dummy variable that assigns a value of one to countries that have RIA partners with average protection above the sample mean, and zero to countries that have partners with average protection below the sample mean. We call this the high protection dummy. Likewise, we also generate a symmetrical dummy variable that takes value one for low protection countries (the low protection dummy).²⁷ Finally, we interact these two dummies with our measure of regional misalignment and estimate Equation (3) with these interactions. The results are presented in Column 5 of Table 1. As expected, we find that regional misalignments are significantly more important for countries with highly protected RIA partners. The results indicate that a one-percentage point contribution of the regional real exchange rate to multilateral appreciation is associated with a 2.9 percent decrease in exports in countries with highly preferential access to their RIA partners and with a 0.6 percent decrease in exports in countries with low preferential access.²⁸ Interestingly, the last row of the table shows that there is no significant difference between the coefficient associated with low-protection regional misalignment and the coefficient associated with non-regional misalignment. These last results are important, because they lend support to the hypothesis that regional goods play an important role in magnifying the impact of exchange rate misalignments within regional integration agreements.²⁹

²⁶ While one would like to have average tariff for the period in question, we were unable to obtain it because of data availability.

²⁷ The following countries were classified as belonging to highly protected RIAs: Argentina, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Paraguay, Peru, Singapore, Uruguay, Venezuela. Notice that, with the exception of Singapore, all these countries are developing countries.

²⁸ In this last case, the coefficient is not significantly different from zero.

²⁹ If the differential effects of regional versus non-regional misalignments were solely due to geographical proximity, we would not have expected different coefficients for the high and low protection cases.

Finally, it is important to keep in mind that the problems a country will face in this regard will be in direct proportion to the size and volatility of its RIA partners. The increase in bilateral trade that results from a RIA will further magnify the consequences of exchange rate disagreements

4. Exchange Rate Disagreements and the Location of Foreign Direct Investment

We have already made reference to the relocation of the Hoover production plant from France to Scotland following the sterling devaluation of September 1992. Similar developments occurred in other episodes of exchange rate disagreements among partners in Regional Integration Agreements. A recent example from Argentina is the move to Brazil of more than 15 auto-parts companies, which took with them 7,000 jobs, about 20% of the sector's total workforce.³⁰ Other closings included Unilever's Compañía Industrial de Conservas Alimenticias (CICA), as well as plastic-container manufacturer Tupperware Corporation. Meanwhile, companies such as Ford, General Motors and Fiat continued to produce domestically, but shifted part of their production to Brazil.

There has been some debate in the literature regarding the potential effects of exchange rates on foreign direct investment. Most of the work in this area was inspired by the spectacular increase in FDI into the US following the depreciation of the dollar in 1985.³¹ While the popular view was just that US assets had become cheaper for foreigners who held most of their wealth in other currencies, Froot and Stein (1991) argue that this is not enough to explain the surge in FDI. In a world of free capital mobility, assets in all currencies should have the same risk-adjusted expected rate of return. Thus, if the dollar is perceived to be below its long-run equilibrium value, the dollar returns on all dollar assets will fall, to compensate the expected appreciation. In order for the returns on a given future stream of income to fall, its price has to increase. As Froot and Stein put it, there would be no "steals" to be had by foreigners.³² In this view, FDI is treated like any other financial asset, whose value should be independent of the exchange rate.

There are, however, a number of channels through which exchange rates can affect FDI. The first one, which maintains the view of FDI as a financial asset, was proposed by Froot and Stein (1991), and is related to the existence of imperfections in capital markets. In particular, informational asymmetries regarding the value of an investment will limit the leverage of firms, making it costly or impossible to fully finance the investment through borrowing. Changes in the real exchange rate affect wealth, and thus borrowing constraints. If foreigners tend to hold relatively more non-dollar assets, a depreciation of

³⁰ The exodus includes the world's largest auto-parts manufacturer, Delphi Automotive Systems Corporation. (See article entitled "Adios, Argentina" in Newsweek, International Edition, January 17, 2000 issue).

³¹ Feenstra (1998) presents data on the surge of FDI flows into the US from the rest of the G-7 countries (see Tables 7 and 8), and provides a useful discussion of the literature linking exchange rates and FDI.

³² They argue that "...if a German has an advantage in purchasing a particular U.S. asset with marks, why can't an American with access to global capital markets borrow marks (at the same opportunity cost as the German) and avail himself of the same advantage?"

the dollar increases their relative wealth, and relaxes their borrowing constraints. This in turn will allow them to acquire more investments abroad.

Blonigen (1997) has proposed an alternative channel for exchange rates to matter. He notes that the acquisition of a firm allows knowledge transfers from the parent company to the subsidiary, but also from the subsidiary to the parent company. This knowledge may take the form of a product or process development. If this technology can be applied by the parent company in its own market, this would lead to a stream of profits in the home market, in domestic currency. If this is so, a depreciation in the target host country will decrease the cost of this stream of revenues. This may explain why a Japanese firm may invest more in US assets following a depreciation of the US dollar, particularly in sectors that are intensive in R&D.

While the last channel seems like a plausible story for FDI between developed countries, it does not fit well with North-South FDI. Firms in the North rarely would acquire a firm in the South in the hope of obtaining a technology to apply in the home country. They usually engage in multinational activity in the South for one of two reasons: either to take advantage of the difference in relative factor endowments in order to reduce overall costs of production (as in the vertical models of FDI) or to serve a protected market that would be too expensive to serve through trade (as in the horizontal models of FDI). In the case of vertical FDI, firms that produce for the world market locate different stages of production in different countries in order to reduce costs. As, other things being equal, the level of the real exchange rate affects the cost of land and labor, a depreciated exchange rate will attract FDI in activities that are intensive in these factors.

In the case of horizontal FDI (which can be thought of as “tariff-jumping”) firms have multiple production facilities producing the same good, with each facility supplying the domestic market. Whether a firm engages in FDI in a particular country will depend on the relative cost of serving this market via trade, or via domestic production. Other things being equal, an exchange rate depreciation in the host country will reduce the cost of producing the good through multinational activity, relative to serving this market through trade.

So far, we have discussed a number of channels through which exchange rate depreciation might increase incoming FDI. These channels suggest that movements in the bilateral exchange rate between two countries will affect the relative amounts of FDI these two countries receive. But a key question of our study has not yet been addressed. Are all “exchange rate disagreements” the same, or are their effects particularly important among countries with trade agreements? Will a country like Argentina suffer more from a depreciation in Brazil, compared to a depreciation in Mexico?

In the case of vertical FDI, in which a firm produces for the world market, a depreciation may favor location in the depreciating country at the expense of all other potential hosts. A depreciation in Brazil, Mexico, or even Malaysia, will make Argentina relatively less attractive as a location of FDI. In the purest case of horizontal FDI, in which each production plant produces for the domestic market, in principle a depreciation should

increase FDI inflows, but this would not necessarily come at the expense of other potential hosts. To the extent that production plants produce only for the domestic market, Mexico or Brazil would receive more FDI if their currency depreciates, but Argentina should in principle not be affected.

The problem with this last argument is that it does not take into account the existence of regional integration agreements, which create an enlarged market protected from the outside world. Provided there are economies of scale, the elimination of trade barriers implicit in the regional integration agreement will induce firms to produce in just one location within the bloc, and serve the extended market from this location.³³ Regional trade arrangements may thus create a space of intense competition for the location of investment. Under these conditions, swings in the bilateral real exchange rates among countries in the bloc, which affect relative costs of production, may have important consequences for the location of new investment, and in many cases may shift the location of existing investment as well. This argument suggests that swings in the real bilateral exchange rate of Argentina vis-a-vis Brazil should have a larger effect on investment in Argentina than similar swings in the exchange rate vis-a-vis Mexico or Malaysia.³⁴ In other words, we expect the elasticity of relative FDI to relative exchange rates to be higher in the case of countries belonging to the same regional integration agreement.

While there is some empirical evidence suggesting that exchange rate movements do affect FDI flows (Froot and Stein, 1991, Blonigen, 1997, and Klein and Rosengreen, 1994), these studies focus on FDI flows between developed countries, and do not study whether the presence of a regional integration agreement affects the relationship between the real exchange rate and FDI. The purpose of this section is to study this last issue empirically, using a sample that includes both developed and developing countries. Thus, we can examine whether common membership in a regional integration agreement has different consequences depending on the nature (North-North, North-South or South-South) of the RIA.

To look at how swings in the real bilateral exchange rate affect the location of FDI, and examine the specific role played by regional integration agreements, we use the following empirical specification:

$$\log\left(\frac{FDI_{i,t}}{FDI_{j,t}}\right) = \mathbf{a} + \mathbf{b} \log\left(\frac{Y_{i,t}}{Y_{j,t}}\right) + \mathbf{q}(OPENNESS_{i,t} - OPENNESS_{j,t}) + \mathbf{g}(NOSAMEFTA_{ij})(RER_{ij,t}) + \mathbf{d}(SAMEFTA_{ij})(RER_{ij,t}) + u_{ij} + \mathbf{e}_{ij,t} \quad (4)$$

Where $FDI_{i,t}$ and $FDI_{j,t}$ are foreign direct investment flows to country i and j at time t . $Y_{i,t}$ and $Y_{j,t}$ are the countries' levels of GDP. $OPENNESS_{i,t}$ and $OPENNESS_{j,t}$ are

³³ For a study of the relationship between RIAs and locations of FDIs see Levy Yeyati, Stein and Daude (2001).

³⁴ Holding size constant.

measures of trade openness for countries i and j . $RER_{ij,t}$ is the bilateral real exchange rate between countries i and j . $NOSAMEFTA_{ij}$ and $SAMEFTA_{ij}$ are dummy variables that take values 0 and 1 depending on whether countries i and j belong to the same regional integration area.³⁵ Finally, u_{ij} is a country-pair specific fixed effect and $e_{ij,t}$ is an error term.

The relative GDPs and the difference in openness are included to control for their effect on relative FDI. We expect the coefficients b to be positive, since larger countries should receive more FDI than smaller ones. The sign of q is ambiguous: in the case of vertical FDI, we would expect FDI to increase with openness, since production in the subsidiary may require imported inputs, which may be produced by the same firm in other locations. In contrast, in the case of the tariff-jumping horizontal variety of FDI, more protection would result in higher FDI. The coefficients we are most interested in, however, are g and d . We expect both to be positive, indicating that a higher (more depreciated) bilateral real exchange rate should lead to higher relative inflows of FDI (from all sources). Furthermore, if changes in the bilateral real exchange rate have, as we argued above, a bigger effect for countries that belong to the same RIA, we also expect to find $\delta > \gamma$.

To test these hypotheses, we use annual data on FDI and GDP in current US dollars for the 1989-2000 period. Bilateral real exchange rates were calculated using nominal exchange rates and the consumer price index. These variables were obtained from the IMF's International Financial Statistics. Openness is defined as exports plus imports over GDP. We use a sample of 37 countries that belong to six regional integration agreements, yielding a sample of 630 country pairs for a total of 6,120 annual observations.

Table 2 reports the results of specification (4). In the first column, we include all country pairs. The results support the hypothesis laid down in the previous discussion. Movements in the real bilateral exchange rate have a much stronger impact among countries with common membership in a RIA. In these cases, a one-percent depreciation of the real bilateral exchange rate increases relative FDI by 1.3 percent. In contrast, among countries not so related, the impact of bilateral exchange rates is not statistically significant.³⁶

In columns (2) through (4), we split the sample according to the type of countries involved. Column (2) restricts the sample to developing countries. With the exception of openness, which in this case is negative and significant, we find results that are qualitatively similar to those of Column 1, although the elasticity for the real bilateral exchange rate in the case of FTA partners is smaller. In this case, a one-percent depreciation is associated with a 0.8 increase in relative FDI. The negative coefficient for openness can be explained by the fact that tariff-jumping FDI is much more prevalent

³⁵ Although we use FTA to name the dummy variable, we are referring to the Regional Integration Agreements mentioned in the introduction, whether they are free trade areas or customs unions. For the purposes of this empirical exercise, we do not distinguish between these different types of trade agreements.

³⁶ The last line in the Table reports that these coefficients are significantly different.

among countries in the South. In column (3), we restrict the sample to North-South pairs. While the estimated elasticity continues to be larger for RIA partners, only the coefficient for unrelated countries is significant, although very small.³⁷ Column 4 presents the results when we restrict the sample to the countries in the North. In this case, the elasticity for FTA partners is very large (1.9) and highly significant. This suggests that while the depreciation of the sterling may lure firms away from France, swings in bilateral real exchange rates may not affect relative inflows of FDI between countries such as France and the US.

Table 2: FDI and RER

	(1)	(2)	(3)	(4)
	All Countries	South-South	North-South	North-North
GDP Difference	1.5169 (16.386)***	1.1501 (5.843)***	1.7225 (13.513)***	2.0372 (10.031)***
Openness Difference	0.001 (1.005)	-0.0127 (6.829)***	0.0036 (2.650)***	0.0143 (6.488)***
a. Same FTA * RER	1.2991 (5.973)***	0.7891 (2.604)***	0.7142 (0.639)	1.8943 (5.234)***
b. Not Same FTA * RER	0.119 (1.174)	0.097 (0.552)	0.304 (2.097)**	0.4806 (1.227)
Constant	-1.8293 (3.690)***	-1.0844 -1.329	-1.7156 (2.385)**	-6.6943 (4.482)***
Observations	6120	1654	3139	1327
Number of pairs	630	171	323	136
R-squared	0.094	0.096	0.127	0.107
<i>Tests on difference between coefficients</i>				
a-b	1.18 [0.000]***	0.69 [0.010]***	0.41 [0.355]	1.41 [0.000]***

Absolute value of t-statistics in parentheses, one tail p-values in brackets. * significant at 10% level ** significant at 5% level; *** significant at 1% level. Year dummies and country fixed effects included in all regressions not reported

Trade Agreements and Currency Crises

In this section we show that regional integration agreements with exchange rate disagreements may be prone to producing strong depreciation pressures and currency crises in their member countries. Once again, the pressure experienced by the Argentine peso after the depreciation of the Brazilian real since the beginning of 1999 is an excellent illustration of this concern. While the currency crisis experienced in Argentina after the recent repeal of the Convertibility Law two years later was caused by a number of factors, including an exchange rate misalignment with the Euro, the sudden misalignment with the real played an important part in weakening the Argentinean peg to the dollar. Europe also has its share of remarkable currency crises springing from close trade partners. For instance, the exit of the Italian lira from the European Monetary System in 1992 was almost immediately followed by the abandonment of the peg by the United Kingdom and caused enormous pressure on the French franc (Buiter et al. 1998).

³⁷ The lack of significance is due to the small number of North-South pairs belonging to the same FTA.

The connection between currency crisis and prior misalignment of the real exchange rate is well established in the empirical literature on leading indicators of crises (see Kaminsky, Lizondo, and Reinhart, 1998, for a survey of studies testing the relevance of real exchange rate misalignments). Goldfajn and Valdés (1997) use a probit model to show that an overvalued multilateral real exchange rate increases the likelihood of a currency crisis under a number of alternative measures of overvaluation and a number of definitions of currency crisis including large nominal depreciation in the spirit of Frankel and Rose (1996), as well as their own definition based on large real depreciation. They also show the consistency of this empirical regularity when crisis episodes are identified by an index combining nominal depreciation and loss of international reserves as in Kaminsky and Reinhart (1999).³⁸

As in the previous sections, our specific question is whether the presence of a regional integration agreement makes this problem any different. Put differently, is the impact of overvaluation on the risk of currency crisis any different when the currency is overvalued with respect to the partners in the regional integration agreement? The analysis and evidence shown in previous sections suggests a positive answer, that is, all else being equal, exchange rate disagreements should have a larger impact on currency crises when these disagreements occur among RIA partners. First, the overall balance of payments impact of a given exchange rate misalignment with respect to a trading partner is larger if it happens within a RIA. This was shown to be true both for trade and for FDI inflows. Second, RIAs constrain the ability of member countries to adjust to an adverse shock to competitiveness by use of import tariffs and other offsetting trade policies. In other words, RIAs enlarge the balance of payments shock of exchange rate overvaluation, and reduce the ability to offset it in ways that diffuse the downward pressure on the currency. This suggests that countries in regional integration agreements with exchange rate disagreements may be more prone to currency crises. Furthermore, the increase in trade that follows the formation of a RIA, be it trade creation or trade diversion, magnifies the significance of this currency crisis bias.³⁹

Our approach to analyze whether overvaluations vis-a-vis RIA partners may be especially risky concerning currency crises builds on Goldfajn and Valdés (1997), in which the probability of a crisis episode in country i at period t ($EP_{i,t}$) is a function of its multilateral real exchange rate misalignment in the period before ($RER_{i,t}$), a set of control variables ($X_{i,t}$) and an error term ($e_{i,t}$):

$$EP_{i,t} = a + bRER_{i,t} + dX_{i,t} + e_{i,t} \quad (5)$$

As in previous sections, to address our question, we decompose the multilateral effective real exchange rate misalignment $RER_{i,t}$ into two components: the contribution of

³⁸ This index attempts to measure the downward pressure on the currency in the spirit of Eichengreen, Rose, and Wyplosz (1996), in which defense mechanisms are also taken into account.

³⁹ If countries belonging to a RIA tend to have high underlying economic volatility, this currency crisis bias would be further enlarged. This is generally the case in developing countries relative to developed countries (see Inter-American Development Bank, 1995), and a fortiori, in South-South RIAs.

countries within the RIA ($REG_{i,t} = w_i R_RER_{i,t}$) and the contribution of countries outside the RIA ($NOREG_{i,t} = (1 - w_i) NR_RER_{i,t}$). We then use an expanded specification to capture the differential effect of within-RIA misalignments on currency crisis:

$$EP_{i,t} = a + bREG_{i,t} + gNOREG_{i,t} + dX_{i,t} + e_{i,t} \quad (6)$$

If the existence of a RIA is irrelevant for the risk of currency crises, then a given exchange rate misalignment should have the same effect, independently of the source of the misalignment (within or outside the RIA). This would imply that $b=g<0$ and the specification collapses to the one in Goldfajn and Valdés based on the overall misalignment (equation 5). If, alternatively, misalignments coming from inside a RIA are riskier, we should obtain $b<g<0$.

As is customary, episodes of currency crisis are identified by a binary variable taking the unit value. In this section, we concentrate on a simple definition of a currency crisis: a country experiences a currency crisis in a given month when its multilateral real exchange rate depreciates by more than either 5% or 10%.⁴⁰ Perhaps surprisingly, this simple and natural definition deviates from most literature, which concentrates on nominal depreciation (Frankel and Rose, 1996, and Kaminsky and Reinhart, 1999). In our view, this traditional approach does not match the real nature of the misalignment under consideration, and adds the unnecessary complication of how to control for inflation to determine what level of depreciation ought to be considered a crisis. An exception is Goldfajn and Valdés (1997), who utilize a definition based on real depreciation. However, they classify as crisis any real depreciation that appears exceptionally large in each country's experience, rather than a uniform threshold across countries like we do. As a result of this definition, every country is imputed a similar number of crises (those depreciation events exceeding 2 standard deviations), irrespective of whether the country is intrinsically stable or in permanent crisis (irrespective of the size of the standard deviation). Our uniform threshold eliminates this element of arbitrariness.⁴¹

The key explanatory variable is the real exchange rate misalignment during the previous month. We start with the customary specification in which misalignment is specified linearly within a probit structure. This linear assumption, however, may not be the most adequate for the problem we face. When the exchange rate is undervalued, for example, we would not expect currency crises to occur. When the exchange rate is grossly overvalued, the degree of overvaluation may mostly reflect itself in the size of crisis

⁴⁰ We use a 2-month window as in Goldfajn and Valdés (1997), so that the two months following a crisis are assigned a missing value to ensure that a spurious second episode is not accounted for. Wider windows do not change results qualitatively.

⁴¹ In our sample, the use of Goldfajn and Valdés (1997) definition of currency crises would include among the episodes of crises observations in which the real exchange rate depreciation was below 1.5% (for example, in Luxemburg). For completeness, in the appendix we report results based on all these alternative definitions of currency crisis.

⁴³ Approximately equal to two standard deviations in the case of the regional misalignment.

rather than its likelihood, which is not reflected in a binary probit model. This would justify using a dummy variable for overvaluation, which would match the binary nature of a currency crisis as modeled. We therefore test the robustness of our results by replacing our regional and non-regional misalignments by dummies that take a value of 1 when the contribution of the regional (or non-regional) overvaluation to the overall misalignment is above 4 percent.⁴³

Table 3 shows results when the thresholds for a real monthly depreciation of the multilateral exchange rate to be classified as currency crisis are 5 and 10 percent, respectively. In each case, we present probit regressions with country fixed effects and three sets of explanatory variables: (i) the multilateral real exchange rate misalignment (columns 1 and 4); (ii) the contribution to the real exchange rate misalignment from countries within and outside the RIA (columns 2 and 5); (iii) the discrete measures of misalignment represented by the dummies described above (columns 3 and 6). All specifications also include two variables that control for access to credit and recent government changes. Access to credit may be relevant because in its absence countries may be unable to cope with depreciation pressures they could otherwise withstand.⁴⁵ For instance, it is unlikely that a developing country would have been able to resist to the pressures mounted against the French franc in the aftermath of the ERM crisis of September 1992.⁴⁶ Furthermore, sudden stops to capital inflows when access is lost imply a significant depreciation of the equilibrium real exchange rate and, correspondingly, an increase in the likelihood of a currency crisis beyond that measured by the misalignment (see Calvo et al, 2002). Recent change of government is a dummy variable taking the value 1 during the first three months of a new government. During this honeymoon period, governments are more prone to devalue without paying political costs.⁴⁷ All results are robust to dropping these two controls.

The regressions with the multilateral real exchange rate misalignment in the first and fourth columns confirm that the effect of this variable, under both definitions of crisis, has the correct sign and is highly statistically significant. It is also substantial in economic terms. In fact, other things being equal, a 10 percent real appreciation is associated with a 100 percent increase in the probability of a crisis (from 2.3 percent to 4.6 percent in the first definition of crisis).⁴⁸ Notice that these are monthly probabilities. A 4.6 percent monthly probability implies a 43 percent probability that a crisis will occur within the next year. Access to credit and change of government always have the expected sign. However, while access to credit is significant only when crises are defined

⁴⁵ Access to credit is a dummy variable that takes the value 0 for developing countries in the years 1989-90 and 1998 onwards when access was generally curtailed. We assume that developed countries have access to credit throughout the sample period.

⁴⁶ Nevertheless, developing countries with highly dollarized economies may resist more fiercely the prospect of a currency crisis in order to avoid widespread domestic financial turmoil, which may result in less frequent but deeper currency crises.

⁴⁷ See Stein and Streb (2000) for evidence that devaluations tend to be delayed prior to elections, and tend to occur after changes in government.

⁴⁸ Figures shown in Table 3 are the marginal effects.

using the 5 percent real depreciation threshold, government change is significant only for the 10 percent crisis definition.

Table 3: Real Misalignments and Currency Crisis, Probit Estimates

	A crisis is a real devaluation greater than 5%			A crisis is a real devaluation greater than 10%		
	(1)	(2)	(3)	(4)	(5)	(6)
(a) Multilateral Misalignment	-0.2288 (8.180)***			-0.127 (6.591)***		
(b) Regional Misalignment		-0.4046 (4.183)***			-0.3388 (3.800)***	
(c) Non-Regional Misalignment		-0.1652 (4.285)***			-0.0598 (2.298)**	
(d) Dummy Regional Misalignment			0.1459 (6.435)***			0.1242 (5.146)***
(e) Dummy Non-Regional Misalignment			0.0719 (7.835)***			0.0457 (6.375)***
(f) Access to foreign credit	-0.0194 (3.040)***	-0.0188 (2.977)***	-0.0172 (2.888)***	-0.0049 (1.075)	-0.0035 (0.868)	-0.0027 (0.845)
(g) Government Change	0.0157 (1.486)	0.0166 (1.563)	0.0162 (1.623)	0.0162 (1.817)*	0.0147 (1.814)*	0.0136 (1.997)*
Observations	3848	3848	3848	2716	2716	2716
Number of groups	28	28	28	19	19	19
Rsquared	0.1368	0.137	0.173	0.1436	0.1577	0.2248
	<i>Tests on difference between coefficients</i>					
(b) - (c)		-0.24 [0.023]**			-0.28 [0.005]***	
(d) - (e)			0.07 [0.069]*			0.08 [0.090]*

The coefficients reported in the table are marginal effects. Absolute value of t-statistics in parentheses, one tail p-values in brackets. * significant at 10% level; ** significant at 5% level; *** significant at 1% level. Year dummies and country fixed effects included in all regressions not reported

When the misalignment contributions are split into its regional and non-regional components (columns 2 and 4), we find that, while both sources of misalignment are statistically significant, the impact of misalignments originated within the RIA is at least twice as large as that originated outside, everything else being equal.⁴⁹ Furthermore, the difference between the coefficients for regional and non-regional misalignments is statistically significant at 2 percent and 1 percent, depending on the definition of crises. Thus, the hypothesis of equal coefficients is rejected.

The results we just described are robust to substituting the continuous measure of misalignment with the discrete measure described above. In particular, column 3 shows that the presence of a large overvaluation with respect to RIA partners increases the probability of a currency crisis by 14 percentage points while a large overvaluation with respect to non-related countries increases the probability of a currency crisis by 7 percentage points. The second part of Table 3 shows that the difference between these two coefficients is significant at the 7 percent confidence level. The results are qualitatively similar when we use the second definition of crisis (column 6).

⁴⁹ Note that the coefficients for the regional and non-regional effects can be compared directly, since the regional and non-regional misalignments are weighted by their respective trade shares. Thus, a similar change in each of these variables represents a similar contribution to the overall misalignment.

Table A1 in the appendix tests the robustness of our results to 8 alternative definitions of currency crisis. For 7 out of 8 of these definitions (the exception being the one labeled “Nominal Goldfajn and Valdes”), the point estimates for the regional misalignment are higher than the point estimates for the non-regional misalignment. Although generally the estimated effect of RIA-originated misalignment is larger than the effects originated elsewhere, the difference is not always statistically significant. This lack of statistical evidence springs from imprecise estimation due to the high collinearity between both sources of misalignment (correlated at 54%) rather than evidence indicating that the effect is negligible. In fact, the evidence certainly supports the hypothesis that adverse effects of within-FTA misalignments on currency crises are rather large.

Policy Issues

The policy issues raised by risks and concerns of regional integration agreements (RIAs) are numerous. Traditional analysis has focused on the traditional trade issues of regional integration agreements, namely the change of trade patterns resulting from a new tariff structure and its welfare implications. The analysis in this document focuses on the problems caused by divergent exchange rates within a preferential trade area, which we show may have significant effects on trade and financial patterns and may have decisive welfare implications.⁵⁰ In fact, exchange rate disagreements may break-up regional integration agreements, so, if for no other reason, they need to be considered very seriously.

Policy issues in connection with risks emerging from exchange rate disagreements can be grouped in three classes: a) unilateral policies countries may choose to protect themselves from vulnerability to RIAs; b) macroeconomic policy coordination among RIA member countries, including the very design of RIAs, to reduce these risks; and c) adequate international financial architecture to support RIAs. In what follows we briefly review these policy issues.⁵¹

Unilateral policies to protect from vulnerability to RIAs

The most direct way to reduce the risks associated with exchange rate disagreements within RIAs is of course for countries to take into account the potential divergence in exchange rate regimes when choosing partners. More generally, the likelihood and the size of the potential exchange rate shock depends on the underlying macroeconomic volatility of the partner and its divergence in terms of fundamentals and policy. In this connection, from the point of view of an individual country, countries with lower volatility (e.g. developed countries) and countries with similar (convergent) exchange rate regimes and similar cyclical macroeconomic patterns would make better partners. Another important consideration may be the term structure and currency composition of financial liabilities in both countries. Differences in the structure of liabilities may lead

⁵⁰ The traditional analysis of preferential trade agreements also falls short in its implications for financial integration and other aspects of economic integration, whose welfare implications may dominate those accounted by traditional trade-related gains.

⁵¹ See also Eichengreen (1997) and Zahler (2000).

countries to respond to common shocks with different policies. A country where most financial liabilities are short-term and denominated in domestic currency is more likely to respond to a shock with a devaluation than a country where most liabilities are denominated in foreign currency. Different debt structures may therefore generate important exchange rate disagreements. Should countries take into account the potential divergence in exchange rates when choosing partners for regional integration agreements? Have they done so in the past?

A vulnerable country can also adapt its policies to reduce vulnerability to its RIAs. A key example would be its exchange rate policy. For example, it could relax or abandon an exchange rate commitment potentially inconsistent with its partners' exchange rate policies. Competitiveness and industrial policy can also be adapted to protect the country against excessive specialization in "regional goods," that is, goods that are difficult to redirect to alternative markets outside the RIA block. As we saw, the tariff preferences in RIAs causes a trade pattern of high concentration in regional goods that exacerbates the impact of exchange rate disagreements within RIAs and likely leads to crisis when countries face exchange rate overvaluation. Special regimes that increase protection vis-a-vis the rest of the world, like the one applied to automobiles within Mercosur, contribute to amplifying the importance of regional goods. The policy question concerning protective policy is whether exporters fully internalize the risk of producing regional goods and their contribution to it. In any event, there is the additional policy issue of what to do in relation to producers of regional goods in the event of a significant depreciation in a partner country. Alleviation of their financial condition may make sense as insurance against external shocks but it may also foster excess production of regional goods. Should countries' revise their exchange rate and industrial policies to reduce vulnerabilities to shocks within RIAs?

Macroeconomic Policy Coordination and the Design of RIAs

The costs and benefits of macroeconomic policy coordination depend not only on trade conditions but also on the degree of factor mobility across borders, both labor and capital. The deeper economic integration, the more macroeconomic policy should be coordinated. A fortiori, the deeper and more comprehensive RIAs are, the more important the question of macroeconomic policy coordination. In this connection, the European Union has always placed great importance on macroeconomic policy coordination. The policy question in our case is: at what point countries in our region ought to move in the direction of European countries and engage in stronger coordination in conjunction with their RIAs? And then, how deep should it be? Should it involve specific outcomes or just policy rules, such as inflation targets? Fiscal deficit and debt limits? Compensatory income transfers between countries?

A key area of coordination emphasized in this paper is exchange rate coordination to avoid harmful misalignments within RIAs, whose substantial effects on trade and FDI, and eventual currency crises have been shown in detail. The Treaty of Rome, under which the members of the European Economic Community committed decades ago to form a customs union, already identified exchange rate consistency as a matter of

common interest. On the other hand, exchange rate coordination implies less monetary independence. What degree of exchange rate coordination is warranted in our region?

On one extreme is the possibility of a monetary union, which would totally eliminate exchange rate misalignments within a RIA. Such monetary union may involve a new currency for the RIA (say a Mercosur currency) or the adoption of the currency of the lead country (say the US dollar in a revised NAFTA or a future FTAA). In the case of a new currency, there is the option of a floating regime, like the Euro, or a fixed regime, linked to a strong currency or currency basket. Short of a monetary union, coordination between national currencies may take the form of consistency with respect to a benchmark currency or basket of currencies so that the bilateral exchange rates within a RIA are limited to a band. At a minimum, RIA members could avoid the coexistence of pegs and floating exchange rate regimes within the RIA. How deep should currency coordination arrangements be? Is there a natural progression in exchange rate coordination in RIAs? What should be the aim concerning the coordination of currency arrangements?

Another critical area of coordination is the institutional design of the RIA itself. The pressure of significant exchange rate misalignments on currencies and on the regional integration agreement itself may be diffused by designing flexible RIAs. For example, the strain on the tradable sector of the country facing sudden depreciation of its partner may be alleviated with a RIA providing for temporary countervailing tariffs and subsidies that would translate into a lower effective bilateral misalignment. Should RIAs contain escape clauses to provide flexibility to adjust to exchange rate misalignments? Similarly, the RIA may include mechanisms to coordinate the provision of incentives to attract FDI. RIAs create an extended space of intense competition for FDI, since the elimination of trade barriers makes it possible to serve the whole extended market from a single location. In the absence of such mechanisms, countries can engage in "beggar thy neighbor" competition in subsidies, which may result in the foreign investors appropriating most of the benefits associated to FDI. Coordination may allow member countries to collectively extract a larger share of these benefits, both during normal times and in the event of exchange rate misalignments.⁵² What kind of institutions should be devised to coordinate policies concerning FDI and other factor flows from abroad?

Supporting International Financial Architecture

Finally, a supporting international financial architecture would facilitate international trade and reduce the risks associated with exchange rate disagreements in RIAs. It is well recognized that there is a common interest in reducing exchange rate instability, of which competitive devaluations are an extreme example. However, global institutions in charge of monitoring and advising on exchange rate matters, such as the International Monetary Fund, have a national scope in dealing with each country's program. Within the bounds of this scope, country programs may support divergent exchange rate regimes within

⁵² Fernández-Arias, Hausmann and Stein (2001) show that optimal coordination involves fine-tuning competition among countries for the attraction of FDI, rather than eliminating it.

RIAs. Would it be advisable to empower global institutions to expand the national scope for the purpose of advising and for program conditionality?

This paper has shown that lack of access to the international capital market increases the probability of a currency crisis. An international financial architecture that ensures international financing to smooth out temporary shocks to trade and limits financial crises, helping the prevention of liquidity crises and resolving efficiently balance of payments crises, would dramatically reduce the frequency and size of exchange rate misalignments within RIAs. In fact, more and more misalignments result from changes to financial conditions, rather than trade conditions. International financial turmoil and sudden stops to capital inflows associated with crises, a frequent experience in the developing world in the last five years, are major causes of significant exchange rate misalignments and subsequent currency crises. There is, therefore, full agreement on the objectives of international financial architecture reform and the strengthening of regional RIAs. The policy question in this case concerns the possible creation of regional institutions to perform some of these tasks while global institutions do not emerge or even afterwards as a supplement. Should regional financial institutions, within the set of member countries or more broadly, be designed to provide liquidity in support of individual central banks in order to avoid unnecessary misalignments?

References

- Bergara, M., Dominioni D., and Licandro J. (1995), 'Un modelo para comprender la 'enfermedad uruguaya''. *Revista de Economía*, Segunda Epoca, 2(2): 39-76, November, Banco Central del Uruguay, Montevideo.
- Bevilaqua, A., M. Catena and E. Talvi. 2001. "Integration, Interdependence, and Regional Goods: An Application to Mercosur." *Economia* 2: 153-207.
- Blonigen, B. 1997. "Firm-Specific Assets and the Link between Exchange Rates and Foreign Direct Investment." *American Economic Review* 87(3): 447-65.
- Buiter, W., G. Corsetti and P. Pesenti. 1998. *Financial Markets and European Monetary Cooperation. The Lessons of the 1992-93 ERM Crisis*. Cambridge, United Kingdom: Cambridge University Press.
- Calvo, G. 1998. "Capital Flows and Capital-Markets Crises: The Simple Economics of Sudden Stops." *Journal of Applied Economics* 1(1): 35-54.
- Calvo, G., A. Izquierdo and E. Talvi. 2002. "Sudden Stops, the Real Exchange Rate and Fiscal Sustainability: Argentina's Lesson." Washington, DC, United States: Inter-American Development Bank.
- Edwards, S. 1999. "How Effective are Capital Controls?" *Journal of Economic Perspectives* 13(4): 65-84.
- Eichengreen, B. 1993. "European Monetary Unification." *Journal of Economic Literature* 31: 1321-1357.
- _____. 1997. "Free Trade and Macroeconomic Policy." In *Trade: Towards Open Regionalism*. S. Burki, G. Perry and S. Calvo, editors. LAC ABCDE Conference, World Bank, Montevideo, Uruguay.
- _____. 1998. "Does Mercosur Need a Single Currency?" Working Paper No. 6821. Cambridge, United States: National Bureau of Economic Research.
- Eichengreen, B. and C. Wyplosz. 1993. "The Unstable EMS." *Brookings Papers on Economic Activity* 1: 51-143.
- Eichengreen, B. A. Rose, and C. Wyplosz. 1996. "Contagious Currency Crisis." NBER Working Paper No. 5681. Cambridge, United States: National Bureau of Economic Research.
- Feenstra, R. 1998. "Facts and Fallacies about Foreign Direct Investment." In M. Feldstein, editor. *International Capital Flows*. Chicago, United States: University of Chicago Press and National Bureau of Economic Research.

- Fernández-Arias, E., R. Hausmann and E. Stein. 2001. "Courting FDI: Is Competition Bad?" XIII Regional Seminar on Fiscal Policy, CEPAL, Santiago, Chile.
- Frankel, J. and A. Rose. 1996. "Currency Crashes in Emerging Markets: An Empirical Treatment." *Journal of International Economics* 41: 351-366.
- Frankel, J. and S. Wei. 1998. Frankel, J. and Wei, S-J. (1998), "Regionalization of World Trade and Currencies: Economics and Politics." in: J. Frankel, editor. *The Regionalization of the World Economy*. Chicago, Illinois, United States: University of Chicago Press.
- Froot, K. and J. Stein. 1991. "Exchange Rates and Foreign Direct Investment: An Imperfect Capital Markets Approach." *Quarterly Journal of Economics* 106: 1191-217.
- Glick R. and A. Rose (2001) "Does a Currency Union Affect Trade? The Time Series Evidence," *European Economic Review*, forthcoming.
- Goldfajn, I. and R. Valdés. 1997. "Are Currency Crises Predictable?" IMF Working Paper No. 97/159. Washington, DC, United States: International Monetary Fund.
- _____. 1999 "The Aftermath of Appreciations." *Quarterly Journal of Economics* 114(1): 229-262.
- Inter-American Development Bank. 1995. *Economic and Social Progress in Latin America, Overcoming Volatility*. Baltimore, United States: The Johns Hopkins University Press.
- Kaminsky, G., S. Lizondo, and C. Reinhart. 1998. "Leading Indicators of Currency Crisis." *IMF Staff Papers* 45: 1-48.
- Kaminsky, G. and C. Reinhart. 1999. "The Twin Crises: The Causes of Banking and Balance-of-Payments Problems." *American Economic Review* 89(3): 473-500.
- Klein, M.W. and N.P. Marion. 1997. "Explaining the Duration of Exchange-Rate Pegs." *Journal of Development Economics* 54: 387-404.
- Klein, M. and E. Rosengreen. 1994. "The Real Exchange Rate and Foreign Direct Investment in the United States." *Journal of International Economics* 36: 373-389.
- Levy Yeyati, E., E. Stein and C. Daude. 2001. "Regional Integration and the Location of FDI." Washington, DC, United States: Inter-American Development Bank. Mimeographed document.

- Levy Yeyati, E., F. Sturzenegger. 2000. "Is EMU a Blue-Print for Latin America?" *Cuadernos de Economía*, Año 37, No. 110: 63-99.
- Obstfeld, M. 1997. "Europe's Gamble." *Brookings Papers on Economic Activity* 2: 241-317.
- Rozemberg R. and G. Svarzman. 2002. "El proceso de integración Argentina-Brasil en perspectiva: conflictos, tensiones y acciones de los gobiernos." Documento elaborado para la División de Integración, Comercio y Asuntos Hemisféricos del Banco Interamericano de Desarrollo.
- Panizza, U, E. Stein and E. Talvi, 2000. "Assessing Dollarization: An Application to Central America and Caribbean Countries", mimeo, IDB.
- Stein, E. and J. Streb. 2000. "Elections and the Theory of Devaluation." Washington, DC, United States: Inter-American Development Bank. Mimeographed document.
- Zahler, R. 2000. "Estrategias para una Cooperación/Unión Monetaria." Coordinación de Políticas Macroeconómicas y Cooperación Monetaria en el MERCOSUR. Foro de Política BID-INTAL, Río de Janeiro.

Table A1: List of Countries and Regional Integration Agreements

FTA	Members
European Union (EU)	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom
North American Free Trade Agreement (NAFTA)	Canada, Mexico, USA
Mercado Común del Sur (MERCOSUR)	Argentina, Brazil, Paraguay, Uruguay
Andean Community	Bolivia, Colombia, Ecuador, Peru, Venezuela
Central American Common Market (CACM)	Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua
Association of Southeast Asian Nations FTA (ASEAN)	Indonesia, Malaysia, Philippines, Singapore, Thailand ¹

¹ Brunei and Vietnam are also members of ASEAN, but data unavailability led to exclude them from the analysis.

Table A2: Real Misalignments and currency crisis, Probit estimates

	Real 2 STD (Goldfajn and Valdes)	2 STD + 5% Real Depreciation	Nominal Goldfajn and Valdes	Modified Nominal Goldfajn and Valdes	Kamisky and Reinhart (Nominal)	Kamisky and Reinhart (Real)	Exchange Rate Regime Changes	Exchange Regime Changes or 5% Nominal Depreciation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) Dummy Weighted Regional Misalignment (5%)	0.1214 (5.419)***	0.11 (5.528)***	0.0611 (3.172)***	0.0707 (3.728)***	0.1124 (3.840)***	0.0445 (1.946)*	0.0292 (2.583)***	0.0668 (2.876)***
(b) Dummy Weighted Non- Regional Misalignment (5%)	0.0569 (7.249)***	0.0456 (6.894)***	0.0741 (8.435)***	0.0508 (6.788)***	0.0351 (4.838)***	0.0161 (1.863)*	0.0111 (3.746)***	0.0224 (4.583)***
(c) Foreign Market Access	-0.0044 (0.937)	-0.0013 (0.389)	-0.0039 (0.749)	-0.0042 (1.012)	-0.0059 (1.521)	-0.0044 (0.836)	-0.0023 (1.283)	0.0009 (0.332)
(d) Government Change	0.0185 (2.435)**	0.0115 (1.895)*	0.0323 (3.532)***	0.0274 (3.300)***	0.0141 (1.906)*	0.0489 (3.083)***	0.0052 (1.728)*	0.0055 (1.133)
Observations	5033	3847	4873	4095	2141	1168	2530	3115
Number of groups	36	27	35	29	15	8	17	22
R-squared	0.1281	0.1936	0.1215	0.1406	0.2114	0.1678	0.1437	0.1555
Number of episodes	108	67	117	74	34	20	21	69
<i>Tests on difference between coefficients</i>								
(a) - (b)	0.0645 [0.096]*	0.0644 [0.089]	-0.013 [0.290]	0.0199 [0.385]	0.0773 [0.119]	0.0284 [0.261]	0.0181 [0.263]	0.97 [0.162]

The coefficients reported in the table are marginal effects. Absolute value of t-statistics in parentheses, one tail p-values in brackets. * significant at 10% level; ** significant at 5% level; *** significant at 1% level. Year dummies and country fixed effects included in all regressions not reported

Figure 1

Bilateral Real Exchange Rates (Month before episode = 100)

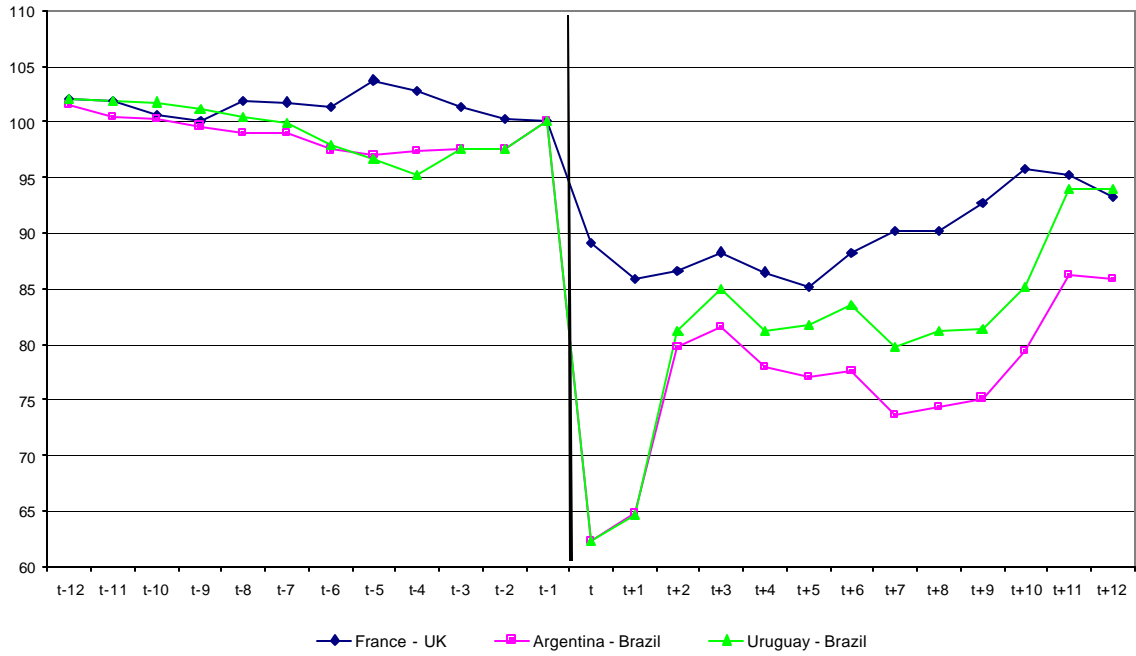


Figure 2

Multilateral RER (Month before episode = 100)

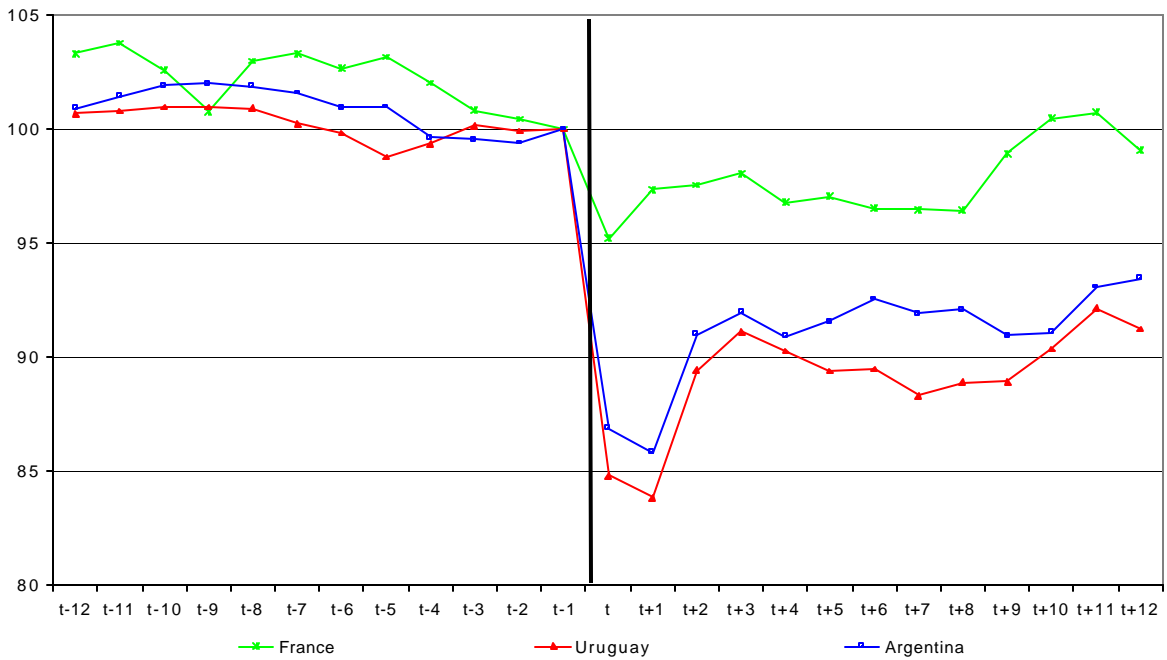


Figure 3

Trade between Argentina and Brazil

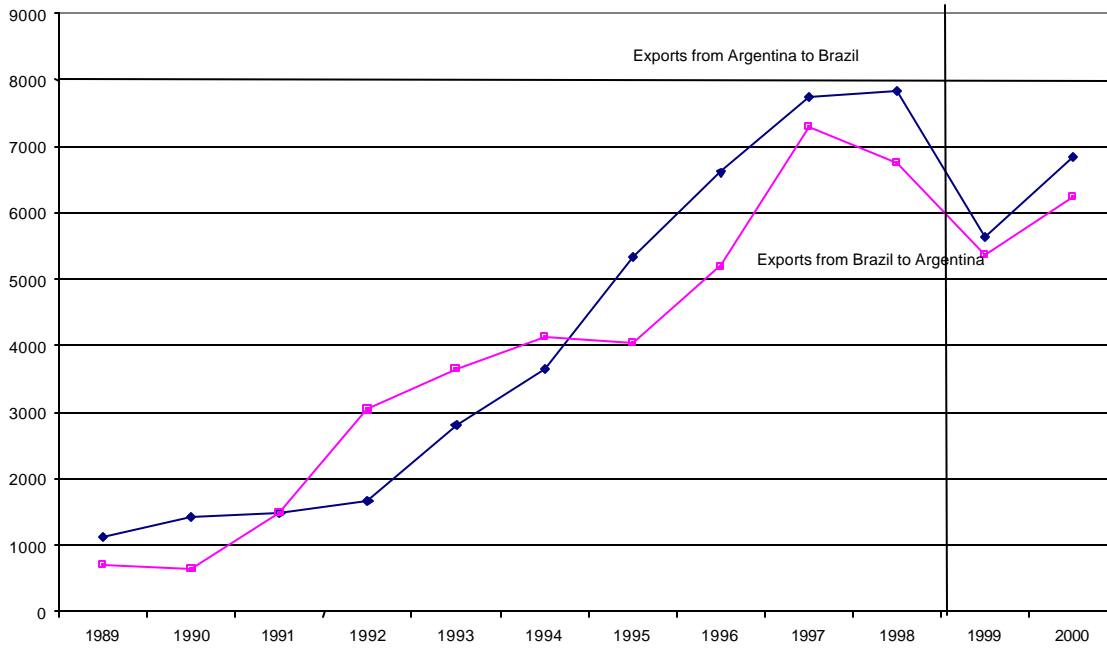


Figure 4

Trade between Brazil and Uruguay

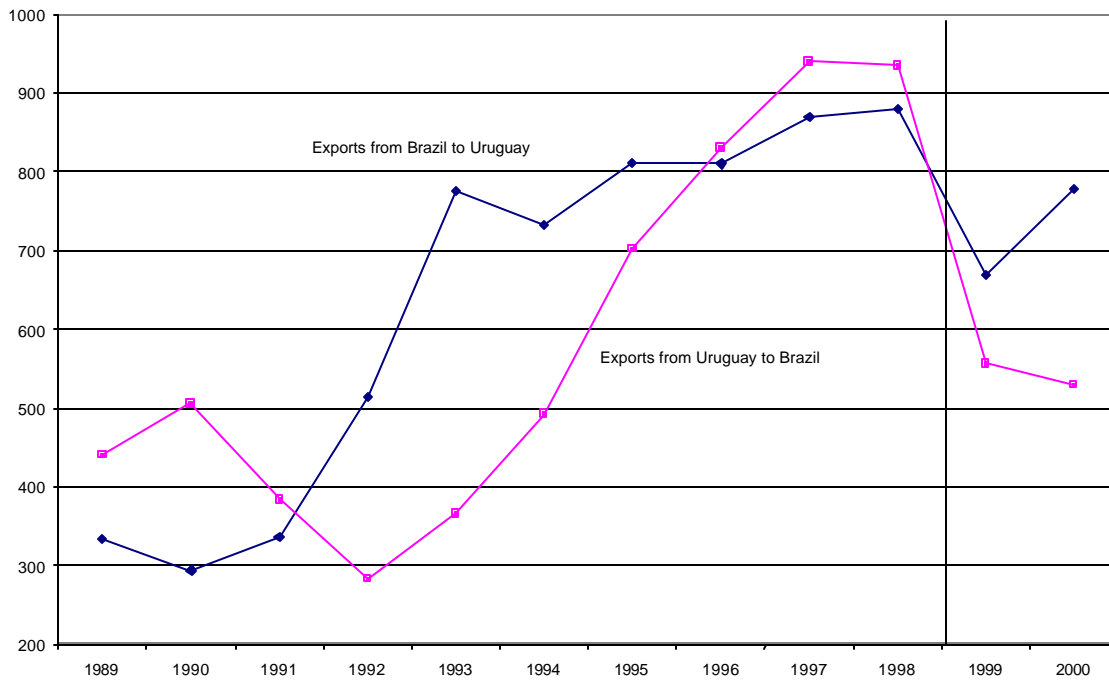


Figure 5

Trade between France and United Kingdom

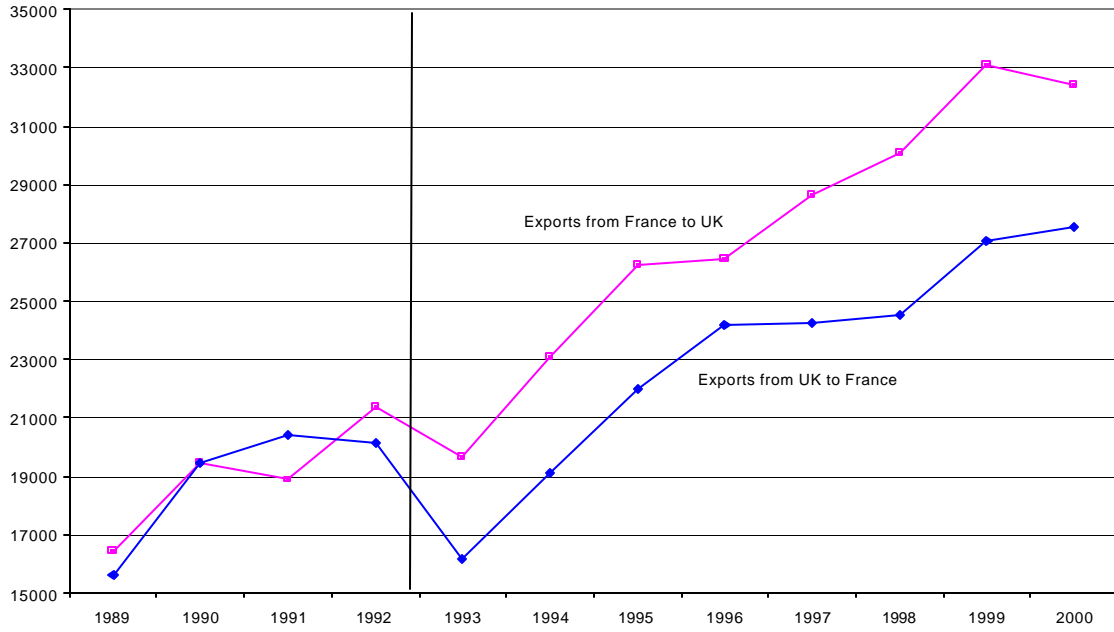
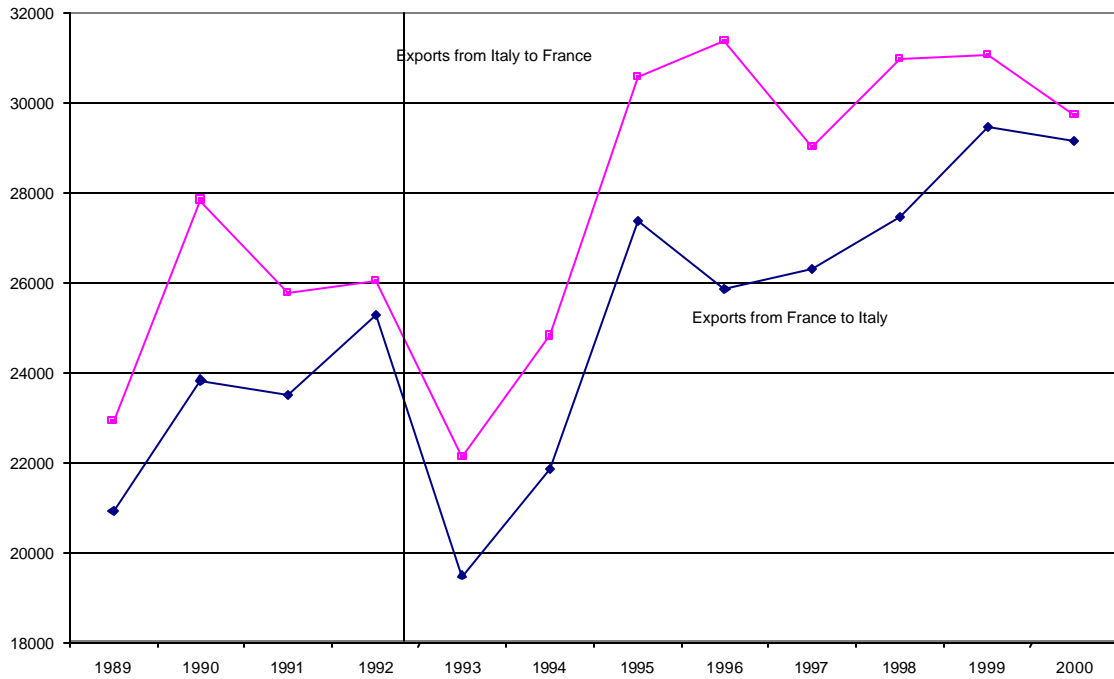


Figure 6

Trade between France and Italy



DEFINITIONS OF CRISES

Real 2 STD (Goldfajn and Valdés) is a dummy variable that takes value 1 when the real monthly depreciation is superior to two standard deviations of the monthly depreciation of the country.

2 STD + 5% Real Depreciation is a dummy variable that takes value 1 when the real monthly depreciation is superior to 5 percent and is greater than two standard deviations of the monthly depreciation of the country.

Nominal Goldfajn and Valdés is a dummy variable that takes value 1 when the nominal monthly depreciation is superior to 2 percent; it is greater than two standard deviations of the monthly depreciation of the country; and it is greater than to a 150 percent the nominal depreciation in the previous month.

Modified Nominal Goldfajn and Valdés is a dummy variable equivalent to the Nominal Goldfajn and Valdés but with a monthly threshold of 5 percent (to be larger than the EMS band limits).

Kaminsky and Reinhart (Nominal) is the weighted average of the monthly rate of change of the nominal exchange rate and the monthly rate of change of the reserves.⁵³

Kaminsky and Reinhart (Real) is equivalent to the Kaminsky and Reinhart with the real exchange rate instead of the nominal exchange rate.

Change in Exchange Rate Regime is a dummy that takes value one when the exchange rate (as classified by the IMF) goes from fixed to floating or from preannounced crawling peg or band to floating.

Change in Exchange Rate Regime or 5% Nominal Depreciation is a dummy that takes value one when there is a change of the exchange rate regime. Furthermore, in regimes that are considered as fixed or preannounced crawling peg or band, the dummy takes value one if there is a nominal depreciation greater than 5% and greater than 150 percent the nominal depreciation in the previous month.

⁵³ As weights we use the inverse of the standard deviations of the each variable for each country in order to reduce the volatility of these measures between them The index is calculated as follows

$$I = \frac{1}{\frac{1}{s_e} + \frac{1}{s_R}} \left[\frac{\frac{\Delta e}{e}}{s_e} - \frac{\frac{\Delta R}{R}}{s_R} \right] \text{ where } e \text{ is the nominal exchange rate, } R \text{ are the reserves, and } \Delta_e \text{ and } \Delta_R \text{ are}$$

the standard deviations of the rate of change of the nominal exchange rate and of the reserves.

