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# Cyclical co- movements in output across **MERCOSUR** countries<sup>1</sup>

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# CYCLICAL CO-MOVEMENTS IN OUTPUT ACROSS MERCOSUR COUNTRIES

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## 1. Introduction.

Preliminary discussions are being held on the prospects of a common currency in MERCOSUR<sup>1</sup>. For any country considering to join a single currency area, the advantages of fixing its exchange rate in terms of the other countries, or of adopting a common currency, must be carefully weighed against the disadvantage of doing so. The benefits of being a member of the area include a reduction in the transaction costs and exchange rate risk associated with trading goods and services between countries with different currencies. Another advantage of fixing the exchange rate is that this variable can be used as a nominal anchor for monetary policy allowing the country to attain a lower level of inflation<sup>2</sup>. The main cost is that entrants will forego the possibility of dampening business cycle fluctuations through independent counter-cyclic monetary policy.

The theory of Optimum Currency Areas, developed initially by Mundell (1961) and McKinnon (1963), remains the workhorse to examine the perspectives of a monetary unification. Contributions to this literature point to characteristics of countries that make stable exchange rate and/or monetary unification more or less desirable. Among the most important of these characteristics are<sup>3</sup>:

- Asymmetric output disturbances between a given pair of countries: the greater the asymmetry of output movements, the higher the value placed on changes in the exchange rate as an instrument of relative price adjustment.
- Dissimilarity of the commodity composition of production and trade: when commodity composition of production and trade is very different across two countries, sector specific shocks are likely to affect them very differently, placing a premium on exchange rate variability.
- Trade linkages: the more two countries trade the more they will value a stable bilateral exchange rate which minimizes relative price disturbances disruptive to commerce between them.
- Size: small countries benefit the most from the unit of account, means of payment and store of value services provided by a common currency or a stable exchange rate link.

In this paper I use as a framework the familiar theory of Optimum Currency Areas. As mentioned before, the adoption of a common currency in MERCOSUR will involve a sacrifice by the countries of monetary autonomy that is potentially all the more serious. However, the weight that should be attached to this argument depends on the incidence of shocks. If disturbances are distributed symmetrically across countries, symmetrical policy responses will suffice. For example, when the region is hit by a negative disturbance, such as a shift in worldwide demand away from the goods it produces, the common monetary authority could respond in the form of a common monetary expansion so that the whole region does not go into recession. Only if disturbances are distributed asymmetrically across countries will there be occasion for an asymmetric policy response and the constraints of monetary union may then be felt<sup>4</sup>.

Accordingly, in this work I focus on the issue of the symmetry of the underlying shocks in MERCOSUR countries. The main features of the aggregate fluctuations in the six countries of the said area are considered, using as a benchmark for comparison data on six countries belonging to the European Union (EU). I explore the direction and magnitude of the co-movements of output across countries and, in addition, study the association of their business cycles decomposing the series in output into cycles of different frequencies. Due to its widespread use in empirical economics, the Hodrick-Prescott filter is applied to mechanically decompose the individual series into a trend movement and a cyclical component. Correlation analysis is then used to summarize the extent to which the cyclical components exhibit co-movements across countries. Similarly, developments over time in the synchronization of the series cyclical component are examined on the basis of the contemporaneous cross correlation coefficients for rolling 10-year periods.

The remainder of the paper is organized as follows: Section 2 examines the raw data in output and calculates some simple statistics to analyze the volatility and correlation among countries of the original series. Section 3 employs methods of current business cycle research to determine the degree of cyclical co-movements between countries while Section 4 explores the hypothesis that the synchronization of business cycles is linked to lower exchange rate volatility. Finally, Section 5 presents some conclusions.

## 1. Preliminary look at the data.

A first glance in the asymmetry between the different economies in the MERCOSUR area can be obtained by analyzing unprocessed data from the countries. Annual data on real GDP, spanning the period 1970-1998, were obtained from the International Monetary Fund's *DataBase* for the countries considered. For each country, the rate of growth of GDP is calculated as the first difference of the logarithm of real GDP. Additionally, data for GDP by sector was taken from the *Boletín Estadístico del Mercosur* and from the Central Bank of Bolivia and Chile.

SECTORS	ARG	BOL	BRA	CHL	PAR	URU
AGRICULTURE	7,3	14,0	8,4	6,5	27,4	8,5
MINING	3,0	19,1	0,6	6,9	0,5	0,3
INDUSTRY	24,8	16,7	20,3	18,6	14,1	17,8
ELECTRICITY & WATER	2,3	2,0	2,8	2,9	5,6	4,6
CONSTRUCTIONS	6,3	4,7	10,3	7,6	5,4	4,9
PUBLIC ADMINISTRATION	4,8	9,0	15,5	3,6	5,7	10,2
TRANSPORTATION & COM.	5,3	10,9	5,6	7,4	5,0	7,3
COMMERCE & SERVICES	46,2	23,6	36,5	46,5	36,3	46,4

Kenen (1969) highlighted the degree of industry or product diversification as a determinant of the symmetry of disturbances. He argued that when two regions (countries) are highly specialized in the production of distinct goods, the prices of which are affected very differently by disturbances, asymmetric shocks are more likely than when two regions have the same industrial structure and produce the same goods. This author also pointed out that a region (country) may not suffer much from being part of a currency area if it has a highly diversified economy. The reason is that a diversified region (country) is unlikely to suffer the large idiosyncratic shocks that would make exchange rate adjustment vital.

Table 1 presents the composition of the economy for MERCOSUR countries. It is clear from the data that the structure of the economies is very different. For example, in Brazil and Argentina the industrial sector is very important accounting for more than 20% of the GDP in a given year. On the other hand, the agricultural sector in Paraguay and Bolivia explains 27.4% and 14% of the GDP in these countries respectively. In addition, the mining sector is an important one for Bolivia and Chile (19.1% and 6.9% of GDP), while in other countries the contribution of this sector to GDP is almost negligible. Thus, considering the dissimilarities in the structure of these economies, an international price shock on agricultural products may be very important for Paraguay, where exports of soybeans and cotton represent more than 60% of exports. Nevertheless, the same shock may not be as harmful to Brazil and Argentina, whose productions and exports are more diversified; or to Chile, where the agricultural sector accounts for only 6.5% of total GDP. This is a first indication that MERCOSUR may not be a good candidate to have an optimal currency area.

Consider next data on the growth rate of real GDP for the period 1970-1998. Table 2 shows standard deviations and correlation coefficients for the growth in output across the six countries of MERCOSUR, considering the full data period and also ten years intervals. Correlations are measured with respect to Brazil, the largest economy in the zone. To assess the magnitude of disturbances on these economies, a standard of comparison is required. Table 2 also presents the same statistics for six countries of the European Union. Italy and five other countries regarded by Bayoumi and Eichengreen (1993) as the "core" members of the Union: Belgium, Denmark, France, Germany and Netherlands. Correlations for these countries are measured with respect to Germany, the largest economy in Europe and a country that has played the anchor role in the exchange rate mechanism implemented by the European Monetary System.

TABLE 2						
OUTPUT GROWTH VOLATILITY AND CORRELATIONS						
MERCOSUR COUNTRIES						
	<u>ARGENTINA</u>	<u>BOLIVIA</u>	<u>BRAZIL</u>	<u>CHILE</u>	<u>PARAGUAY</u>	<u>URUGUAY</u>
<u>Standard Dev.</u>						
1970-98	0,051	0,031	0,042	0,064	0,036	0,041
1970-79	0,044	0,017	0,034	0,072	0,021	0,027
1980-89	0,049	0,028	0,045	0,072	0,043	0,057
1990-98	0,045	0,010	0,023	0,027	0,015	0,029
<u>Correlation with BRA</u>						
1970-98	0,094	0,326	1,000	-0,075	0,444	0,120
1970-79	0,085	0,116	1,000	-0,121	-0,295	-0,696
1980-89	0,130	0,111	1,000	0,321	0,216	0,483
1990-98	-0,116	0,354	1,000	0,038	0,636	-0,111
EUROPEAN COUNTRIES						
	<u>BELGIUM</u>	<u>DENMARK</u>	<u>FRANCE</u>	<u>GERMANY</u>	<u>ITALY</u>	<u>NETHERLANDS</u>
<u>Standard Dev.</u>						
1970-98	0,020	0,019	0,016	0,026	0,020	0,016
1970-79	0,024	0,023	0,017	0,021	0,026	0,017
1980-89	0,019	0,020	0,012	0,015	0,012	0,017
1990-98	0,015	0,015	0,012	0,039	0,011	0,010
<u>Correlation with GER</u>						
1970-98	0,447	0,246	0,384	1,000	0,417	0,493
1970-79	0,725	0,844	0,841	1,000	0,755	0,689
1980-89	0,520	0,142	0,479	1,000	0,724	0,930
1990-98	0,322	-0,238	0,182	1,000	0,296	0,149

For the full period, the data shows that volatility in the MERCOSUR countries have been higher than in European countries. Bolivia and Paraguay are the countries with the lowest standard deviation (with 0.031 and 0.036 respectively), all other values for this statistic are above 0.04. However, the growth rates of real GDP in the EU countries have standard deviations below 0.03 and only Germany has a value above 0.20. On the other hand, the correlation coefficients reveal that output growth was much more highly correlated across EU countries than among MERCOSUR ones. In the EU region all the coefficients, but the one for Denmark, are close to 0.4 while the only country in the MERCOSUR area with a value higher than 0.4 is Paraguay (0.44). This coefficient is even negative for Chile.

Consider now the stability of these correlations and volatilities over time. I examine this issue by breaking the sample in ten years periods. The data indicates that output fluctuations in MERCOSUR countries have generally been bigger (across all countries) during the eighties than during any other ten years period. The findings also show that for most countries, and certainly for the average, volatility of the growth rate of GDP reached its lowest value during

the nineties. The average standard deviation was 0.036, 0.049 and 0.025 in the seventies, eighties and nineties respectively. On the contrary, EU countries presented a lower degree of volatility in their growth rates: only during the nineties, and for Germany, the coefficient was above 0.03. The average standard deviations for the six countries belonging to EU considered were 0.021, 0.016 and 0.017 during the three periods considered. Again, for most countries, volatility of the GDP growth rate reached its lowest value during the nineties.

Regarding the output co-movements, output growth was not highly correlated during any period in MERCOSUR as revealed by the correlation coefficients. Only in one period (1990-98), and for one country (Paraguay), this coefficient was above 0.50. In most countries output correlations with Brazil were lower during the nineties, period marking the beginning of MERCOSUR, than in previous periods. This is specially striking for Argentina, the other big partner in the area, with a negative correlation coefficient of -0.12 during the nineties, a period where there was a huge increase in trade between the two countries<sup>5</sup>. Similarly, for all EU countries this statistic was significantly lower during the nineties. The fact that the correlation coefficient declined for all the countries considered, suggests it was Germany which moved out of line during this period.

I have also calculated an alternative measure for asymmetric output disturbances by estimating the parameter  $\gamma_{ij}$ , defined as the standard deviation of the difference in the growth rate of GDP between countries  $i$  and  $j$ ,  $SD(\Delta y_i - \Delta y_j)$ . Thus, for countries where business cycles are symmetric and national output move together, the value of this measure will be small. Table 3 and 4 present the parameter  $\gamma_{ij}$  estimated using the full period and intervals of ten years for both MERCOSUR and EU countries.

<b>TABLE 3</b>					
<b>PARAMETER GAMMA – MERCOSUR COUNTRIES</b>					
<b>1970-1998</b>					
	<b>ARGENTINA</b>	<b>BOLIVIA</b>	<b>BRAZIL</b>	<b>CHILE</b>	<b>PARAGUAY</b>
<b>ARGENTINA</b>	0,000				
<b>BOLIVIA</b>	0,054	0,000			
<b>BRAZIL</b>	0,063	0,043	0,000		
<b>CHILE</b>	0,075	0,068	0,079	0,000	
<b>PARAGUAY</b>	0,068	0,038	0,042	0,057	0,000
<b>URUGUAY</b>	0,054	0,042	0,055	0,058	0,047
<b>1970-1979</b>					
	<b>ARGENTINA</b>	<b>BOLIVIA</b>	<b>BRAZIL</b>	<b>CHILE</b>	<b>PARAGUAY</b>
<b>ARGENTINA</b>	0,000				
<b>BOLIVIA</b>	0,050	0,000			
<b>BRAZIL</b>	0,053	0,036	0,000		
<b>CHILE</b>	0,076	0,083	0,083	0,000	
<b>PARAGUAY</b>	0,047	0,036	0,045	0,057	0,000
<b>URUGUAY</b>	0,058	0,034	0,056	0,078	0,028
<b>1980-1989</b>					
	<b>ARGENTINA</b>	<b>BOLIVIA</b>	<b>BRAZIL</b>	<b>CHILE</b>	<b>PARAGUAY</b>
<b>ARGENTINA</b>	0,000				
<b>BOLIVIA</b>	0,064	0,000			
<b>BRAZIL</b>	0,062	0,050	0,000		
<b>CHILE</b>	0,090	0,054	0,072	0,000	
<b>PARAGUAY</b>	0,078	0,030	0,055	0,053	0,000

URUGUAY	0,066	0,049	0,053	0,044	0,050
		<u>1990-98</u>			
	<b>ARGENTINA</b>	<b>BOLIVIA</b>	<b>BRAZIL</b>	<b>CHILE</b>	<b>PARAGUAY</b>
ARGENTINA	0,000				
BOLIVIA	0,049	0,000			
BRAZIL	0,053	0,021	0,000		
CHILE	0,046	0,034	0,035	0,000	
PARAGUAY	0,052	0,017	0,018	0,026	0,000
URUGUAY	0,028	0,035	0,039	0,037	0,040

<b>TABLE 4</b>					
<b>PARAMETER GAMMA – EUROPEAN COUNTRIES</b>					
<u>1970-1998</u>					
	<b>BELGIUM</b>	<b>DENMARK</b>	<b>FRANCE</b>	<b>GERMANY</b>	<b>ITALY</b>
BELGIUM	0,000				
DENMARK	0,023	0,000			
FRANCE	0,011	0,022	0,000		
GERMANY	0,025	0,028	0,025	0,000	
ITALY	0,013	0,022	0,013	0,025	0,000
NETHERLANDS	0,014	0,020	0,013	0,023	0,016
<u>1970-1979</u>					
	<b>BELGIUM</b>	<b>DENMARK</b>	<b>FRANCE</b>	<b>GERMANY</b>	<b>ITALY</b>
BELGIUM	0,000				
DENMARK	0,022	0,000			
FRANCE	0,012	0,019	0,000		
GERMANY	0,017	0,012	0,011	0,000	
ITALY	0,017	0,024	0,017	0,017	0,000
NETHERLANDS	0,011	0,021	0,007	0,015	0,017
<u>1980-1989</u>					
	<b>BELGIUM</b>	<b>DENMARK</b>	<b>FRANCE</b>	<b>GERMANY</b>	<b>ITALY</b>
BELGIUM	0,000				
DENMARK	0,029	0,000			
FRANCE	0,014	0,025	0,000		
GERMANY	0,017	0,023	0,014	0,000	
ITALY	0,011	0,023	0,012	0,010	0,000

NETHERLANDS	0,019	0,023	0,017	0,007	0,013
<b>1990-1998</b>					
	<b>BELGIUM</b>	<b>DENMARK</b>	<b>FRANCE</b>	<b>GERMANY</b>	<b>ITALY</b>
<b>BELGIUM</b>	0,000				
<b>DENMARK</b>	0,015	0,000			
<b>FRANCE</b>	0,007	0,016	0,000		
<b>GERMANY</b>	0,037	0,045	0,039	0,000	
<b>ITALY</b>	0,008	0,012	0,009	0,037	0,000
<b>NETHERLANDS</b>	0,009	0,015	0,006	0,039	0,009

For the full period, data reveals that MERCOSUR countries do not have a close business cycle conformance. The value of the parameter  $\gamma_{ij}$  is usually, for any two pair of countries, higher than 0.04 with a maximum value of 0.079 for Brazil and Chile. The exceptions are Bolivia and Paraguay, which have a parameter value of 0.038. On the other hand, business cycles have been more synchronized across EU countries. In these cases the parameter  $\gamma_{ij}$  presents values lower than 0.03 for any pair of countries  $i$  and  $j$ , with a maximum value of 0.028 when considering Germany and Denmark.

The same conclusions are reached when examining the behavior of the parameter gamma in ten-year intervals. For MERCOSUR countries, dissimilarities of business cycles have been usually lower during the nineties than during any other ten-year period. In average, the value of the parameter  $\gamma_{ij}$  was 0.055, 0.060 and 0.038 during the seventies, eighties and nineties respectively. In comparison, business cycles correlations have been higher in EU countries as reflected by the value of  $\gamma_{ij}$  that have an average of 0.017, 0.019 and 0.020 during each of the three periods considered. Again, during the nineties Germany seems to have moved out of line with respect to other countries in the region<sup>6</sup>.

The analysis of the statistics estimated in this section, reveals that output disturbances have been more asymmetrically distributed across MERCOSUR economies than among EU ones. This finding underscores the possibility that MERCOSUR countries may find it more difficult to operate a monetary union than the European Union.

### 3. Business cycles fluctuations across countries.

In this part of the paper I employ the methodologies of current business cycle research, so as to explore the direction and magnitudes of the co-movements of the economies in the MERCOSUR area. For a particular economic variable, long-term developments are reflected in the trend of the variable while cyclical movements are determined as short-term deviations from this trend. Nevertheless, it can prove difficult in practice to distinguish between trend and cycle, thus studies of the business cycles still face the basic problem of how to isolate those features in the data that are associated with long-term growth and those related with business cycles.

Accordingly, I employ the well-known Hodrick-Prescott (HP) filter in order to decompose each of the time series in output into a trend component and a cyclical component. The HP filter is applied to the logarithm of the series and the smoothing parameter  $\lambda$  is set equal to 100, a number commonly used for annual data.



<b>TABLE 5</b>						
<b>BUSINESS CYCLES VOLATILITY</b>						
<b>HP FILTER – LOG</b>						
	<b>BELGIUM</b>	<b>DENMARK</b>	<b>FRANCE</b>	<b>GERMANY</b>	<b>ITALY</b>	<b>NETHERLANDS</b>
<b>Standard Dev.</b>						
<b>1970-98</b>	0,018	0,019	0,015	0,028	0,016	0,016
<b>1970-79</b>	0,019	0,017	0,015	0,019	0,017	0,017
<b>1980-89</b>	0,018	0,022	0,014	0,020	0,018	0,015
<b>1990-98</b>	0,014	0,016	0,014	0,035	0,012	0,011
	<b>ARGENTINA</b>	<b>BOLIVIA</b>	<b>BRAZIL</b>	<b>CHILE</b>	<b>PARAGUAY</b>	<b>URUGUAY</b>
<b>Standard Dev.</b>						
<b>1970-98</b>	0,042	0,036	0,037	0,059	0,038	0,045
<b>1970-79</b>	0,036	0,039	0,038	0,067	0,028	0,032
<b>1980-89</b>	0,039	0,042	0,045	0,072	0,056	0,068
<b>1990-98</b>	0,050	0,009	0,021	0,019	0,012	0,020

Tables 5 to 7 present the results for both regions. Consider first the volatility of the output cyclical component. The calculations show that volatility in MERCOSUR countries has been higher than in European ones. When analyzing the full period, the lowest standard deviations in the first region are for Bolivia, Brazil and Paraguay (0.036, 0.037 and 0.038 respectively). At the same time, the highest coefficient among European countries is for Germany (0.028), all other values are below 0.02. In addition, it is clear that volatility has been much lower in both regions during the nineties than in any other period, the exceptions being Argentina and Germany.

Regarding the pattern of correlation among the series, statistics reveal that in MERCOSUR countries co-movements of outputs are not usually high. Specifically, when considering the full period, neither Argentina nor Brazil shows a correlation coefficient above 0.5 with any other country. In the region, the smallest countries seem to be more integrated. However, data analyzed by shorter periods reveals that co-movements of the series during the eighties explain the largest part of the correlation of output among countries in the full period. For example, during the most recent period the correlation coefficient is above 0.5 only for the pairs Bolivia-Brazil, Brazil-Paraguay and Argentina-Uruguay. In EU countries output correlations are generally much higher but the degree of co-movement is more pronounced in subgroups of countries: Belgium, France, Italy and Netherlands. Denmark appears to be the less integrated of the economies since it co-moves negatively with two other countries and its highest correlation coefficient is only 0.23.

A question that may arise is if there have been changes in the output co-movements over time. One possible explanation for the low correlations found previously is that they reflect the low co-movement from earlier periods. Figure 1 and 2 illustrate the correlation coefficients between cyclical components compiled for rolling 10-year periods. Similar findings are obtained for rolling periods of shorter length.

<b>TABLE 6</b>					
<b>BUSINESS CYCLES CORRELATIONS – HP FILTER</b>					
<b>1970-1998</b>					
	<b>BELGIUM</b>	<b>DENMARK</b>	<b>FRANCE</b>	<b>GERMANY</b>	<b>ITALY</b>
<b>BELGIUM</b>	1,000				
<b>DENMARK</b>	0,014	1,000			
<b>FRANCE</b>	0,896	-0,040	1,000		
<b>GERMANY</b>	0,483	-0,219	0,483	1,000	
<b>ITALY</b>	0,755	0,101	0,727	0,388	1,000
<b>NETHERLANDS</b>	0,772	0,234	0,719	0,508	0,637
<b>1970-1978</b>					
	<b>BELGIUM</b>	<b>DENMARK</b>	<b>FRANCE</b>	<b>GERMANY</b>	<b>ITALY</b>
<b>BELGIUM</b>	1,000				
<b>DENMARK</b>	0,606	1,000			
<b>FRANCE</b>	0,863	0,742	1,000		
<b>GERMANY</b>	0,597	0,885	0,863	1,000	
<b>ITALY</b>	0,578	0,520	0,677	0,737	1,000
<b>NETHERLANDS</b>	0,808	0,579	0,838	0,702	0,583
<b>1980-89</b>					
	<b>BELGIUM</b>	<b>DENMARK</b>	<b>FRANCE</b>	<b>GERMANY</b>	<b>ITALY</b>
<b>BELGIUM</b>	1,000				
<b>DENMARK</b>	-0,402	1,000			
<b>FRANCE</b>	0,897	-0,530	1,000		
<b>GERMANY</b>	0,541	-0,468	0,275	1,000	
<b>ITALY</b>	0,913	-0,180	0,782	0,460	1,000
<b>NETHERLANDS</b>	0,655	0,191	0,432	0,490	0,804
<b>1990-98</b>					
	<b>BELGIUM</b>	<b>DENMARK</b>	<b>FRANCE</b>	<b>GERMANY</b>	<b>ITALY</b>
<b>BELGIUM</b>	1,000				
<b>DENMARK</b>	-0,047	1,000			
<b>FRANCE</b>	0,953	-0,219	1,000		
<b>GERMANY</b>	0,344	-0,684	0,328	1,000	
<b>ITALY</b>	0,898	0,038	0,844	0,265	1,000

NETHERLANDS	0,934	-0,052	0,950	0,194	0,792
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TABLE 7					
BUSINESS CYCLES CORRELATIONS - HP FILTER					
<u>1970-1998</u>					
	<u>ARGENTINA</u>	<u>BOLIVIA</u>	<u>BRAZIL</u>	<u>CHILE</u>	<u>PARAGUAY</u>
ARGENTINA	1,000				
BOLIVIA	0,224	1,000			
BRAZIL	0,302	0,410	1,000		
CHILE	0,083	0,277	0,142	1,000	
PARAGUAY	-0,070	0,550	0,102	0,733	1,000
URUGUAY	0,235	0,511	0,369	0,603	0,673
<u>1970-1979</u>					
	<u>ARGENTINA</u>	<u>BOLIVIA</u>	<u>BRAZIL</u>	<u>CHILE</u>	<u>PARAGUAY</u>
ARGENTINA	1,000				
BOLIVIA	0,416	1,000			
BRAZIL	0,686	0,747	1,000		
CHILE	-0,001	-0,326	-0,305	1,000	
PARAGUAY	0,019	0,157	-0,269	0,591	1,000
URUGUAY	-0,171	0,394	-0,203	0,126	0,788
<u>1980-89</u>					
	<u>ARGENTINA</u>	<u>BOLIVIA</u>	<u>BRAZIL</u>	<u>CHILE</u>	<u>PARAGUAY</u>
ARGENTINA	1,000				
BOLIVIA	0,102	1,000			
BRAZIL	0,243	0,196	1,000		
CHILE	0,118	0,837	0,554	1,000	
PARAGUAY	-0,024	0,975	0,250	0,887	1,000
URUGUAY	0,281	0,564	0,690	0,888	0,734
<u>1990-98</u>					
	<u>ARGENTINA</u>	<u>BOLIVIA</u>	<u>BRAZIL</u>	<u>CHILE</u>	<u>PARAGUAY</u>
ARGENTINA	1,000				
BOLIVIA	0,407	1,000			
BRAZIL	-0,074	0,520	1,000		

CHILE	0,382	-0,152	-0,050	1,000	
PARAGUAY	-0,359	-0,144	0,522	0,417	1,000
URUGUAY	0,866	0,094	-0,149	0,241	-0,433

Figure 1 displays the rolling correlations of Brazil with the rest of the countries. Figure 2 does the same for Argentina. It can be seen that the co-movements of output among the different countries and Argentina or Brazil follow almost the same pattern. In both cases, correlations tend to decline from the initial periods of the sample up to the first part of the nineties and since then practically all resume increasing<sup>7</sup>. In addition, the degree of synchronization of output cyclical movements among Argentina or Brazil and the other countries in the region has not been very high in any period. It can be observed in the figures that, for any period, correlation coefficients of the different countries with Argentina are lower than 0.20 and that the same coefficients with Brazil are less than 0.30.

Findings in this section reinforce previously reached conclusions: business cycles correlations among the countries in the MERCOSUR area are very low. Therefore the results cast doubts about the convenience of a common currency area for the region since the countries, that appear to have very idiosyncratic business cycles, would be giving up an important stabilizing tool.

Figura 1  
Rolling Correlation Coefficient  
Argentina

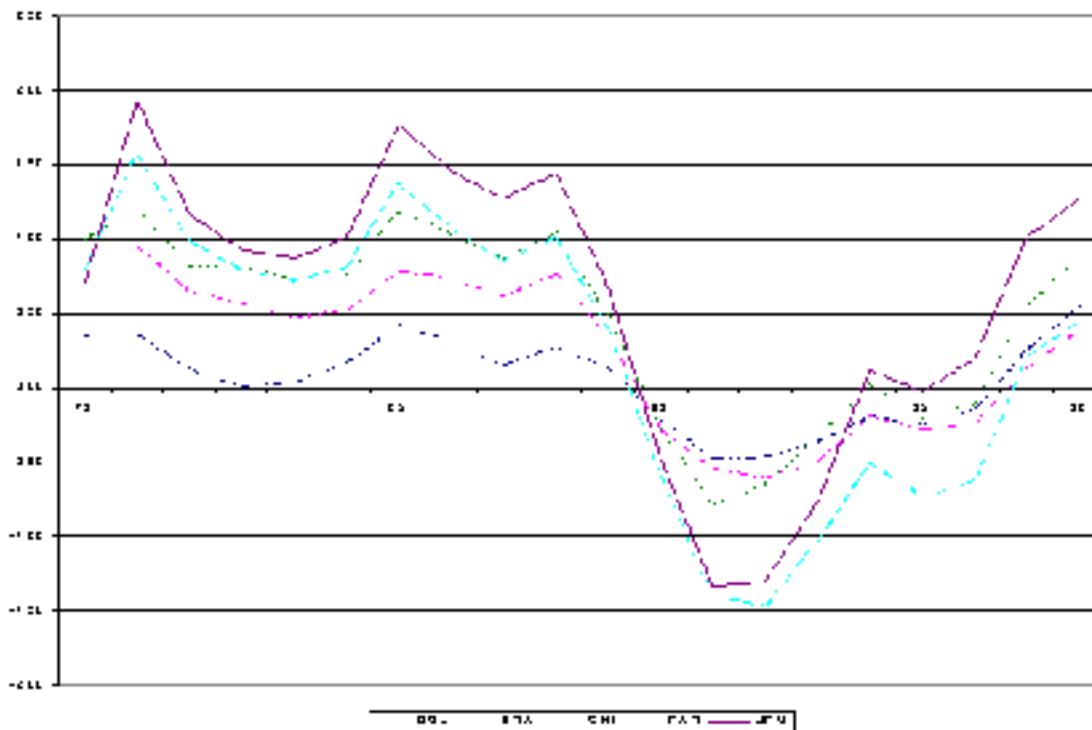
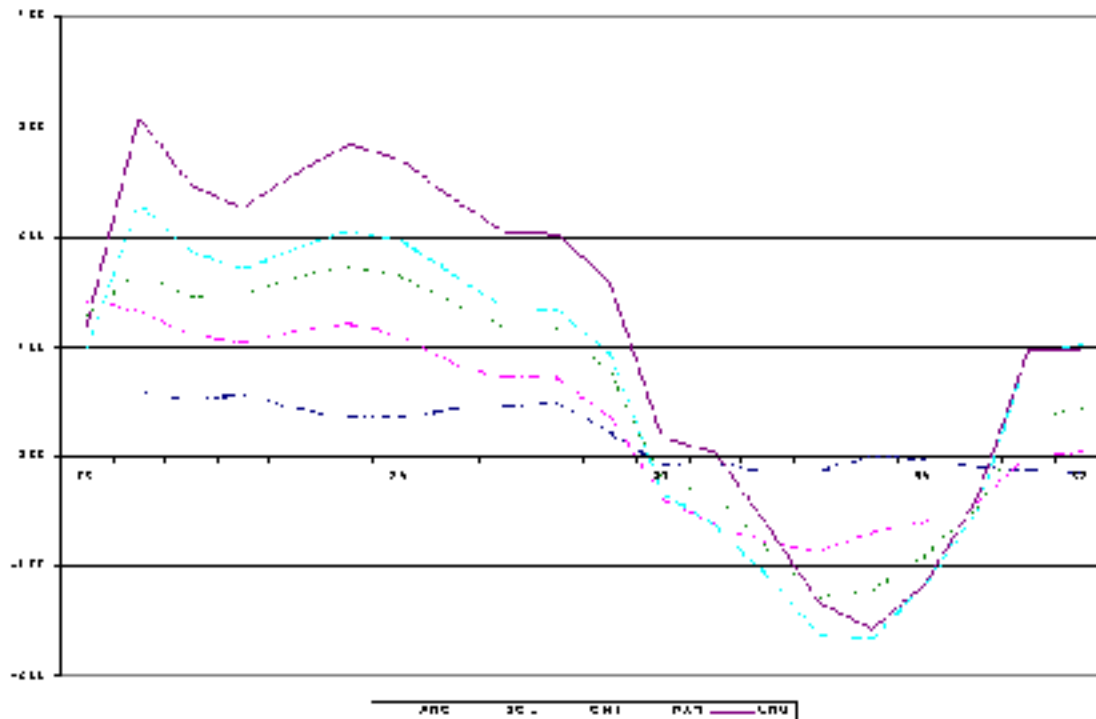


Figure 1  
 Rolling Correlation Coefficient  
 Brazil



#### 4. Convergence in business cycles?

Entry into a currency union may significantly raise international trade linkages (and therefore the benefits foregone by not joining a currency union). More importantly, countries that enter a currency union may experience dramatically different business cycles than before. In part this will be a result of closer international trade with other members of the union, but it will also reflect changes in monetary policy. For example, using a sample of 19 developed countries, Artis and Zhang (1999) found that a higher degree of synchronization in business cycles is associated with lower volatility in exchange rates.

Thus, it is conceivable that the low degree of correlation in business cycles across MERCOSUR countries is mainly explained by distortions produced by monetary policies implemented by the governments in the region. This issue is even more relevant in this case since the two biggest countries in the union, Argentina and Brazil, experienced a high degree of macroeconomic turbulence during some periods, with the inflation reaching more than 1,000 per cent per year.

In this section of the paper I analyze the potential endogeneity of the optimum currency area criteria. In particular, I consider the hypothesis that the correlation of business cycle disturbances across countries might itself be significantly affected by the extent to which governments succeed in stabilizing the exchange rate. No sooner was the free trade area in MERCOSUR formed than Argentina launched its convertibility plan. Inflation came down from well over 1,000 per cent to little more than one per cent per annum, and the real economy entered a period of rapid growth. The convertibility plan forced the Argentinean authorities to peg, in a one-to-one basis, its currency with the American dollar, forming a sort of monetary union with the United States. Hence, it might be the case that business cycles among these two countries became more synchronize after Argentina implemented its stabilization plan.

Table 8 presents different statistics on the correlation of output among Argentina and United States. To see how the co-movements of the economies evolved after the implementation of the convertibility plan by Argentina I consider intervals of ten years, the last of which coincide with the beginning of the plan. The data does not show any convergence over time in the business cycles of the two countries. For example, output growth correlation is even negative during the nineties (-0.08) after reaching a value of 0.23 during the interval 1980-89. Similarly, the value of the parameter gamma does not decline in recent periods remaining around 0.05. Finally, the correlation among the output cyclical components for Argentina and United States decreases from 0.25 during the seventies to a negative value of -0.30 during the period 1990-98.

Thus, the Argentinean experience does not support the hypothesis that a successful exchange rate regime, that imposes policy discipline to the government, will lead *per-se* to conformity in the business cycles across countries. Besides monetary policy other factors might as well be important in influencing business cycle affiliations, thus the low correlation across the economies in MERCOSUR cannot be seen only as a consequence of the distortions produced by monetary policies implemented by the authorities in these countries.

<b>TABLE 8</b>			
<b>CORRELATIONS BETWEEN ARGENTINA AND USA</b>			
	<u>1970-98</u>	<u>1980-89</u>	<u>1990-98</u>
<b>Output Growth</b>	-0,214	0,229	-0,076
<b>Parameter Gamma</b>	0,055	0,050	0,048
<b>Business Cycles</b>	0,246	-0,004	-0,295

## 5. Conclusions.

This paper has made use of one of the criteria of the Optimal Currency Area theory to analyze the advisability of a common currency area in MERCOSUR. An argument against such an area is the difficulty of squeezing different economies into the confines of a single monetary policy. If business cycles are very different across countries in a monetary region, then a single monetary policy could aggravate cyclical imbalances.

The main findings were that MERCOSUR economies exhibit a high degree of volatility indicating that they are subject to no few shocks. The results also suggest that the economies in the region have very asymmetric cyclical conditions and the magnitudes of the co-movements of the business cycles are small. In addition, the Argentinean experience in fixing its own currency with the US dollar caution against any expectation of convergence in business cycles across countries based only in a monetary policy change.

It is true that besides the exchange rate policy, the economy or region could possess other instruments of adjustment. However, it is clear that there is not much labor mobility inside the region, an instrument that has played a major adjustment role in the United States. Also, up to the present, the MERCOSUR countries do not have a fiscal policy with a system of automatic stabilizers nor can rely on international capital mobility to smooth the effects of asymmetric shocks. In short, based on the analysis performed in this paper, it is not possible to say that MERCOSUR is an Optimum Currency Area. On the contrary, the costs of adopting a single currency can be high and a monetary union in MERCOSUR may not be feasible at least in the short run.

## 5. References.

Artis, M. and Zhang, W. (1999). "Further evidence on the international business cycle and the ERM: Is there a European business cycle?". *Oxford Economic Papers* 51, pp. 120-132.

Bayoumi, T. and B. Eichengreen (1997). "Optimum currency areas and exchange rate volatility: Theory and evidence compared", in B.J. Cohen (Ed.), *International trade and finance new frontiers for research: Essays in honor of Peter Kenen*. Cambridge University Press, Cambridge, Mass.

Bayoumi, T. and B. Eichengreen (1993). "Shocking aspects of European monetary unification", in F. Torres and F. Giavazzi (Eds.), *Adjustment and growth in the European Monetary Union*. Cambridge University Press, Cambridge, Mass.

Eichengreen, Barry (1998). "Do es MERCOSUR need a single currency?". National Bureau of Economic Research Working Paper 6281.

Frankel, J. and A. Rose (1997). "Is EMU more justifiable ex post than ex ante?". *European Economic Review* 41, pp. 753-760.

McKinnon, Robert (1963). "Optimum currency areas". *American Economic Review* 53, pp. 717-724.

Mundell, Robert (1961). "A theory of optimum currency areas". *American Economic Review* 51, pp. 657-665.

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<sup>1</sup> Banco Central del Paraguay and Universidad Católica de Asunción.

Throughout the paper I shall refer as MERCOSUR to Argentina, Bolivia, Brazil, Chile, Paraguay and Uruguay.

The argument is that a central bank that wants to fight inflation can commit more credibly by fixing the exchange rate, or even giving up its currency altogether.

<sup>2</sup> See Eichengreen (1998).

<sup>3</sup> See Eichengreen (1998).

<sup>4</sup> In Mundell's framework, the incidence of disturbances across regions is a critical determinant of the design of currency areas

<sup>5</sup> The outcome that closer international trade links result in more closely correlated business cycle across countries is found in Frankel and Rose (1997) using data in 20 industrialized countries over 30 years.

<sup>6</sup> Excluding Germany for the computation of the average of  $\beta_{it}$  for the period 1990-98 reduce its value to 0.011.

<sup>7</sup> The correlations between Argentina and the rest of the countries become negative at the beginning of the nineties. The same happens to the correlation coefficients of Brazil.