Trade as a Determinant in Business Cycle Synchronization: The Case of Ecuador

Igor E. Díaz-Kovalenko[1], José L. Torres[2]

[1]Faculty of Social Science, Commercial Education and Law. State University of Milagro. Milagro, Ecuador.
[2]Faculty of Economics and Business Science. Malaga University. Malaga, Spain.
Email: idiazk@unemi.edu.ec

Abstract

This research evaluates the level of synchronization for the Ecuadorian business cycle with the countries of the Andean Community of Nations in two stages (1950-1994, 1995-2019) and focuses on whether the business cycles with its neighbors have become more similar over time, especially in the period prior to and following the signing of the Cartagena Agreement and the birth of the Andean Community of Nations. We also study the level of synchronization with its main international trading partners. We conclude that the business cycles of the member countries have gone through periods of both convergence and divergence. However, there is considerable evidence that, since the 1994 integration, business cycle synchronization in the CAN area has increased. It is found that such trade intensity led to greater synchronization, however, these results suggest but do not confirm the existence of a common business cycle, not ruling out, therefore, the possibility of a monetary union. On the other hand, it confirms the country's dependence on periods of economic expansion of its trading partners to stimulate its level of economic activity.

Keywords: Business cycle synchronization, economic growth.

1. Introduction

It is well known that macroeconomic volatility generates both economic and political uncertainty, with detrimental effects on investment and consumption plans and, ultimately, on future economic growth and aggregate welfare. The analysis of volatility evolved in work on business cycles with the seminal work of Mitchell (1913), Kuznets (1926) and Mills (1936) first, but it was with Lucas (1972) that the characterization of fluctuations, as well as the explanation of their causes was taken up with special interest.

The description of the business cycle involves the measurement of the volatility of the main macroeconomic variables, that is, the movements of these variables around their respective trend,

the persistence of the cyclical component of these variables, as well as the comovements of the cyclical component of all variables with that of real output. Therefore, there is great interest among both academics and policy makers to shed light on the sources of output fluctuations, especially in the new globalized economic environment, characterized by a much larger role of emerging market countries and low growth and uncertainty in advanced economies. However, it has been during the last two decades that the study and systematic measurement of economic fluctuations has seen greater development, which has provoked considerable macroeconomic debate. Some of this research has been assembled into a body of theory known as the Real Business Cycle (RBC) approach.

Whereas economic linkages between countries around the world have increased rapidly in recent years thanks to trade and financial integration. With regard to trade, the cumulative increase in the volume of world trade is almost three times greater than that of world output between 1960 and 2010. The rate of increase is even faster in emerging and developing economies, where it has risen from 6% in 1980 to 9% in 2010. On the financial side, the world's total foreign assets increased from 19% of world GDP in 1980 to 172.4% in 2011, and total portfolio investment in the world increased from 19% of world GDP in 1997 to 55.5% in 2011. These figures show that there is strong momentum behind the growth of trade and financial globalization. This growth has been reflected to regional economic linkages. Multiple trade agreements and trade unions, e.g., CAN, ASEAN, NAFTA, MERCOSUR and the EU, have been formed on a regional basis.

Knowledge of contagion effects between countries is especially relevant for emerging countries due to their higher degree of volatility compared to more mature economies. Both internal and external factors explain why emerging economies are so volatile: (1) intrinsic instability induced by the development process itself; (2) lack of effective mechanisms (such as well-functioning financial markets and adequate macroeconomic stabilization policies) to absorb external fluctuations; and (3) exposure to exogenous shocks in the form of sudden capital inflows/outflows and/or large changes in international terms of trade.

Separating the effects of regional and global integration is important. An economic event in the major industrial countries substantially affects emerging and developing countries through the economic linkages between the two groups of countries. Therefore, economic integration with industrial countries is likely to be important in explaining the business cycles of emerging and developing countries, as well as the co-movements of business cycles of countries in a region.

Economic theory does not offer unambiguous predictions: International financial and trade linkages could lead to a greater or lesser degree of business cycle comovement, meaning that the underlying economic relationships of countries significantly affect their business cycle co-movement through trade and financial integration. In particular, various types of regional and global integration influence the co-movement of the business cycle among countries within a region.

For example, a recession in the United States can worsen the trade balance of two developing countries in a region and generate business cycle comovements between those two countries. This effect of global economic integration on business cycle co-movements can be as important

as the effects of global economic integration on business cycle co-movements. This effect of global economic integration on the co-movements of the business cycle can be as important as the effects of regional economic integration. Since the effects of these two types of economic integration may be different, separating them is crucial to measure the precise effect of each type of integration. Moreover, discovering the relative importance of regional versus global economic integration in explaining the business cycle comovements of countries in a region is an important issue in itself. The question of the business cycle synchronization of countries in a region has several important implications for that region. When the degree of business cycle synchronization in a region is high, emphasis can be placed on common policy responses and/or policy cooperation within the region to stabilize it.

Within the business cycle literature, two views have been presented on this issue. In what we call the "optimistic view", greater economic (and monetary) integration will lead to less divergence. This view is quite popular among policy makers in the European Union, for example. However, other economists argue that if there is a similar concentration of industries in particular regions, because of economies of scale and scope, sector-specific shocks may become regional shocks, thus increasing the likelihood of asymmetric shocks and divergent business cycles. Therefore, the "pessimistic view" argues that business cycles in the euro area may become more divergent in the future.

In the debate on the synchronization of business cycles in Latin America, two questions can be asked. First, have business cycles in the region become more similar? and, second, what events have driven business cycle synchronization? On the first issue, the literature has not yet reached a consensus on whether the business cycles of the region's countries are converging. Differences among various studies can be partly explained by the use of different data. However, other reasons include the use of divergent methods for identifying business cycles and assessing convergence. Competing methods have been suggested for calculating a business cycle. There is also no consensus on how convergence between business cycles should be measured. Regarding the second issue, several factors that can affect business cycle synchronization have been raised, ranging from trade relations (Frankel and Rose, 1998), specialization (Imbs, 2004), monetary integration (Fatas, 1997), financial relations. (Imbs, 2006) and shared borders (Clark and van Wincoop, 2001). However, despite the theoretical and empirical analyses to date, it seems fair to say that there is no consensus on the important determinants of business cycle comovement, the main difficulty being the existence of multiple possible explanations.

This paper analyzes the effects of economic integration on the co-movements of Ecuador's business cycle with the countries of the Andean Community of Nations, as well as with its four main trade partners: United States, European Union, China and Russia.

The rest of the article is organized as follows. Section 2 reviews the data used, as well as the method for identifying business cycles and business cycle synchronization. Section 3 discusses the results obtained and the last section provides the relevant conclusions as well as some concluding remarks.

2. Methodology

Studies examining the synchronization of business cycles in the Latin American region tend to reach very different conclusions. Part of these differences may be related to the selection of variables used, divergent methodologies for constructing business cycles and alternative ways of assessing synchronization. The methodology used in this paper is described below.

2.1 Data used

The variable used was the annual data on real GDP in 2017 values of Ecuador, Colombia, Peru and Bolivia, being the broadest production variable. The time series was divided into two periods, 1950-1994 and 1995-2019, this because 1994 is a relevant point in the history of the Andean Community of Nations, this being the year of entry into force of the Common External Tariff. In the case of the cycles of the main trading partners, a 1995-2020 series was used. Generally, annual data would be avoided in order to capture more high frequency fluctuations, however, unfortunately in the Latin American case the absence of long duration databases at shorter frequencies does not exist in the long run. GDP has been chosen instead of the Index of Industrial Production because manufacturing activity is less representative in Latin America compared to Europe or the United States, so a priori it would not seem to be representative of total production. Second, manufacturing production is much more volatile than aggregate production. The data were taken from WPT v.10 and supplemented with information from the Central Banks of the respective countries.

2.2 Business Cycle Measurement

In order to carry out studies of this type, a first distinction to be made is between classic business cycles and deviation (or growth) cycles, i.e., the difference between the cyclical and trend component of a time series. (Classical) business cycles are defined in terms of absolute expansions and contractions of economic activity. Similar studies use a variety of filtering techniques to decompose the output into trend and cycle. Among them the simplest filtering technique is to calculate the first differences, the Baxter-King (1999) bandpass filter and the phase average trend using the Bry-Boschan (1971) algorithm.

For this study we used the Hodrick-Prescott (1997) nonparametric filter, which is probably the most widely used filter in this type of research. This filter estimates the trend component by minimizing deviations from the trend, subject to a predetermined smoothness of the resulting trend.

2.3 Synchronization measurement

Given a certain measure of the business cycle, one has to determine to what extent these cycles move together across countries. Several techniques have been suggested for this type of study, such as Harding and Pagan's (2002) matching index and Bernard and Durlauf's stochastic definitions of convergence. For this study, however, a cross-correlation analysis was performed.

3. Results and discussion

3.1 Business cycles in the Andean Community of States

The CAN countries share similar productive structures and generally compete for the same markets and are affected by fluctuations in developed countries. Although the volume of trade between the countries is considerably less than that with the developed economies and therefore less conditioned by the surrounding economies, it is of interest to study the cyclical behavior of the Ecuadorian economy in relation to the cyclical behavior of those countries. To determine the extent to which the cyclical fluctuations of the CAN countries affect their performance, we will compare the cyclical performance of the Ecuadorian economy with the cyclical performance of the main economies of this regional agreement. These countries are Colombia, Peru and Bolivia.

Figure 1 shows the year-on-year GDP growth rate in Ecuador and the countries of the region. As we can see, the behavior of growth is quite different, with fluctuations in Peru, Bolivia and, to a lesser extent, Ecuador, with Colombia being the most stable. There is also a closer correlation between Ecuador and Colombia than among the others. This means that the Ecuadorian economy has been historically linked to the Colombian economy, both because of the existing commercial proximity and because of the similarity of their productive structures, affected in a similar way by the fluctuations of commodities in the international markets, mainly oil, coffee and bananas. It is worth mentioning the rapprochement that has existed since 1995, since the entry into operation of the single regional tariff, which has allowed business cycles to be synchronized, especially with respect to recessions.

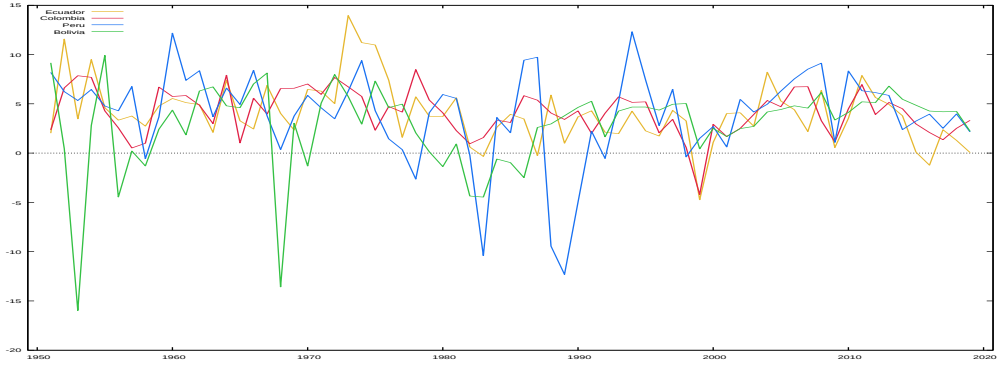

Figure 1. Interannual growth rate for the CAN countries

Figure 2 shows how the business cycle has a distant relationship among the countries analyzed. We found important differences with respect to Ecuador's cyclical behavior with the rest of the economies, with the cycles of Ecuador and Colombia being the most similar to the national cycle.

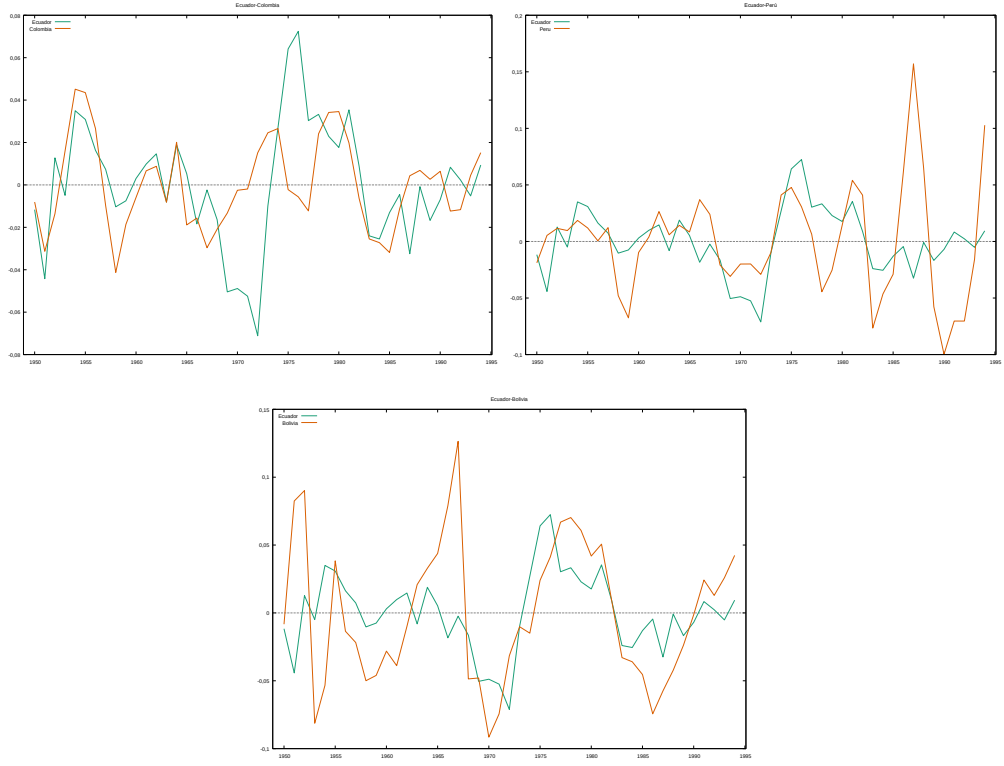

Figure 2. Comparison of the Ecuadorian cyclical component with its CAN trade partners (1950-1994)

In Figure 3 we can notice two things: the level of synchronization of the cycles has experienced a rapprochement with respect to previous levels, especially the cycles of Ecuador with Colombia and Peru are quite close, and secondly, volatility has decreased.

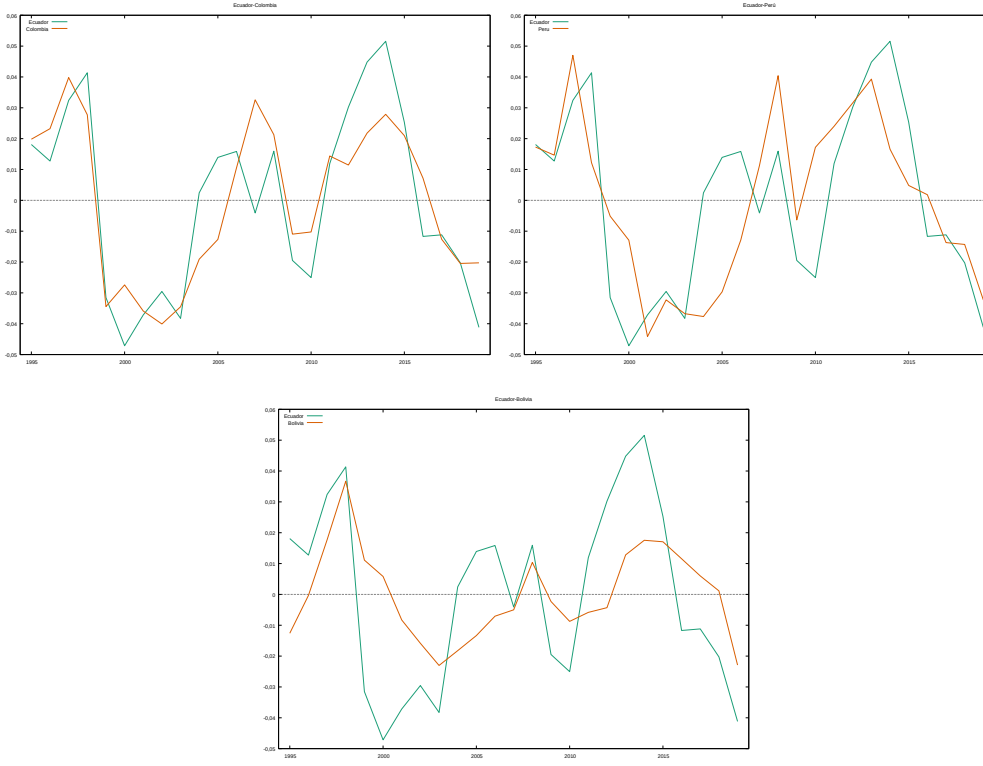

Figure 3. Comparison of the Ecuadorian cyclical component with its CAN trade partners (1995-2019)

Table 1 shows the volatilities of the cyclical components for the two periods. As we can see, the variability of the Ecuadorian cycle in the first period analyzed is surpassed by Peru and Bolivia, and is only comparable to that of Colombia, which is the closest country in volatility of those analyzed. In the second period, however, we note that the levels of volatility among the countries have become much closer, especially Bolivia and Peru reached levels of stability comparable to Colombia and Ecuador, which has the most volatile cycle in this period.

Table 1: Volatility of the Cyclical Component

	1950-1994		1995-2019	
	Standard Deviation	Relative Deviation	Standard Deviation	Relative Deviation
Ecuador	0.029	1.000	0.029	1.000
Colombia	0.021	0.728	0.025	0.846
Perú	0.048	1.674	0.026	0.903
Bolivia	0.052	1.798	0.015	0.498

Table 2 shows the cross-correlation matrix between the different cyclical components extracted through the use of the HP filter in the period 1950-1994. As we can see, the correlation with the

cyclical component between Ecuador and the other economies is not very high, indicating that the national cycles move in a not very similar way in this period. It is worth noting that only Peru has a procyclical behavior that coincides with that of Ecuador, although its correlation coefficient is quite low. On the other hand, with respect to Colombia's business cycle, it is shown that the Ecuadorian cycle is one period ahead with a coefficient of 0.441. Finally, in the case of Bolivia, a procyclical behavior is observed with the highest coefficient of those reviewed, and a delay of two periods.

Table 2. Correlations of the GDP cyclical component (1950-1994)

	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4
Colombia	-0.132	-0.138	-0.013	0.117	0.379	0.441	0.389	0.256	0.133
Perú	-0.240	-0.182	-0.044	0.129	0.249	0.184	0.012	-0.060	-0.029
Bolivia	0.021	0.338	0.453	0.369	0.427	0.349	0.143	-0.022	-0.222

Table 3 shows the cross-correlation matrix between the different cyclical components extracted through the use of the HP filter in the period 1995-2019. We can notice how the cycles have synchronized to a large extent, especially those of Colombia and Peru with Ecuador, reaching procyclical coincident behaviors and correlation coefficients of 0.842 and 0.677 respectively. In the case of Peru, a two-period lag is still observed, although its coefficient is higher than in the previous scenario.

Table 3. Correlations of the GDP cyclical component (1995-2019)

	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4
Colombia	-0.334	0.076	0.393	0.602	0.842	0.586	0.105	-0.223	-0.316
Perú	-0.085	0.127	0.435	0.513	0.677	0.516	0.177	-0.053	-0.141
Bolivia	0.122	0.509	0.673	0.657	0.529	-0.104	-0.504	-0.551	-0.337

Several studies examining the correlation of cyclical indicators over time in Latin American countries and their different regional integration process reach quite similar conclusions, including Ávila-Vélez, J., & Pinzón-Giraldo, Á. J. (2015), Gong, C., & Kim, S. (2018), González, G. H., Rendón, A. H., & Restrepo, A. M. P. (2012). Mora-Mora, J. U. (2016).

Mainly we can highlight the prevailing consensus about the lack of evidence of the existence of a common business cycle for Latin American countries, i.e., there has not been full convergence. Even so, there are relevant correlations between pairs of countries. This would lead one to think that there is a greater correlation of business cycles among them, even sub regional synchronization, as shown by the results obtained. The relationship between trade and the business cycle is the most important aspect of synchronization, and regional trade integration has a positive effect on the synchronization of regional business cycles.

3.2 Synchronization of the Ecuadorian business cycle with its main trade partners

The Ecuadorian business cycle is strongly conditioned by the fact that it is an economy with a high degree of openness and dependence on the price of its main exports. Therefore, to the analysis made in the previous section, we will add the results of comparing the Ecuadorian cycle with that of its main trading partners, which are the USA, the European Union, China and Russia. Being the first two historical partners of the country and the next two countries that have increased the volume of imports from Ecuador, representing about 70% of Ecuador's exports, as we can see in Figure 4.

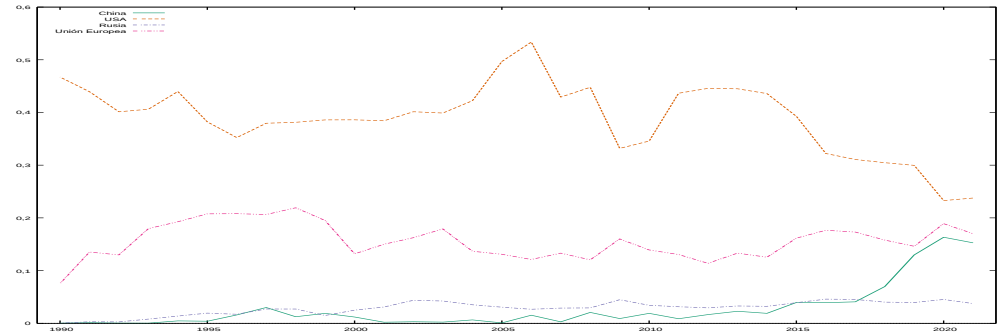

Figure 4. Percentage of the total Ecuadorian exportations by country of destination (1995-2020)

Figure 5 shows the cyclical components of the Ecuadorian economy together with those of the selected countries. As we can see, the cycle according to the HP filter has a certain concordance with the selected economies. We find important differences with respect to the cyclical behavior with the rest of the economies, being the cycles of the USA and the European Union the least similar to the national cycle, on the other hand, China and Russia seem to show a closer behavior.

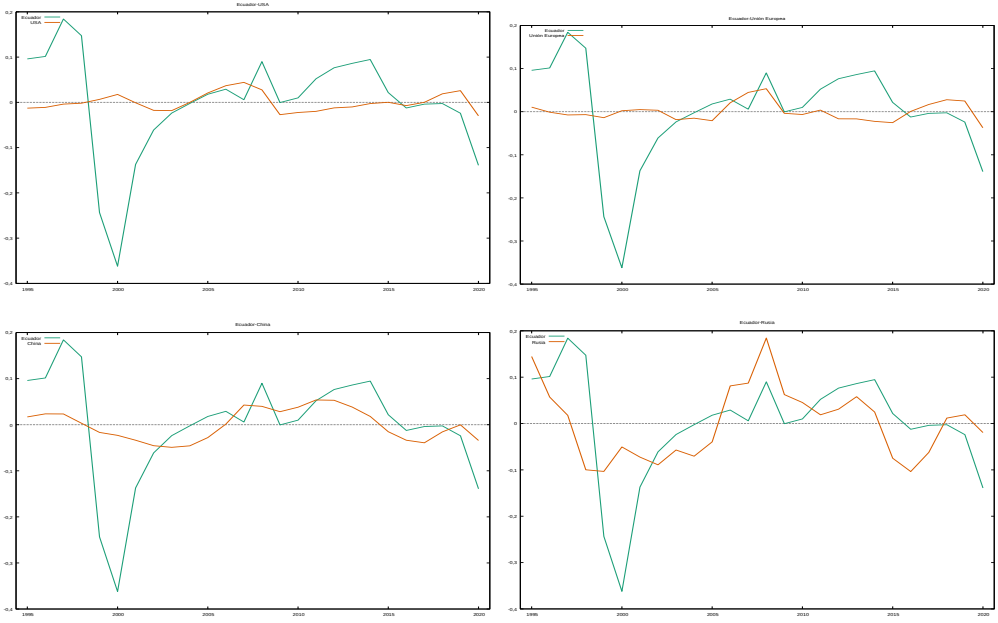

Figure 5. Comparison of the Ecuadorian cyclical component with its worldwide trade partners (1995-2020)

Table 4 shows the volatilities of the cyclical components for the period analyzed. As we can see, the variability of the Ecuadorian cycle is not comparable to that of the USA and the European Union, which have very mild cycles over time. Even Russia's volatility is lower, being the most volatile of the countries analyzed. Considering the relative volatility with respect to Ecuador, we observe that in all countries the cyclical fluctuations are lower.

Table 4: Volatility of the Cyclical Component (1995-2020)

	Standard deviation	Relative deviation
Ecuador	0.117	1.000
USA	0.020	0.168
European Union	0.021	0.183
China, P.R of	0.034	0.286
Russia	0.078	0.663

Table 5 shows the cross-correlation matrix between the different cyclical components extracted through the use of the HP filter. As we can see, the correlation with China's cyclical component is relatively high, at 0.514, and they move synchronously. Something similar occurs with the degree of interrelation with the Russian economy, although in this case it is observed that the Ecuadorian cycle is delayed by one period.

In the case of the United States and the European Union, the coefficients are low, so there does not seem to be a stable relationship between these economies and the Ecuadorian economy. In addition, in the case of the USA we observe an asymmetry in the cycles and a delay of one period and with respect to the EU it is four periods ahead.

Table 5. Correlations of the GDP cyclical component (1995-2020)

	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4
USA	0.139	-0.023	-0.169	-0.209	-0.091	-0.052	0.164	0.164	-0.039
European Union	0.079	0.067	0.048	0.026	0.082	-0.154	-0.084	0.121	0.198
China, P.R of	-0.053	0.045	0.207	0.398	0.514	0.427	0.359	0.265	0.136
Russia	-0.066	0.207	0.459	0.529	0.441	0.178	0.117	0.003	-0.062

The results of this paper provide support for the conventional wisdom that globalization leads to an increase in the degree of synchronization of business cycles. We find that trade and market integration increase macroeconomic fluctuations, which has important implications for the conduct of macroeconomic policies in an increasingly integrated world economy.

4. Concluding remarks

Having made a comparison between the business cycle of Ecuador and that of the CAN countries, we obtained that the correlation between the business cycle of Ecuador and these countries has followed a synchronization trend that intensified after the implementation of the trade agreements reached in 1994, which eliminated trade barriers. There is currently a very similar business cycle between Ecuador, Colombia and Peru.

This result is logical given not only that the countries share extensive borders and have strong trade links, but also that their productive structures are similar. In other words, the cycles of the Latin American economies now seem to be more in line with international shocks related to the

rise of the Chinese and Russian economies, but also strongly linked to the U.S. and European economies.

This is consistent with a region that is increasingly integrated with the Chinese economy as the Latin American region is now. In that sense, the Latin American region as a whole is highly dependent on external development, especially since the great recession of 2008. There is a clear dominance of trade flows over financial flows as determinants of business cycle movements in the short term. Latin America's linkage with respect to the most advanced economies seems to have been determined not only by the increase in trade flows to China, but also by a low degree of financial integration with its main trade partners.

WORKS CITED

[1] Ávila-Vélez, J., & Pinzón-Giraldo, Á. J. (2015). ¿Están sincronizados los ciclos económicos en Latinoamérica? Borradores de Economía; No. 864.
[2] Baxter, M. and King, R.G. (1999) Measuring business cycles: approximate bandpass filters for economic time series. Review of Economics and Statistics, 81(4): 575–593.
[3] Bry, G. and Boschan, C. (1971) Cyclical Analysis of Time Series: Selected Procedures and Computer Programs. New York: NBER
[4] Clark, T.E. and E. van Wincoop (2001) Borders and business cycles. Journal of International Economics 55: 59–85.
[5] Fatas, A. (1997) EMU: countries or regions? Lessons from the EMS experience. European Economic Review, 41(3–5): 743–751.
[6] Fiess, N. (2007). Business cycle synchronization and regional integration: a case study for Central America. The World Bank Economic Review, 21(1), 49-72.
[7] Frankel, J. A., & Rose, A. K. (1998). The endogenity of the optimum currency area criteria. The economic journal, 108(449), 1009-1025.
[8] Gong, C., & Kim, S. (2018). Regional business cycle synchronization in emerging and developing countries: Regional or global integration? Trade or financial integration? Journal of International Money and Finance, 84, 42-57.
[9] González, G. H., Rendón, A. H., & Restrepo, A. M. P. (2012). Sincronización de ciclos e integración latinoamericana: nuevas hipótesis tras otro ejercicio empírico. Trayectorias, 14(35), 3-26.
[10] Harding, D. and Pagan, A.R. (2002) Extracting, analyzing and using cyclical information.
Mimeo, University of Melbourne.
[11] Hodrick, R.J. and Prescott, E.C. (1997) Postwar US business cycles: an empirical investigation. Journal of Money, Credit, and Banking, 29: 1–16.
[12] Imbs, J. (2004). Trade, finance, specialization, and synchronization. Review of economics and statistics, 86(3), 723-734.
[13] Imbs, J. (2006). The real effects of financial integration. Journal of International Economics, 68(2), 296-324.
[14] Kuznets, S. (1926), Cyclical fluctuations, retail and wholesale trade. New York.
[15] Kydland, F. y E.C. Prescott (1982), Time to build and aggregate fluctuations. Econometrica. 1345-1370.
[16] Long, B.L y C.I Plosser (1983), Real business cycles. Journal of Political Economy, 91 (1), 39-69.
[17] Lucas, R.E. Jr. (1975), An equilibrium model of business cycles. Journal of Political Economy, 83, 1113-1344.
[18] Mills, F.C. (1936), Prices in recession and recovery: A survey of recent changes. New York. NBER.
[19] Mitchell, W.C. (1913), Business cycles. University of California Press. Berkeley.
[20] Mora, J. U. M. (2016). La Alianza del Pacífico y Mercosur: evidencias de convergencia económica. Estudios Gerenciales, 32(141), 309-318.