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TRADE AS A DETERMINANT IN BUSINESS CYCLE SYNCHRONIZATION. THE CASE OF ECUADOR

EL COMERCIO COMO DETERMINANTE DE LA SINCRONIZACIÓN DE LOS CICLOS ECONÓMICOS. EL CASO DE ECUADOR

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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 (CAN). 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 Andean Community of States 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, Trading partners, Economic growth.

RESUMEN

Esta investigación evalúa el nivel de sincronización del ciclo económico ecuatoriano con los países de la Comunidad Andina de Naciones en dos etapas (1950-1994, 1995-2019) y se centra en si los ciclos económicos con sus vecinos se han vuelto más similares con el tiempo, especialmente en el período anterior y posterior a la firma del Acuerdo de Cartagena y al nacimiento de la Comunidad Andina de Naciones. También se estudia el nivel de sincronización con sus principales socios comerciales internacionales. Se concluye que los ciclos económicos de los países miembros han pasado por períodos tanto de convergencia como de divergencia. Sin embargo, hay evidencia considerable de que, desde la integración de 1994, la sincronización del ciclo económico en el área de la Comunidad Andina de Naciones (CAN) ha aumentado. Se encuentra que dicha intensidad comercial condujo a una mayor sincronización, sin embargo, estos resultados sugieren, pero no confirman la existencia de un ciclo económico común, no descartando, por tanto, la posibilidad de una unión monetaria. Por otro lado, confirma la dependencia del país de los períodos de expansión económica de sus socios comerciales para estimular su nivel de actividad económica.

Palabras clave: Sincronización del ciclo económico, Socios comerciales, Crecimiento económico.

INTRODUCTION

Macroeconomic volatility is widely recognized for generating both economic and political uncertainty. These effects adversely impact investment and consumption plans, ultimately influencing future economic growth and aggregate welfare. The analysis of volatility is initially developed in studies of business cycles, beginning with seminal works by Kuznets (1926), Mills (1936), and Mitchell (1913). However, special attention is drawn to the characterization and explanation of fluctuations with the contribution of Lucas (1972).

The business cycle is described by measuring the volatility of major macroeconomic variables, identifying their deviations from respective trends, examining the persistence of cyclical components, and analyzing their comovements with real output. Considerable interest is shown by academics and policymakers in understanding the sources of output fluctuations, particularly in today's globalized economic environment, which is shaped by the increasing prominence of emerging markets and the persistent low growth and uncertainty in advanced economies. Over the past two decades, the systematic measurement and study of economic fluctuations are advanced significantly, stimulating extensive macroeconomic debate. These discussions are integrated into the Real Business Cycle (RBC) theory.

Economic linkages between countries continue to grow rapidly, driven by trade and financial integration. Trade data reveals that, between 1960 and 2010, the cumulative increase in world trade volume exceeds the growth of global output by nearly threefold. Emerging and developing economies experience an even steeper rise, with trade participation growing from 6% in 1980 to 9% in 2010. On the financial side, total global foreign assets grow from 19% of world GDP in 1980 to 172.4% in 2011. Similarly, total portfolio investment increases from 19% of world GDP in 1997 to 55.5% in 2011. These trends demonstrate robust momentum behind trade and financial globalization, which is reflected in strengthened regional economic linkages. Multiple regional trade agreements, such as CAN, ASEAN, NAFTA, MERCOSUR, and the EU, are established to promote such connections.

The study of contagion effects between countries is particularly relevant for emerging economies due to their higher volatility compared to mature economies. Both internal and external factors contribute to this volatility, including (1) intrinsic instability associated with the development process, (2) the absence of effective mechanisms (such as well-functioning financial markets and stabilization policies) to mitigate external shocks, and (3) exposure to exogenous factors such as sudden capital flows and significant shifts in international trade terms.

A distinction between regional and global integration effects is essential. Economic events in major industrialized nations are observed to substantially influence emerging and developing economies through established linkages. Thus, integration with industrialized nations is likely to play a pivotal role in shaping business cycles in these economies and in driving the synchronization of business cycles within a region.

Economic theory provides no definitive predictions regarding the effects of trade and financial linkages on business cycle synchronization. Trade and financial integration could either enhance or diminish business cycle comovements, depending on the underlying economic relationships among countries. Regional and global integration types are shown to influence the extent of business cycle synchronization. For instance, a recession in the United States is observed to negatively affect the trade balance of two developing countries in the same region, fostering synchronized business cycles between them. The differentiation of regional and global economic integration effects remains critical to quantifying their respective impacts and identifying their relative importance.

The synchronization of business cycles holds several implications for regional policy. A high degree of synchronization supports coordinated policy responses and collaborative efforts to stabilize the region. Two contrasting perspectives are presented in the literature. The "optimistic view" suggests that greater economic integration reduces business cycle divergence, a notion embraced by policymakers in regions like the European Union. Conversely, the "pessimistic view" argues that industry concentration within regions can amplify sector-specific shocks, increasing the likelihood of asymmetric shocks and divergent business cycles.

For Latin America, the debate on business cycle synchronization centers on two key questions: whether business cycles are becoming more synchronized and what factors drive this synchronization. Existing literature offers mixed conclusions regarding convergence, partly due to differences in data sources, methods for identifying business cycles, and approaches for measuring convergence. Factors influencing synchronization range from trade relations (Frankel & Rose, 1998) and specialization (Imbs, 2004) to monetary integration (Fatas, 1997; Fiess, 2007; Kydland & Prescott, 1982) and shared borders (Clark & Van Wincoop, 2001). Despite these analyses, no consensus exists on the primary determinants of business

cycle comovements due to the multiplicity of potential explanations.

This study examines the effects of economic integration on Ecuador's business cycle synchronization with countries in the Andean Community of Nations and its four primary trade partners: the United States, the European Union, China, and Russia.

This article is organized as follows: Section 2 reviews the data and methods used to identify business cycles and assess synchronization. Section 3 discusses the findings, and the final section provides relevant conclusions and reflections.

MATERIALS AND METHODS

Studies examining the synchronization of business cycles in the Latin American region tended to reach very different conclusions. Part of these differences was attributed to the selection of variables used, divergent methodologies for constructing business cycles, and alternative ways of assessing synchronization. The methodology employed in this study is described below.

The variable used was the annual data on real GDP (in 2017 values) of Ecuador, Colombia, Peru, and Bolivia, as it represented the broadest production variable. The time series was divided into two periods: 1950–1994 and 1995–2019. This division was based on the relevance of 1994 as a significant point in the history of the Andean Community of Nations, marking the year when the Common External Tariff came into effect. For the cycles of the main trading partners, a series from 1995–2020 was utilized. Although annual data was typically avoided to capture higher-frequency fluctuations, the absence of long-duration databases with shorter frequencies in the Latin American context necessitated its use. GDP was chosen instead of the Index of Industrial Production because manufacturing activity was less representative in Latin America compared to Europe or the United States. Additionally, manufacturing production was found to be much more volatile than aggregate production. The data were sourced from WPT v.10 and supplemented with information from the Central Banks of the respective countries.

To conduct studies of this nature, an initial distinction was made between classical business cycles and deviation (or growth) cycles. Classical business cycles were defined in terms of absolute expansions and contractions of economic activity. Similar studies employed various filtering techniques to decompose output into trend and cycle components. These techniques included calculating first differences, the Baxter & King (1999) bandpass filter, and the phase average trend using the Bry & Boschan (1971) algorithm.

For this study, the Hodrick & Prescott (1997) nonparametric filter was applied. This filter, widely used in similar research, estimated the trend component by minimizing deviations from the trend while adhering to a predetermined smoothness of the resulting trend.

After obtaining a measure of the business cycle, the extent to which these cycles moved together across countries was determined. Several techniques, such as Harding & Pagan's (2002) matching index and Bernard and Durlauf's stochastic definitions of convergence, had been proposed for such analyses. However, for this study, a cross-correlation analysis was performed.

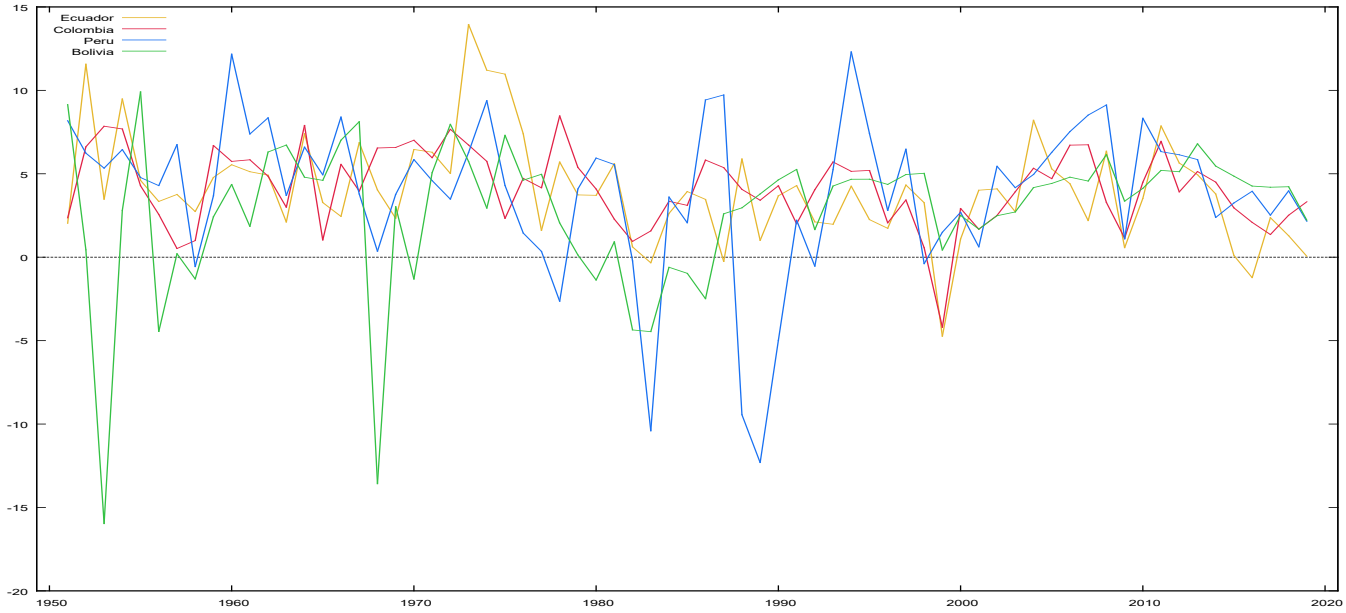
RESULTS-DISCUSSION

The countries of the Andean Community of Nations are observed to share similar productive structures and are generally affected by fluctuations in developed economies, competing for the same markets. Although the volume of trade between these countries is considerably smaller than their trade with developed economies, and therefore less influenced by surrounding economies, the cyclical behavior of the Ecuadorian economy in relation to these countries remains of interest. To assess the extent to which the cyclical fluctuations of the Community countries affect their economic performance, the cyclical behavior of the Ecuadorian economy is compared with that of the main economies within this regional agreement: Colombia, Peru, and Bolivia.

In figure 1, the year-on-year GDP growth rates of Ecuador and the other regional countries are displayed. The behavior of growth is observed to differ significantly among the countries. Fluctuations are more pronounced in Peru, Bolivia, and to a lesser extent, Ecuador, whereas Colombia exhibits the most stable growth. A closer correlation is identified between Ecuador and Colombia compared to the other countries. This indicates that the Ecuadorian economy is historically linked to the Colombian economy due to both their commercial proximity and their similar productive structures. These economies are similarly affected by fluctuations in international commodity markets, particularly oil, coffee, and bananas.

It is noteworthy that since 1995, the implementation of the single regional tariff has contributed to greater synchronization of business cycles, particularly during recessions. This policy shift has strengthened the alignment of economic behaviors between Ecuador and its regional counterparts, enhancing their shared response to external shocks.

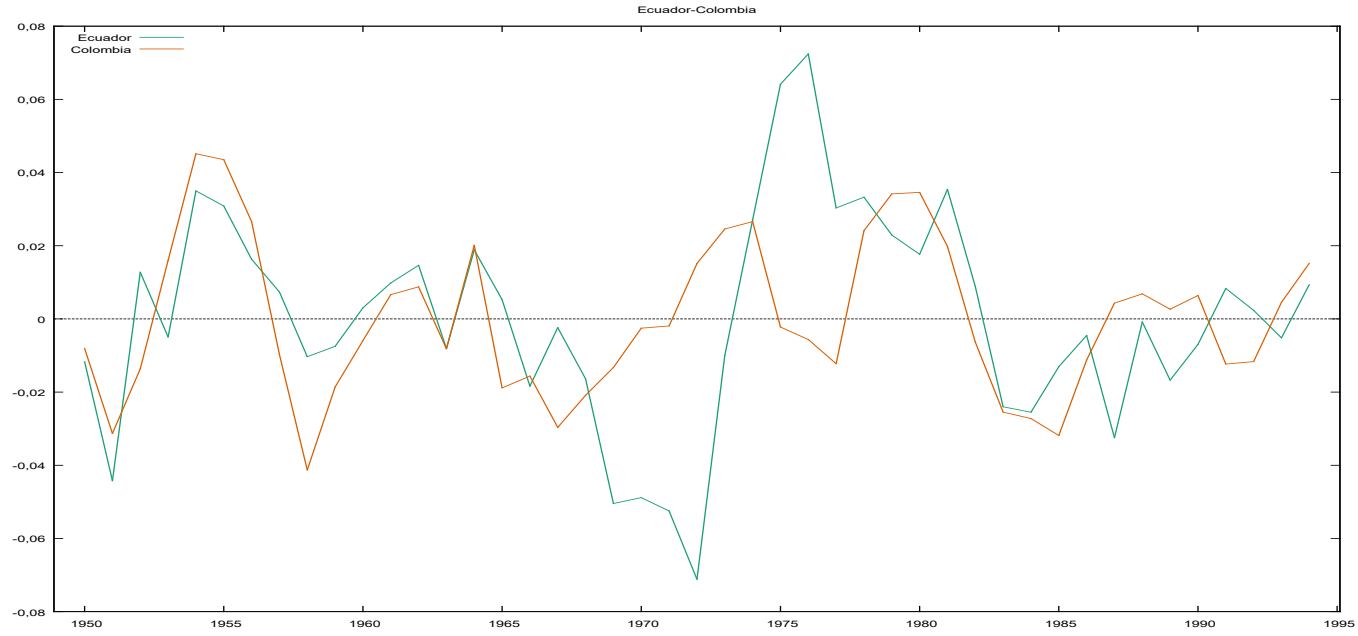
Fig 1: Interannual growth rate for the CAN countries.

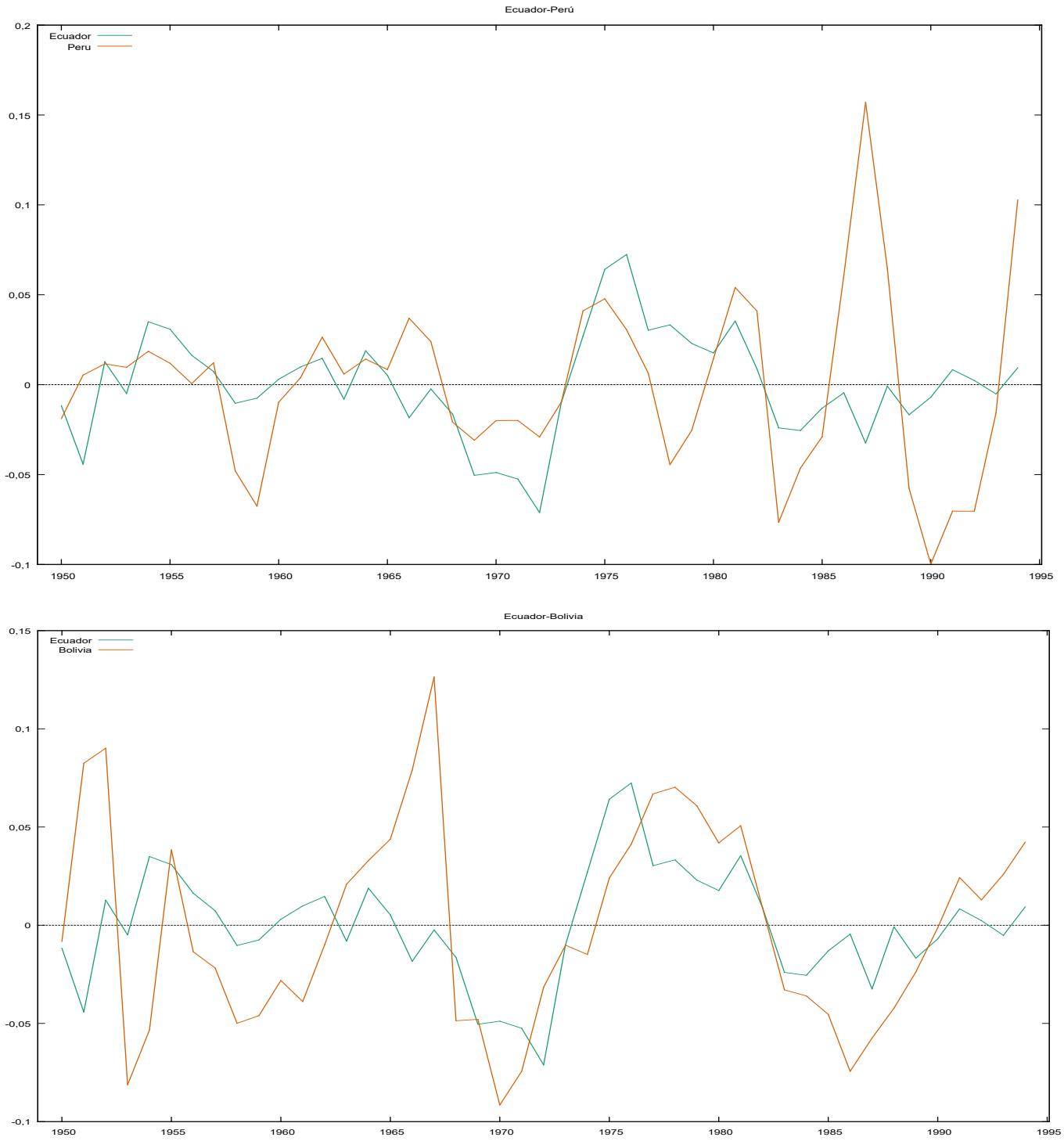


Source: own elaboration.

In figure 2, the business cycle is shown to exhibit a distant relationship among the analyzed countries. Significant differences are identified in Ecuador's cyclical behavior compared to the other economies, with the cycles of Ecuador and Colombia being the most closely aligned with the national cycle.

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

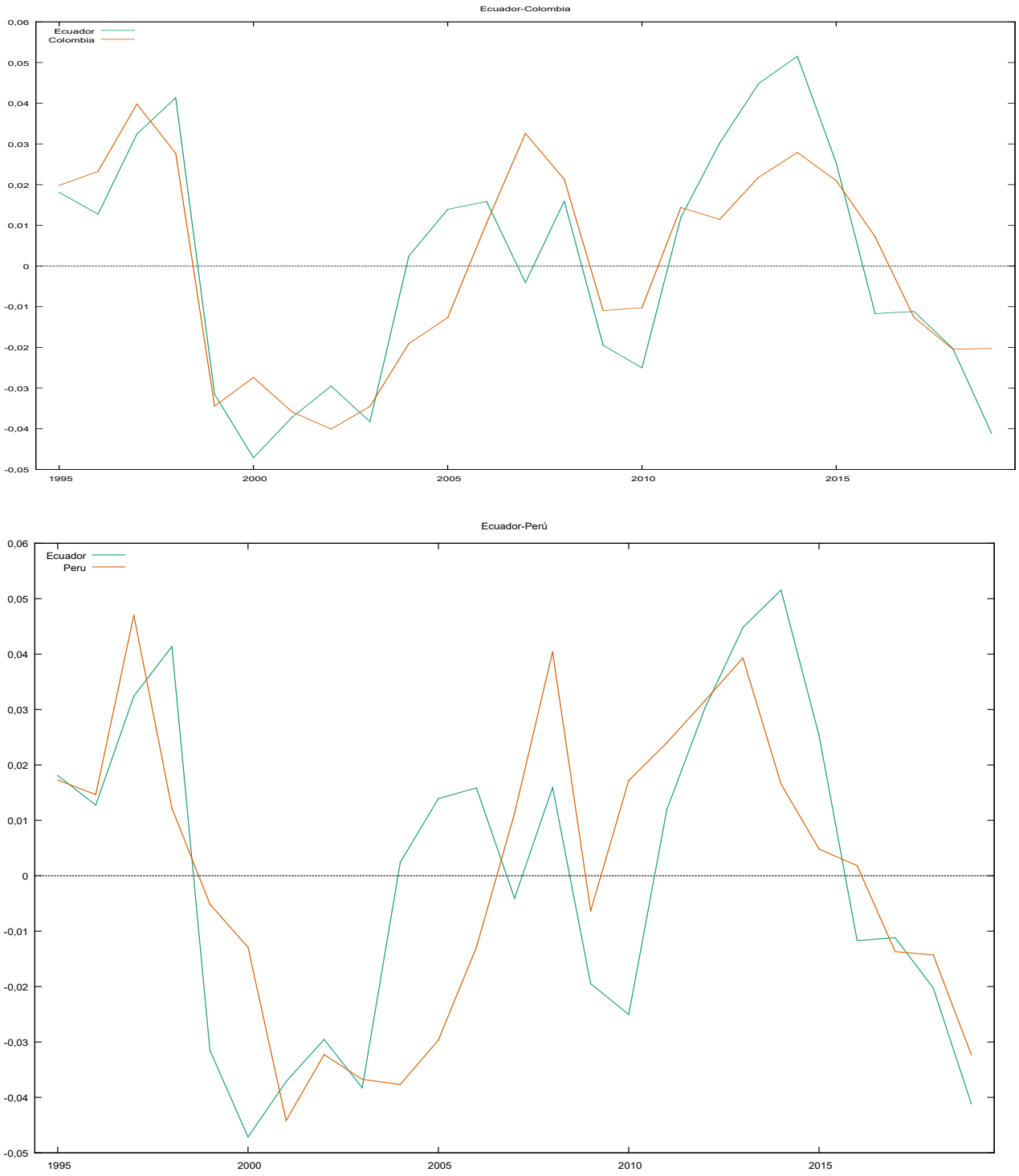


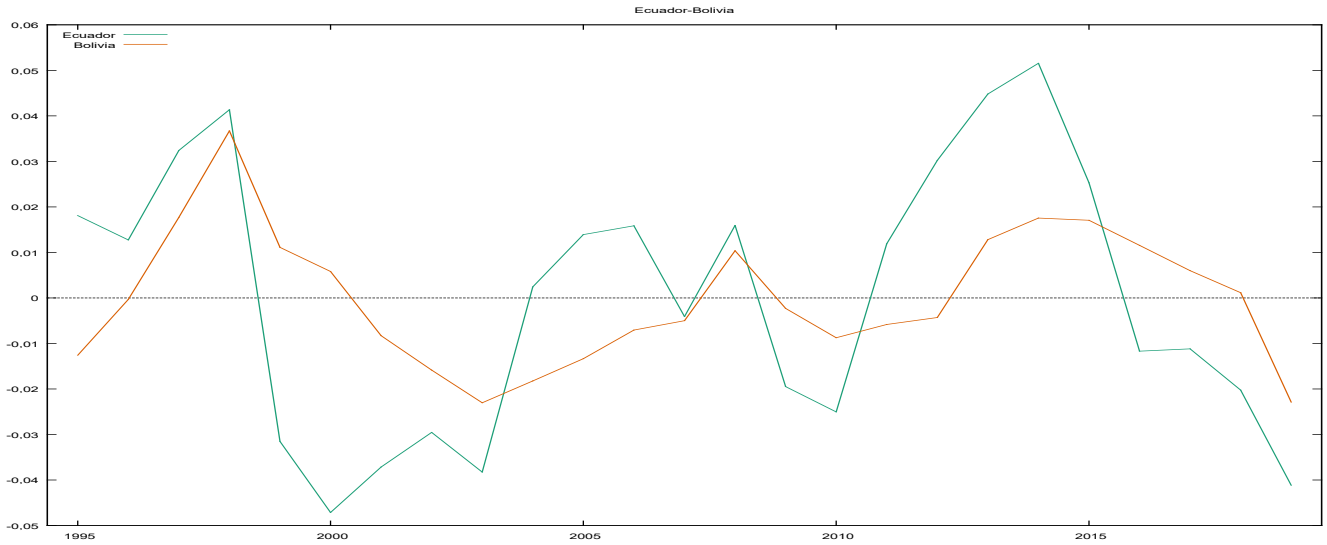


Source: own elaboration.

In figure 3, it is observed that the level of synchronization of the cycles has experienced an increase compared to previous levels. Specifically, the cycles of Ecuador with Colombia and Peru are shown to be closely aligned. Additionally, a decrease in volatility is identified.

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





Source: own elaboration.

In Table 1, the volatilities of the cyclical components for the two periods are presented. It is observed that, during the first period analyzed, the variability of the Ecuadorian cycle is surpassed by that of Peru and Bolivia and is comparable only to that of Colombia, which exhibits the closest volatility among the countries studied. In the second period, it is noted that the levels of volatility among the countries converge significantly. Bolivia and Peru, in particular, are shown to reach levels of stability comparable to Colombia and Ecuador. However, Ecuador is identified as having 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

Source: own elaboration.

In Table 2, the cross-correlation matrix between the different cyclical components extracted using the HP filter for the period 1950–1994 is presented. The correlation between the cyclical component of Ecuador and those of the other economies is shown to be low, indicating that the national cycles do not move in a highly similar manner during this period.

It is noted that only Peru exhibits a procyclical behavior coinciding with that of Ecuador, though the correlation coefficient remains quite low. Additionally, with respect to Colombia's business cycle, the Ecuadorian cycle is observed to lead by one period, with a coefficient of 0.441. Finally, in the case of Bolivia, a procyclical behavior is identified, showing the highest coefficient among those reviewed, with 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

Source: own elaboration.

In Table 3, the cross-correlation matrix between the different cyclical components extracted using the HP filter for the period 1995–2019 is presented. It is observed that the cycles have become largely synchronized, particularly those of Colombia and Peru with Ecuador, displaying procyclical coincident behaviors and correlation coefficients of 0.842 and 0.677, respectively. In the case of Peru, a two-period lag is still identified, although its coefficient is shown to be higher than in the previous period.

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

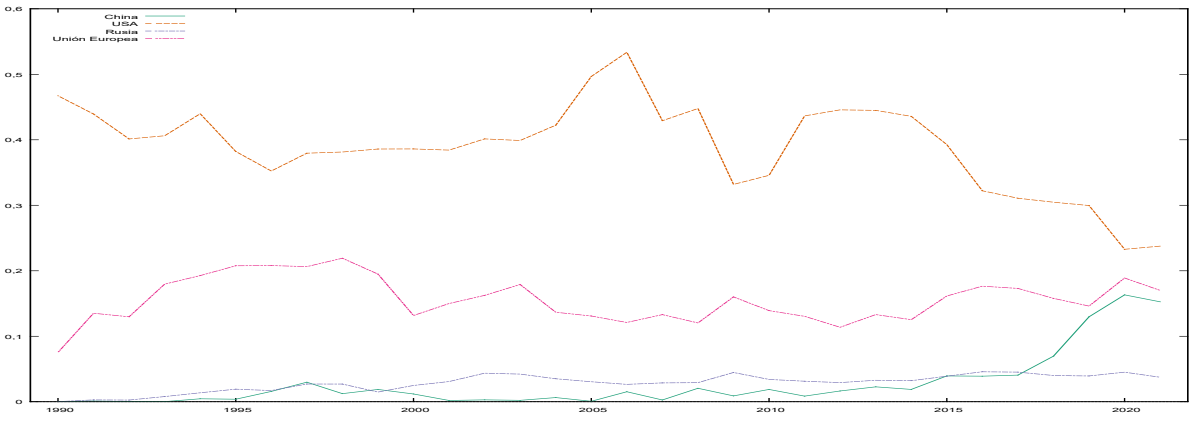
Source: own elaboration.

Several studies examining the correlation of cyclical indicators over time in Latin American countries and their different regional integration processes are shown to reach similar conclusions, including those by Anguiano & Ruiz (2022), Ávila-Vélez & Pinzón-Giraldo (2015), Gong & Kim (2018), González et al. (2012), Kuppusamy et al. (2023), and Mora (2016).

A prevailing consensus is highlighted regarding the lack of evidence supporting the existence of a common business cycle among Latin American countries, indicating that full convergence has not occurred. However, relevant correlations between pairs of countries are identified, suggesting a higher degree of correlation among their business cycles and even sub-regional synchronization, as demonstrated by the obtained results. The relationship between trade and the business cycle is recognized as the most significant factor in synchronization, with regional trade integration positively influencing the alignment of regional business cycles.

The Ecuadorian business cycle is observed to be strongly conditioned by its high degree of openness and dependence on the prices of its main exports. Consequently, the analysis presented in the previous section is supplemented by results comparing the Ecuadorian cycle with those of its main trading partners: the USA, the European Union, China, and Russia. The first two are identified as historical partners of Ecuador, while the latter two are noted for significantly increasing their import volumes from the country. These four partners collectively account for approximately 70% of Ecuador's exports, as shown in figure 4.

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

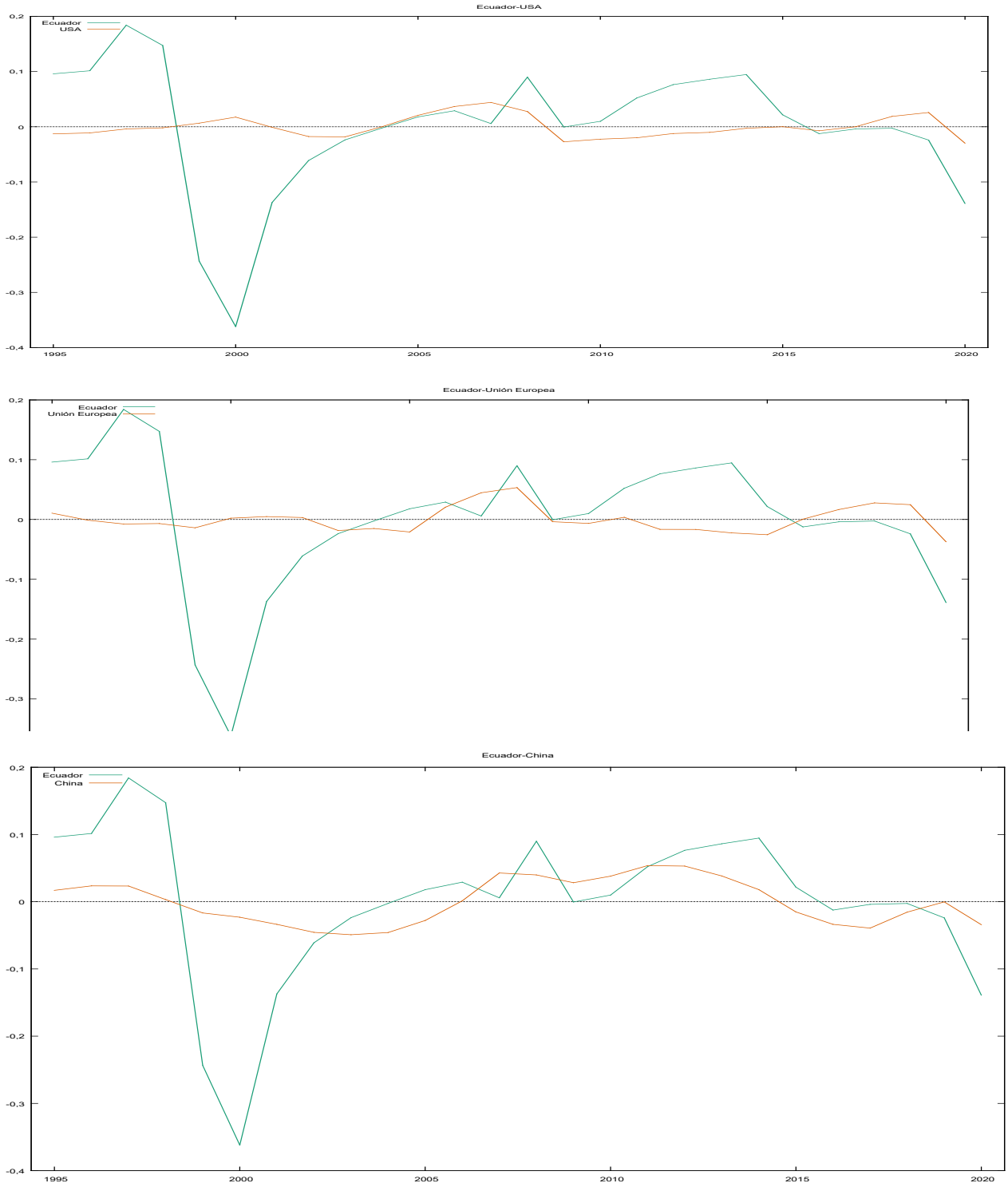


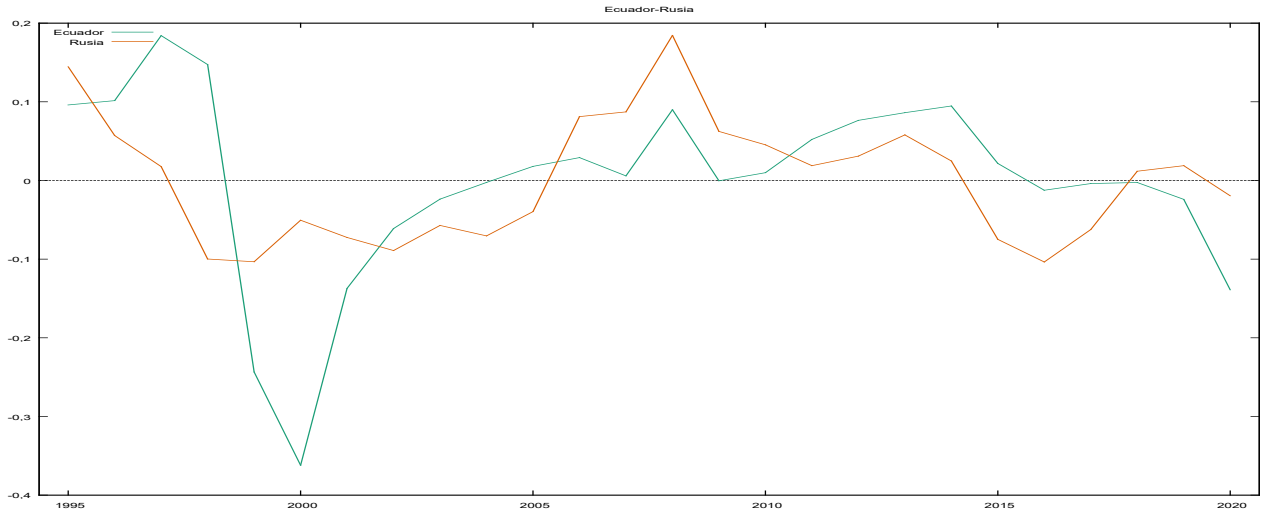
Source: own elaboration.

In figure 5, the cyclical components of the Ecuadorian economy are presented alongside those of the selected countries. A certain degree of concordance with the selected economies is observed according to the HP filter. Significant differences in cyclical behavior are identified, with the cycles of the USA and the European Union being the least similar

to the national cycle. Conversely, the cycles of China and Russia are shown to exhibit a closer alignment with Ecuador's cycle.

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





Source: own elaboration.

In table 4, the volatilities of the cyclical components for the period analyzed are presented. The variability of the Ecuadorian cycle is shown to be incomparable to that of the USA and the European Union, both of which exhibit very mild cycles over time. Even Russia's volatility, identified as the most volatile among the countries analyzed, is observed to be lower than that of Ecuador. When the relative volatility with respect to Ecuador is considered, it is noted that all countries display lower cyclical fluctuations.

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

Source: own elaboration.

In table 5, the cross-correlation matrix between the different cyclical components extracted using the HP filter is presented. A relatively high correlation with China's cyclical component is identified, at 0.514, indicating synchronous movement. A similar degree of interrelation is observed with the Russian economy, although it is noted that the Ecuadorian cycle lags by one period in this case.

For the United States and the European Union, the coefficients are shown to be low, suggesting that a stable relationship between these economies and the Ecuadorian economy does not exist. Additionally, in the case of the USA, an asymmetry in the cycles is observed along with a delay of one period, whereas with the EU, the Ecuadorian cycle is shown to lead by four periods.

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

Source: own elaboration.

The results of this paper are found to support the conventional wisdom that globalization increases the degree of synchronization of business cycles. Trade and market integration are shown to amplify macroeconomic fluctuations, which holds significant implications for the formulation of macroeconomic policies in an increasingly integrated global economy.

Through the comparison of Ecuador's business cycle with those of the CAN countries, it is observed that the correlation between Ecuador's cycle and those of these countries has followed a synchronization trend. This trend is identified to have intensified after the implementation of the trade agreements in 1994, which eliminated trade barriers. At present, a very similar business cycle is noted among Ecuador, Colombia, and Peru.

CONCLUSIONS

The results of this study highlight the evolving synchronization of business cycles among Latin American economies and their increasing alignment with global economic trends. This synchronization is considered logical, given the shared extensive borders, strong trade links, and similar productive structures of these countries. It is observed that the cycles of Latin American economies, particularly those of Ecuador, Colombia, and Peru, now align more closely with international shocks stemming from the rise of the Chinese and Russian economies, while maintaining significant connections to the U.S. and European economies.

The findings reveal that trade and market integration play a pivotal role in shaping macroeconomic fluctuations. The implementation of trade agreements in 1994, which eliminated barriers among the CAN countries, significantly intensified the synchronization of business cycles, particularly among Ecuador, Colombia, and Peru. This increased alignment underscores the importance of regional trade policies in fostering economic stability and cooperation. Moreover, the comparison of Ecuador's business cycle with its major global trading partners demonstrates varying degrees of correlation, with stronger synchronization observed with China and Russia compared to the U.S. and the European Union.

The dominance of trade flows over financial flows is identified as the primary determinant of short-term business cycle movements in Latin America. This trade-driven synchronization highlights the region's growing dependence on external developments, particularly since the great recession of 2008. While the rise of China as a key trade partner has deepened the integration of Latin American economies with global markets, the region's limited financial integration with its main partners, such as the U.S. and Europe, suggests that trade relationships continue to drive economic linkages more than financial ones.

These findings have important implications for policymakers. First, the increasing synchronization of business cycles suggests that Latin American countries should prioritize coordinated macroeconomic policies to mitigate the impact of external shocks. Regional cooperation could enhance resilience to international fluctuations, particularly those linked to commodity markets, which heavily influence these economies. Second, the reliance on trade flows highlights the need for strategies that diversify export bases and reduce vulnerability to commodity price volatility. Greater efforts to foster financial integration could also help balance the region's economic relationships and reduce overdependence on trade-driven dynamics.

Finally, while regional synchronization is observed, the differences in cyclical behavior with global partners, such as the U.S. and the European Union, suggest the need for differentiated policy approaches. Strengthening regional trade agreements and improving infrastructure for intra-regional trade could further enhance the benefits of synchronization while reducing exposure to global economic volatility. This nuanced understanding of the interplay between regional and global integration offers valuable insights for shaping future economic strategies in Latin America.

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