

Application and Comparison of Regional Economic Integration Index for Mercosur and the Pacific Alliance*

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Abstract This paper aims to apply the comprehensive regional economic integration index for the Southern Common Market (Mercosur) and the Pacific Alliance, which are the most prominent economic integrations in Latin America and the Caribbean. By using the thirteen variables in the four dimensions, and by calculating the weights from the Principal Component Analysis methodology, it reports the composite index for each dimension and the overall regional economic integration index. In case of the output and input market, the degree of integration is higher in Mercosur than in the Pacific Alliance, while the results are reversed in the financial and foreign exchange market. Unlike the previous three markets, both economic integrations have the similar degree of integration in the Global Value Chain. Finally, Mercosur is more comprehensively integrated than the Pacific Alliance, while recently, the effects of integration has been reduced in the output market.

Key words Economic integration, Principal Component Analysis, Mercosur, the Pacific Alliance, Trade, Finance, Global Value Chain

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I. Introduction

Historically, the aspirations for regional economic integration have been intense in Latin America and the Caribbean (hereafter, LAC). Due to the failure of the import substitution industrialization, finding new engines for economic growth was strongly required. Creating regional economic integration such as the European Community was considered as one of them, because it was able to solve many constraints and limitations that occurred from demand and supply sides by means of economies of scale. Thus, starting with the Latin America Free Trade Association in 1960, several regional economic integrations were established, such as the Central American Common Market, Andean Community, and Caribbean Community and Common Market. Since then, a number of integrations have emerged in this region for various purposes, leading to the recent creation of the Progress of South America.

Among them, the most noticeable and successful ones are the Southern Common Market (hereafter, Mercosur) founded in 1991 and the Pacific Alliance in 2012. Firstly, the proportion of economic size in 2017 for Mercosur and Pacific Alliance in LAC, respectively, was 47% and 35%, and of working age population was 42% and 35%. In other words, both account for more than 80% of the whole regional economy. Secondly, both integrations presented new economic paradigms. Before Mercosur, one of the main features of regional economic integrations was the closed regionalism. However, Mercosur succeeded on the basis of open regionalism, and it has become a new paradigm in this region.¹⁾ Similarly, the Pacific Alliance declared pro-American market friendly integration at the peak of Pink tide. The economic performance has recently been

1) For more detailed explanation, refer to Kwon *et al.* (2018).

increasing as the mainstream of LAC has been changing from the leftist party to the rightist one.

Nevertheless, there are not many comprehensive studies on Mercosur and the Pacific Alliance, because most of them focus on specific topic or market. Lots of previous literatures composed the economic integration index for LAC as a whole. But as mentioned above, it is necessary to figure out the degree of integration given that both represent over 80% of this region's economy.

In all the studies of LAC, SELA (2016) documented the comprehensive Latin American economic integration index that consisted of economic, political, social, environmental, and cultural dimensions. A total of forty variables were combined by the Principal Component Analysis (hereafter, PCA) for the overall index. However, most variables were not bilateral and it did not provide the index for Mercosur and the Pacific Alliance. Beaton *et al.* (2017) captured the relative importance of Latin American economic integration reporting the degree of economic integration of major countries in the world. However, the comprehensive index for Mercosur and the Pacific Alliance was not offered. Basnet and Sharma (2013) analyzed the degree of economic integration by estimating the short and long-term synchronization of four macroeconomic variables in seven Latin American countries. Consequently, the similar pattern to fluctuations was found in many countries.

When it comes to Mercosur, Basnet and Pradhan (2017) documented the degree of economic integration by analyzing common trends and cycles of variables in real and financial sectors. In the long-term, real output, investment and intra-regional trade were substantially integrated. Furthermore, it demonstrated that the degree among the countries in Mercosur has been deepened over time. Baer *et al.* (2002) empirically researched the effects of mismatched macroeconomic policies on trade

side between Brazil and Argentina, which are the main countries of Mercosur. As a result, they made the degree of trade integration worse through risk averseness and protectionist forces. Kaltenthaler and Mora (2002) reported the main motivations for the integration process of Mercosur, and Sanguinetti *et al.* (2004) examined the economic advantages of South-South regional cooperation by considering the effects of trade creation and diversification. Additionally, the effects of economies of scale and tariff reduction on the volume of trade were analyzed by regression models. Both explanatory variables positively affected the volume of trade.

Unlike the literatures about Mercosur that focused on trade sides, those of the Pacific Alliance mainly documented the synchronization of financial and foreign exchange markets due to the existence of the Latin American Integrated Market (hereafter, MILA). Using the Dynamic Conditional Correlation Multivariate GARCH (hereafter, DCC-MGARCH) model, Mellado and Escobari (2015) examined the change of interdependence of stock returns among the Pacific Alliance after creating MILA. They found that the interdependence strengthened and concluded that there was no merit to diversify portfolio investments in the member countries of MILA. Bolanos *et al.* (2015) observed the change of profitability, risk, correlation and trading volume in the stock market of MILA and documented that MILA was not as effective as expected, because the effects about profitability, risk and correlation were minimal. Perry and Auvert (2016) studied the degree of the Pacific Alliance's integration from the various aspects that consisted of trade, insurance, bond and stock markets. Compared to East Asia and emerging countries, it provided the relative level of the Pacific Alliance. However, the comprehensive economic integration index was not applied.

To summarize the above literatures, it is hard to find an overall economic integration index for Mercosur and the Pacific Alliance contrary to the

index for the whole LAC. Thus, this paper aims to apply the comprehensive one for the two integrations. Additionally, this paper reports the relative degree of integration that compares with the primary economic integrations in the world. The main contributions are as follows.

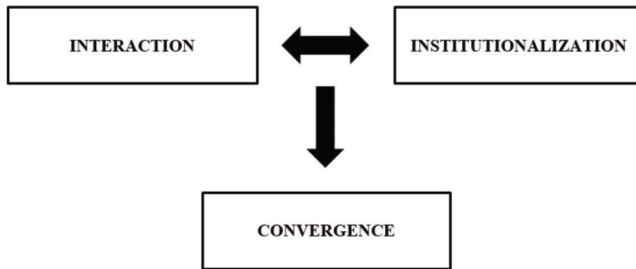
First of all, definitively, this paper provides the overall economic integration index for Mercosur and the Pacific Alliance. In order to clarify the intra-regional relationship, this paper uses as many bilateral data as possible. Even though the number of applied variables decreases compared to the previous literatures, this is advantageous in that it clearly demonstrates the intra-regional connection. Second, this paper collects the data of seven economic integrations, which consist of a total of fifty-seven countries in the world, in order to normalize the variables. Since the normalized value is heavily influenced by the maximum, this paper tries to obtain as much data as possible. Third, the PCA methodology is applied to eliminate the overlapped information when calculating the weights used for all variables and dimensions. Fourth, for financial and foreign exchange market where bilateral data do not exist, The DCC-MGARCH model is applied. It reflects the effects of bilateral information transmission and preserves the time-varying properties of correlation coefficient.

The remainder of this paper is organized as follows. Section 2 discusses the concept and structure about economic integration and the composition of dataset for this paper. Section 3 describes the normalization and PCA method. Section 4 reports the empirical results. Section 5 draws implications.

II. Composition of Regional Economic Integration Index

1. Concept and Structure

This paper justifies the term “economic integration” as the removal of artificial constraints for optimal economic activities that lie mutually for the existence and development of community members, introducing all the factors of modifications and integrations consciously to pursue such forms as if it is one whole country. Based on Balassa (2013), the theory of economic integration is reconstructed, as shown in Figure 1.



<Figure 1> Process of Economic Integration

Firstly, the interaction and institutionalization are in a mutually influential relationship. When the volume of trade increases, for instance, institutional measures, such as tariff reduction, will be implemented and this will lead to increased trade volume again. It is the same with the first stage of economic integration theory by Balassa (2013). Secondly, intra-regional interactions in real sector and factors of production market become more active as additional institutional actions like common external tariff are established, which is the second and third stages of Balassa (2013). Thirdly, major macroeconomic variables are converged in the process of interrelationship between interaction and institutionalization. These features are further strengthened in the fourth and fifth stages where

regional common policies are implemented and transnational institutions are established. In summary, the degree of economic integration is reinforced while the interaction and institutionalization mutually influence to each other, and then, the macroeconomic variables among the countries are converged.

This paper redefines and reclassifies institutionalization as the institutional integration and the interaction and convergence as the relational integration. The institutional integration is characterized by the fact that the same institutional system is adopted to all member countries, or the same accessibility is guaranteed for economic agents by the same transaction and access costs among countries. Some representative examples are the elimination of tariffs and non-tariff barriers through the Free Trade Agreement, adoption of common currencies, and convention for the Prevention of Double Taxation. On the other hand, the relational integration is determined by either the close proximity of multiple economic markets or the increase in the share of transactions among countries. The typical instances are the increased interdependence of trade shares and stock returns. However, this paper does not consider and measure the institutional integration, since the effects of institutional integration are assumed to have already been reflected in the indicators of the relational integration.²⁾ Thus, considering and including both integrations causes the double counting problem. The variables for this paper consist of a total of thirteen variables, and they are divided into four dimensions, as shown in Table 1.³⁾

2) Additionally, there are some institutional implementations that cannot affect the change of interaction or convergence. That is to say, they may not have significant effects on the economic integration. Therefore, this paper only takes into account the relational integration.

3) This paper tried to use more variables to make the economic integration index

<Table 1> Information of Data

Dimension	Variable	Date	Source
Output market (a)	Exports (a-1)	1990M1-2018M12	DOTS
	Imports (a-2)	1990M1-2018M12	DOTS
	TII (a-3)	1990M1-2018M12	Calculated
Input market (b)	Portfolio (b-1)	2001-2017	CPIS
	FDI (b-2)	2009-2017	CDIS
	ODI (b-3)	2009-2017	CDIS
	Remittances (b-4)	2010-2017	World Bank
Financial and foreign exchange market (c)	Stock return (c-1)	2003M1-2018M12	Bloomberg
	10Y Treasury bond yield (c-2)	2013M3-2017M10	Bloomberg
	Exchange rate (c-3)	1992M8-2018M12	Bloomberg
GVC (d)	Intermediate exports (d-1)	1992-2017	WITS
	Intermediate imports (d-2)	1992-2017	WITS
	Intermediate TII (d-3)	1992-2017	Calculated

Note: GVC is the Global Value Chain. DOTS is the Direction of Trade Statistics, CPIS is the Coordinated Portfolio Investment Survey, CDIS is the Coordinated Direct Investment Survey, and WITS is the World Integrated Trade Solution.

2. Data Composition

Table 1 summarizes the basic information of all variables. First, the output market consists of the exports, imports and Trade Intensity Index (hereafter, TII), which represents the relative importance of trading partner and is calculated by using the exports data.⁴⁾ The indexes for exports and imports are the proportion of intra-regional exports and imports to the world, and is constructed by using the monthly data in order to improve the accuracy of PCA. Second, the input market is composed of the portfolio investment, Foreign Direct Investment

more precise. However, in many variables, there were too many missing values and it was impossible to find the bilateral data. If additional data are collected in the future, more variables are to be used.

- 4) Visit https://wits.worldbank.org/wits/wits/witshelp/Content/Utilities/e1.trade_indicators.htm for detailed definition and method.

(hereafter, FDI) and Outward Direct Investment (hereafter, ODI),⁵⁾ which represent the capital market, and the amount of remittances indicating the labor market. The indexes of all four variables are intra-regional share of the world. Third, the stock return, 10-year Treasury bond yield,⁶⁾ and exchange rate form the financial and foreign exchange market. Since they are not bilateral data, this paper adopts different methodologies in order to make the indexes. The indexes for stock return and exchange rate are the Dynamic Conditional Correlation (hereafter, DCC) derived from the DCC-MGARCH model proposed by Engel (2002). Unlike the Pearson correlation coefficient, the DCC reflects the information transmission between countries and preserves the time-varying property of correlation coefficient. For the 10-year Treasury bond, the rolling correlation method is applied because the DCC-MGARCH model is not able to be used due to the data characteristics. Fourth, the Global Value Chain (hereafter, GVC) is measured by the intermediate exports, imports, and TII. The intermediate transactions between countries are one of the representative variables in order to measure how they are interconnected. Like the output market, the indexes are composed by the intra-regional shares of the world.

For the normalization methodology to be introduced in the next section, this paper collects all thirteen variables from seven major economic integrations, consisting of fifty-seven countries, as shown in Table 2.

5) The United Nations Conference on Trade and Development (hereafter, UNCTAD) provides the FDI and ODI data from 2001 to 2012. However, this paper does not use them due to the big discrepancy in values between UNCTAD and CDIS, which offers the latest data.

6) The 3-month and 3-year bond yields were also considered to be used, but this paper excluded them because they were severely unbalanced.

<Table 2> Major Economic Integrations for Normalization

East Asia	ASEAN	EU			Mercosur	Pacific Alliance	NAFTA	CACM
Korea	Brunei	Austria	Germany	Poland	Argentina	Chile	Canada	Costa Rica
Japan	Cambodia	Belgium	Greece	Portugal	Brazil	Mexico	Mexico	El Salvador
China	Indonesia	Bulgaria	Hungary	Romania	Uruguay	Colombia	U.S.	Guatemala
	Lao PDR	Croatia	Ireland	Slovakia	Paraguay	Peru		Honduras
	Malaysia	Cyprus	Italy	Slovenia				Nicaragua
	Myanmar	Czech	Latvia	Spain				
	Philippines	Denmark	Lithuania	Sweden				
	Singapore	Estonia	Luxembourg	UK				
	Thailand	Finland	Malta					
	Vietnam	France	Netherlands					

Note: East Asia has not been formed as an official economic integration, yet. However, the economic interactions are the most active in Asia. Each integration represents each continent in the world, but Africa and Oceania are excluded by the difficulty to collect data. There are lots of missing values in ASEAN and CACM for some variables, but they do not affect the maximum.

III. Methodology

First of all, when reducing multidimensional variables into unidimensional one, it is important to adjust the level difference among variables. This paper applies the max-scaling method⁷⁾ in order to create a comprehensive index for Mercosur and the Pacific Alliance. The maximum for each variable is presented in Table 3, and the normalization is performed by dividing each observation at t-period by its maximum value.⁸⁾ The variable that has been normalized lies between zero and one which are the minimum and maximum, respectively.

Second, calculating the weights for variables is another important issue

7) Instead of the max-scaling, the min-max-scaling method is also widely adopted. However, there is no significant difference between them as the main concern is to capture the relative degree of economic integration in the sample.

8) Since the EU uses the common currency, EURO, the maximum of exchange rate is conceptually set as 1.

<Table 3> Maximum for Each Variable among Seven Integrations

Dim.	(a)			(b)				(c)			(d)		
Var.	a-1	a-2	a-3	b-1	b-2	b-3	b-4	c-1	c-2	c-3	d-1	d-2	d-3
Max.	0.74	0.72	125.37	0.65	0.83	0.69	0.69	0.86	0.87	1.00	0.46	0.48	83.85
Name	EU	EU	CACM	EU	EU	EU	EA	NAFTA	PA	EU	PA	PA	CACM
Year	2004	2004	1992	2016	2009	2009	2011	2010	2013	—	1992	1992	2008

Note: Var. is the variable and Max. is the Maximum. PA indicates the Pacific Alliance.

about creating an overall index. This paper uses the PCA methodology as it transforms a number of possible correlated variables into a smaller number of “uncorrelated” ones by the orthogonal property and any overlapped information among variables is efficiently eliminated.⁹⁾ To explain furthermore, assume that $x=[x_1, x_2, x_3]$ is the data vector. For $j=1, 2, 3$, each principal component is defined as $PC_j=e'_jx$ where $e_j=[\alpha_{1j}, \alpha_{2j}, \alpha_{3j}]$ is the eigenvector, and has its eigenvalue λ_j . As $\alpha_{ij}\sqrt{\lambda_j}$ denotes the correlation between x_i and PC_j , $\alpha_{ij}^2\lambda_j$ represents the proportion of variance in x_i explained by the PC_j . Following the constraints mentioned by Huh and Park (2018),¹⁰⁾ the principal components are selected. Suppose if λ_1 and λ_2 satisfy these conditions, the comprehensive index among the variables is created as the following equation:

$$\begin{aligned}
 Index_t = & \left(\frac{\alpha_{11}^2\lambda_1}{(\lambda_1 + \lambda_2)} + \frac{\alpha_{12}^2\lambda_2}{(\lambda_1 + \lambda_2)} \right) x_{1t} + \left(\frac{\alpha_{21}^2\lambda_1}{(\lambda_1 + \lambda_2)} + \frac{\alpha_{22}^2\lambda_2}{(\lambda_1 + \lambda_2)} \right) x_{2t} + \\
 & \left(\frac{\alpha_{31}^2\lambda_1}{(\lambda_1 + \lambda_2)} + \frac{\alpha_{32}^2\lambda_2}{(\lambda_1 + \lambda_2)} \right) x_{3t}.
 \end{aligned}$$

Table 4 represents the results of PCA. On the output market, the first

9) This paper uses the PCA method developed by Huh and Park (2018). For the more specific explanation, see Huh and Park (2018).

10) According to Huh and Park (2018), there are three constraints, which are (i) the principal components should have the eigenvalues exceeding 1 (Kaiser criterion), (ii) each component is able to explain the total variance at least 10%, and (iii) all components contribute cumulatively to explain more than 60% of total variance.

<Table 4> Summary of PCA Results

PC_j	(a)			(b)				(c)			(d)		
	1	2	3	1	2	3	4	1	2	3	1	2	3
λ_j	2.93	0.05	0.02	2.46	0.90	0.53	0.11	2.53	0.35	0.13	1.73	1.11	0.16
α_{1j}	0.58	-0.59	0.58	0.43	-0.56	0.71	-0.07	-0.55	0.83	0.11	0.73	0.03	-0.68
α_{2j}	0.58	-0.19	-0.79	0.59	0.20	-0.28	-0.73	0.59	0.48	-0.66	0.41	0.78	0.48
α_{3j}	0.57	0.79	0.23	0.42	0.73	0.36	0.40	0.60	0.29	0.75	0.54	-0.63	0.56
α_{4j}				0.54	-0.34	-0.54	0.55						
Prop.	0.98	0.01	0.01	0.62	0.22	0.13	0.03	0.84	0.12	0.04	0.58	0.37	0.05
Cum.	0.98	0.99	1.00	0.62	0.84	0.97	1.00	0.84	0.96	1.00	0.58	0.95	1.00

principal component accounts for 98% of the total variance and it satisfies all the constraints. The addition of the other two components does not have any significant effect on explaining the variation, nor does it satisfy the constraints. When it comes to the input market, only the first component satisfies the constraint. Constructing the weights with the first one can only account for about 62% of the total variation, but the other components cannot be added because of the constraints. The case of financial and foreign exchange market is the same with the previous two markets. Only the first component is able to utilize to calculate the weights. However, the two components are available in relation to GVC. When using only the first one, it does not satisfy all of the constraints, but adding the second makes it possible and the explanatory power is about 95%.

The calculated weights for all variables and dimensions are represented in Table 5. In case of the output market, the weights for each variable are fairly uniform. However, on the input market, FDI occupies the largest weight, which is 0.348, and the weights of portfolio investment and ODI are relatively small. Similar to the output market, the weights for the financial and foreign exchange market and GVC are distributed without any major difference. Lastly, this paper has once again performed the PCA with four markets being new variables. The output market has the largest

<Table 5> Weights for Variables and Dimensions

(a)	Weights	(b)	Weights	(c)	Weights	(d)	Weights	TOTAL	Weights
a-1	0.336	b-1	0.185	c-1	0.303	d-1	0.325	(a)	0.282
a-2	0.336	b-2	0.348	c-2	0.348	d-2	0.340	(b)	0.252
a-3	0.328	b-3	0.176	c-3	0.349	d-3	0.335	(c)	0.197
		b-4	0.291					(d)	0.268

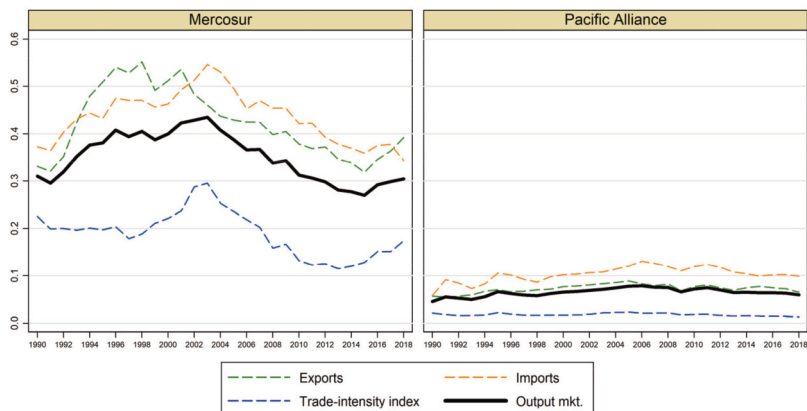
Note: For cases where weights cannot be properly assigned due to the missing values in the bond market, PCA was implemented only with the stock return and exchange rate except the bond yield. The eigenvalues corresponding to stock return and exchange rate are 1.44 and 0.56, respectively, and the proportion is 0.72 and 0.28. Based on the constraints, it constructed the weights using only the first component.

weight, which is 0.282, while the financial and foreign exchange market has the least value.

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IV. Results of Economic Integration Index

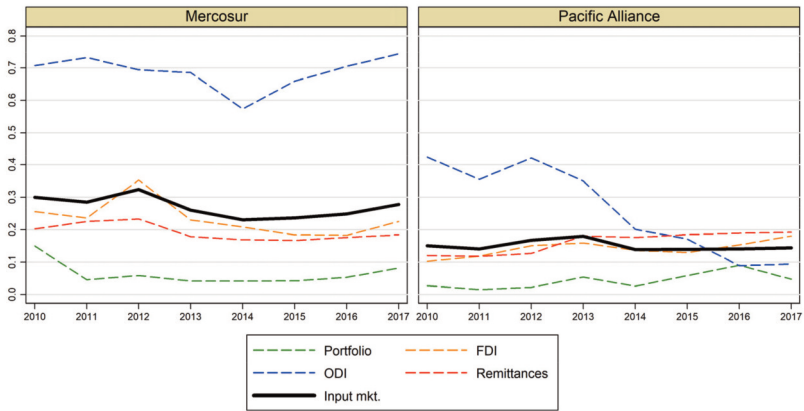
This section reports the values of the weighted variables and the composite index representing each market. Firstly, Figure 2 represents the results of output market where there is a distinctive difference between Mercosur and the Pacific Alliance. For the sample period, Mercosur has a



<Figure 2> Output Market

higher value than the Pacific Alliance in all variables. While both exports and imports increased rapidly in 1991 when Mercosur was formally signed, the volume of trade in the Pacific Alliance did not increase significantly, even though it was signed in 2012. Another interesting point in Figure 2 is the decreasing trade volume among the countries in Mercosur since 2003. Consequently, the composite degree of output market in 2018 is almost equal to the value in 1991. That is to say, there is no longer any increase in the trade volume due to the implementation of Mercosur. In terms of trade intensity, both integrations have relatively low values compared to the world. Specifically, the trade intensity among the countries of the Pacific Alliance is very low. On the composite index, Mercosur is about 0.35 while the Pacific Alliance is approximately 0.05 on average.

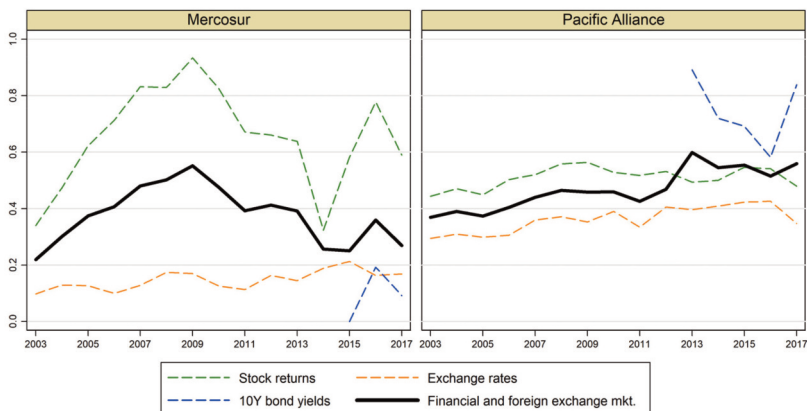
Secondly, the results in the input market are different from those in the output market. Only except for ODI, the relative level of the remaining variables is similar between the two integrations. Mercosur's ODI is high compared to the integrations in the world, because it is over 0.6 on average during the sample period. On the contrary, the proportion of ODI among the countries in the Pacific Alliance has been decreasing despite of the



<Figure 3> Input Market

implement of the integration. In both regions, the direct investment is greater than the portfolio investment. The size of remittances representing the labor market has been increasing in the Pacific Alliance and is almost similar to Mercosur. Comprehensively considering the input market, Mercosur has developed more like the output market, even though the difference is not large.

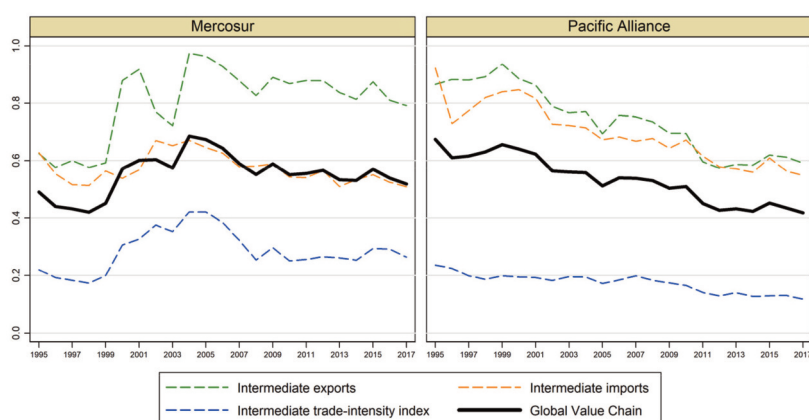
Thirdly, unlike the two previous cases, the Pacific Alliance recently showed more advanced results in the financial and foreign exchange market, as shown in Figure 4. If only focusing on the stock returns, the degree of integration is relatively high in Mercosur even though the fluctuation is very severe. However, the co-movement in exchange rates and bond yields is very low in Mercosur, while in the Pacific Alliance, it is moderate and stable. It can be seen that the degree of integration in the bond market in the Pacific Alliance is very high although the more accurate analysis is limited due to the lack of sample period. The level of financial and foreign exchange market is somewhat higher in the Pacific Alliance, based on the official entering years of the two integrations in 1991 and 2012.



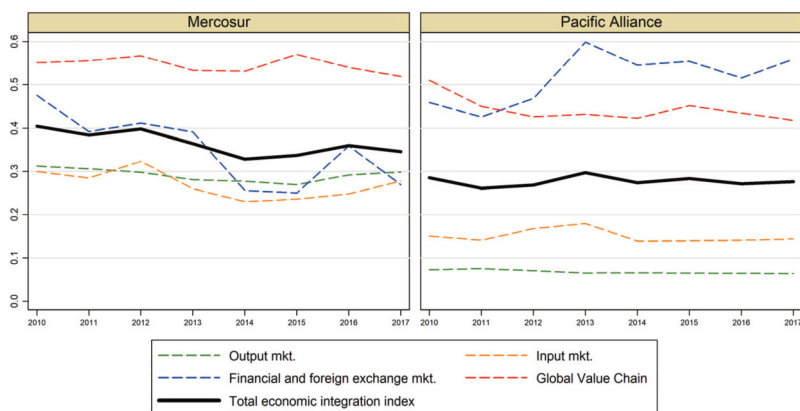
<Figure 4> Financial and Foreign Exchange Market

Fourthly, Figure 5 presents the degree of GVC. The most striking point in both integrations is the very high degree of intermediate exports and imports. Specifically, the export's value of Mercosur is noticeable. The intermediate trade among the Pacific Alliance has continued to decline as time went on, but still remains relatively high in terms of relative value. Another interesting finding is that both integrations are more integrated in GVC than in the output market. Specifically, the difference is very large in the Pacific Alliance. Nevertheless, the intermediate trade intensity is still relatively low in both integrations. In case of the composite index, Mercosur has recently been slightly higher as the value in the Pacific Alliance has continued to decline, although it varies with time. However, it can be concluded that the two integrations are showing similar values because the gap difference is trivial.

Finally, Figure 6 documents the total economic integration index and shows the composite indexes for all four markets. Mercosur was the most integrated in terms of GVC, while the Pacific Alliance was the most advanced in the financial and foreign exchange market. The degree of integration on GVC in the Pacific Alliance is also high like Mercosur.



<Figure 5> GVC



<Figure 6> Total Economic Integration Index

However, there is a huge difference in the output market. The Pacific Alliance's output market integration level is so weak that it does not exceed 0.1. Like the output market, the level of input market is also low in the Pacific Alliance. Therefore, the total economic integration index is higher in Mercosur than in the Pacific Alliance. In the case of the Pacific Alliance, there has been no rapid integration effect except for the financial and foreign exchange market since 2012. On Mercosur, after the official launch in 1991, the effect of integration has been clearly seen in the output and input market. However, those in the output market has decreased significantly in recent years.

V. Concluding Remarks

This paper examined the relative degree of integration of Mercosur and the Pacific Alliance that are the most important integrations in LAC. Using the bilateral data and the proper methodology for each variable, it applied the composite market indexes and the total economic integration index. The main findings are as follows. First, the output and input market in

Mercosur has been relatively more integrated than the Pacific Alliance. Specifically, the gap is large in the output market since the degree in the Pacific Alliance cannot even exceed 0.1. Second, contrary to the previous two markets, the degree of integration in the financial and foreign exchange market is larger in the Pacific Alliance as expected, because they have the MILA while Mercosur has no specific institution for financial integration. Third, the relative level of GVC is similar between both integrations. The intermediate volume of the Pacific Alliance, however, which steadily declines over time, needs to be noted. Lastly, the total economic integration index is higher in Mercosur than in the Pacific Alliance, even though there is not a big difference. In case of the Pacific Alliance, there is no significant effects of integration only except for the financial and foreign exchange market.

In conclusion, this paper is significant and different in that it introduced the PCA, which is the most widely used when making the composite index, in Mercosur and the Pacific Alliance. However, the limitations certainly exist. First, the number of variables that represent each dimension should increase, although it is difficult mainly due to unbalanced panel data or its credibility. Second, the sample period needs to be extended to increase the accuracy of PCA. In specific, for yearly data, using more samples will be helpful for the research. Lastly, more precise economic integration index can be derived if the double counting problem between the institutional and relation integration is solved.

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Appendix A. Economic Integration Index of Mercosur

Year	(a)				(b)				(c)				(d)				Total	
	a-1	a-2	a-3	a	b-1	b-2	b-3	b-4	b	c-1	c-2	c-3	c	d-1	d-2	d-3		d
1990	0.33	0.37	0.23	0.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1991	0.32	0.36	0.20	0.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1992	0.35	0.40	0.20	0.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993	0.42	0.43	0.20	0.35	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1994	0.48	0.44	0.20	0.38	-	-	-	-	-	-	-	-	-	0.59	0.60	-	-	-
1995	0.51	0.43	0.20	0.38	-	-	-	-	-	-	-	-	-	0.62	0.63	0.22	0.49	-
1996	0.54	0.47	0.20	0.41	-	-	-	-	-	-	-	-	-	0.58	0.55	0.19	0.44	-
1997	0.53	0.47	0.18	0.39	-	-	-	-	-	-	-	-	-	0.60	0.52	0.18	0.43	-
1998	0.55	0.47	0.19	0.41	-	-	-	-	-	-	-	-	-	0.58	0.51	0.17	0.42	-
1999	0.49	0.46	0.21	0.39	-	-	-	-	-	-	-	0.05	-	0.59	0.56	0.2	0.45	-
2000	0.51	0.46	0.22	0.40	-	-	-	-	-	-	-	0.12	-	0.88	0.54	0.31	0.57	-
2001	0.54	0.49	0.24	0.42	0.30	-	-	-	-	-	-	0.13	-	0.92	0.57	0.33	0.6	-
2002	0.48	0.51	0.29	0.43	0.27	-	-	-	-	-	-	0.11	-	0.77	0.67	0.38	0.6	-
2003	0.46	0.55	0.30	0.44	0.39	-	-	-	-	0.34	-	0.10	0.22	0.72	0.65	0.35	0.57	-
2004	0.44	0.53	0.25	0.41	0.32	-	-	-	-	0.47	-	0.13	0.30	0.97	0.67	0.42	0.69	-
2005	0.43	0.50	0.24	0.39	0.29	-	-	-	-	0.62	-	0.13	0.37	0.96	0.65	0.42	0.67	-
2006	0.42	0.45	0.22	0.37	0.25	-	-	-	-	0.71	-	0.10	0.41	0.93	0.63	0.39	0.64	-
2007	0.42	0.47	0.20	0.37	0.31	-	-	-	-	0.83	-	0.13	0.48	0.88	0.58	0.32	0.59	-
2008	0.40	0.45	0.16	0.34	0.16	-	-	-	-	0.83	-	0.17	0.50	0.83	0.58	0.25	0.55	-
2009	0.41	0.45	0.17	0.34	0.21	-	0.46	-	-	0.93	-	0.17	0.55	0.89	0.59	0.3	0.59	-
2010	0.38	0.42	0.13	0.31	0.15	0.26	0.71	0.20	0.30	0.83	-	0.13	0.48	0.87	0.54	0.25	0.55	0.41
2011	0.37	0.42	0.12	0.31	0.05	0.24	0.73	0.23	0.28	0.67	-	0.11	0.39	0.88	0.54	0.26	0.56	0.38
2012	0.37	0.39	0.13	0.30	0.06	0.35	0.69	0.23	0.32	0.66	-	0.16	0.41	0.88	0.57	0.27	0.57	0.40
2013	0.35	0.38	0.12	0.28	0.04	0.23	0.69	0.18	0.26	0.64	-	0.15	0.39	0.84	0.51	0.26	0.53	0.36
2014	0.34	0.37	0.12	0.28	0.04	0.21	0.57	0.17	0.23	0.32	-	0.19	0.26	0.81	0.53	0.25	0.53	0.33
2015	0.32	0.36	0.13	0.27	0.04	0.18	0.66	0.17	0.24	0.58	0.00	0.21	0.25	0.87	0.55	0.29	0.57	0.34
2016	0.35	0.38	0.15	0.29	0.05	0.18	0.70	0.18	0.25	0.78	0.19	0.16	0.36	0.81	0.52	0.29	0.54	0.36
2017	0.36	0.38	0.15	0.30	0.08	0.23	0.74	0.18	0.28	0.59	0.09	0.17	0.27	0.79	0.51	0.26	0.52	0.35
2018	0.39	0.34	0.17	0.30	-	-	-	-	-	0.53	-	0.21	-	-	-	-	-	-

Note: Refer to the Table 1 in Section 2 to find the variable name corresponding to each alphabet. The sign “-” means unobservable data.

Appendix B. Economic Integration Index of the Pacific Alliance

Year	(a)				(b)					(c)				(d)				Total
	a-1	a-2	a-3	a	b-1	b-2	b-3	b-4	b	c-1	c-2	c-3	c	d-1	d-2	d-3	d	
1990	0.06	0.06	0.02	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1991	0.05	0.09	0.02	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1992	0.06	0.08	0.02	0.05	-	-	-	-	-	-	-	0.19	-	1.00	1.00	0.20	0.73	-
1993	0.06	0.07	0.02	0.05	-	-	-	-	-	-	-	0.24	-	0.98	0.94	0.20	0.71	-
1994	0.07	0.08	0.02	0.06	-	-	-	-	-	-	-	0.18	-	0.97	0.92	0.22	0.7	-
1995	0.07	0.11	0.02	0.07	-	-	-	-	-	-	-	0.20	-	0.87	0.92	0.24	0.67	-
1996	0.07	0.10	0.02	0.06	-	-	-	-	-	-	-	0.22	-	0.88	0.73	0.22	0.61	-
1997	0.07	0.09	0.02	0.06	-	-	-	-	-	-	-	0.22	-	0.88	0.77	0.20	0.62	-
1998	0.07	0.09	0.02	0.06	-	-	-	-	-	-	-	0.28	-	0.89	0.82	0.19	0.63	-
1999	0.07	0.10	0.02	0.06	-	-	-	-	-	-	-	0.30	-	0.94	0.84	0.20	0.66	-
2000	0.08	0.10	0.02	0.07	-	-	-	-	-	-	-	0.26	-	0.89	0.85	0.20	0.64	-
2001	0.08	0.10	0.02	0.07	0.05	-	-	-	-	-	-	0.27	-	0.86	0.82	0.19	0.62	-
2002	0.08	0.11	0.02	0.07	0.02	-	-	-	-	-	-	0.33	-	0.79	0.73	0.18	0.56	-
2003	0.08	0.11	0.02	0.07	0.01	-	-	-	-	0.44	-	0.29	0.37	0.77	0.72	0.20	0.56	-
2004	0.09	0.11	0.02	0.07	0.01	-	-	-	-	0.47	-	0.31	0.39	0.77	0.71	0.20	0.56	-
2005	0.09	0.12	0.02	0.08	0.01	-	-	-	-	0.45	-	0.30	0.37	0.69	0.67	0.17	0.51	-
2006	0.08	0.13	0.02	0.08	0.01	-	-	-	-	0.50	-	0.31	0.40	0.76	0.68	0.18	0.54	-
2007	0.08	0.13	0.02	0.08	0.01	-	-	-	-	0.52	-	0.36	0.44	0.75	0.67	0.20	0.54	-
2008	0.08	0.12	0.02	0.08	0.04	-	-	-	-	0.56	-	0.37	0.46	0.74	0.68	0.18	0.53	-
2009	0.07	0.11	0.02	0.07	0.02	0.09	-	-	-	0.56	-	0.35	0.46	0.70	0.64	0.17	0.5	-
2010	0.08	0.12	0.02	0.07	0.03	0.10	0.42	0.12	0.15	0.53	-	0.39	0.46	0.69	0.67	0.17	0.51	0.29
2011	0.08	0.12	0.02	0.08	0.02	0.12	0.36	0.12	0.14	0.52	-	0.33	0.43	0.60	0.62	0.14	0.45	0.26
2012	0.07	0.12	0.02	0.07	0.02	0.15	0.42	0.13	0.17	0.53	-	0.41	0.47	0.57	0.58	0.13	0.43	0.27
2013	0.07	0.11	0.02	0.06	0.05	0.16	0.35	0.18	0.18	0.49	0.89	0.40	0.60	0.59	0.57	0.14	0.43	0.30
2014	0.07	0.10	0.02	0.07	0.03	0.14	0.2	0.18	0.14	0.50	0.72	0.41	0.55	0.58	0.56	0.13	0.42	0.27
2015	0.08	0.10	0.01	0.06	0.06	0.13	0.17	0.18	0.14	0.55	0.69	0.42	0.55	0.62	0.61	0.13	0.45	0.28
2016	0.07	0.10	0.01	0.06	0.09	0.15	0.09	0.19	0.14	0.54	0.58	0.43	0.52	0.61	0.56	0.13	0.43	0.27
2017	0.07	0.10	0.01	0.06	0.05	0.18	0.09	0.19	0.14	0.48	0.84	0.35	0.56	0.59	0.55	0.12	0.42	0.28
2018	0.07	0.10	0.01	0.06	-	-	-	-	-	-	-	0.40	-	-	-	-	-	-

Note: Refer to the Table 1 in Section 2 to find the variable name corresponding to each alphabet. The sign “-” means unobservable data.

Aplicación y Comparación del Índice de Integración Económica Regional para el Mercosur and la Alianza del Pacífico

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Resumen Este documento tiene como objetivo aplicar el índice de integración económica regional para el Mercado Común del Sur (Mercosur) y la Alianza del Pacífico, que son las integraciones económicas más prominentes en América Latina y el Caribe. Al usar las trece variables en las cuatro dimensiones, y al calcular los pesos a través de la metodología de Análisis de Componentes Principales, se informa el índice compuesto para cada dimensión y el índice general de integración económica regional. En el caso del mercado de producción e insumos, el grado de integración es mayor en el Mercosur que en la Alianza del Pacífico, mientras que los resultados se invierten en el mercado financiero y de divisa extranjera. A diferencia de los tres mercados anteriores, ambas integraciones económicas tienen el grado similar de integración en la Cadenas Globales de Valor. Finalmente, el Mercosur está más integrado que la Alianza del Pacífico, mientras que recientemente los efectos de la integración se han reducido en el mercado del producción.

Palabras claves Integración económica, Análisis de Componentes Principales, Mercosur, la Alianza del Pacífico, Comercio, Finanzas, Cadenas Globales de Valor