The Integration of Domestic Commodity Market: Evidence from Vietnam

Hoang Van HAI
University of Economics,
The University of Danang, Viet Nam

Dao Huu Hoa
University of Economics,
The University of Danang, Viet Nam

Abstract:- **This study aims to evaluate the integration process of the commodity market in Vietnam from the perspective of a price-related approach. Particularly, we use the commodity price index of Vietnam from 2010 to 2018 to investigate the degree and trend of the commodity market integration of Vietnam during this period. As a result, a simple index of market integration is found to be a successful proxy for the market integration level. In addition, an upward trend is generally observed for the degree of the integration of Vietnam's domestic market from 2010 to 2018, suggesting a strong evidence of the market integration among the Vietnam's provinces.**

Keywords:- Market Integration Index, Commodity Market, Domestic Market, Segmentation Market, Vietnam.

JEL classification: C21; O11; R11

I.   INTRODUCTION

The trend of economic development within several major economies has increasingly intensified thanks to the regional economic integration. Following this trend, Vietnam has been recently considered to be a successful market integration (Esiyok & Ugur, 2018). Several previous studies tried to evaluate the Vietnam's market integration level and effect of the market integration on the Vietnam's economic growth, such as Vu & Khiem (2016), Chien & Huy (2018), and Esiyok & Ugur (2018). According to Hansjörg Herr et al., (2016), the economic integration has been an important pillar of Viet Nam's reforms since 1968 within the impact of trade and investment liberalization. In particular, deepened economic integration has broadened the economic opportunities, risen the GDP growth, trade and foreign

investment, and incomes (Vu, 2016). However, there are still some issues related to the Vietnam's market integration which has not been clarified in previous studies, including a variation, such as an increase or a decrease, of the market integration in Vietnam since the reform and opening up and the integration trend of Vietnam's domestic market.

To measure the degree of market integration, we can utilize three approaches: trade flow method (Young, 2000); production method (Xu, 2002); and price-related approach (Parsley & Wei, 2001). More importantly, we need to understand the factors controlling the market integration or market segmentation from both theoretical and empirical analysis to provide a basis for economic policy. However, most of the above-mentioned studies can only evaluate whether the market is going towards integration and are difficult to produce a consistent indicator reflecting the degree of market integration. It is even more impossible to match such an indicator with the data of possible explanatory variables to provide further research.

In the perspective of the price-related approach, Samuelson (1954) was the first study using the "price method" to measure the degree of inter-regional market integration. This model shows that P_i and P_j can either rise or fall at the same time, or one rises but the other falls. If the value of the relative price P_i/P_j does not exceed a certain range, it can be considered that the markets between two regions is integrated. Some researchers have applied the "iceberg" cost model and the variance of the relative prices among different regions to measure the "boundary effect" between the United States, Europe, Chinese and other regions, as well as the effect within each region (Parsley & Wei, 2001; Bai et al., 2012; Fall, 2019). However, no research applies

this method to analyse the issues of Vietnam's inter-regional market integration.

This study aims to evaluate the integration process of the commodity market in Vietnam in 2010-2018 from the perspective of a price-related approach. In more details, this study firstly reviews literature on the degree of integration of Vietnam's inter-regional markets from the perspective of price-related approach, then applies the information contained in the price index to investigate the integration process of commodity markets in Vietnamese provinces.

The remainder of this study is organized into four sections. Section 2 presents the data and methodologies utilized for our analysis. Section 3 provides the results and discussions. Lastly, the conclusion is shown in Section 4.

II.   METHOD AND DATA

2.1. Method

Following Parsley & Wei (2001), the degree of integration of Vietnam's inter-regional markets is estimated using the relative prices of good in different locations. Then the standard deviations of the relative prices across different goods for each city pair are computed as follows:

$$\Delta Q_{ijt}^{k} = \ln(P_{it}^{k}/P_{jt}^{k}) - \ln\left(\frac{P_{it-1}^{k}}{P_{jt-1}^{k}}\right) = \ln\left(\frac{P_{it}^{k}}{P_{it-1}^{k}}\right) - \ln\left(\frac{P_{jt}^{k}}{P_{jt-1}^{k}}\right) \qquad (1)$$

$$\mathrm{Var}(q_{ijt}^{k}) = \mathrm{Var}\left(\left|\Delta Q_{ijt}^{k}\right| - \overline{\left|\Delta Q_{t}^{k}\right|}\right) \qquad (2)$$

where P_{it}^{k} (P_{it}^{k}) is the price of a certain commodity in the province i (j) of the commodity k. $\mathrm{Var}(q_{ijt}^{k})$ represents variance in the relative price changes and is time-series data, which is convenient to observe the evolution of variance over time, thereby using the self-movement law of time series to test the variation trend of the degree of market integration.

Based on our samples including 10 categories of commodities and 30 pairs of neighbouring provinces in 14 years from 2005 to 2018, we can obtain 4200 relative price indicators ΔQ_{ijt}^{k} in differential forms. Next, the absolute value of relative prices $\left|\Delta Q_{ijt}^{k}\right|$ was chosen to measure the

variance. The reason for processing this step is that after taking the logarithmic form, the position exchange of the numerator and denominator of the price of region i and j will cause the sign of ΔQ^{k} to change inversely, that is $\Delta Q_{ijt}^{k} = -\Delta Q_{ijt}^{k}$. At this time, the placement order will affect the size of $\mathrm{Var}(\Delta Q_{ijt})$ and uniformly taking the absolute value can avoid this problem. From the viewpoint of the Parsley & Wei (2001), the logarithmic form [ln(1-c), -ln(1-c)] of the no-arbitrage interval [1-c, 1/(1-c)] is symmetric, meaning that the ΔQ^{k} with the same absolute value and opposite direction reveal the same price change range., however, the arbitrage direction of them is opposite. In particular, a positive value of ΔQ_{ijt}^{k} indicates that goods in region i are shipped to region j for sale. Reversely, a negative value of ΔQ_{ijt}^{k} means that the commodities in region j are brought to region i for sale.

To measure the relative price variance more accurately, we eliminate the non-additive effects caused by commodity heterogeneity in the $\left|\Delta Q_{ijt}^{k}\right|$. For doing so, we need to calculate the average value $\overline{\left|\Delta Q_{t}^{k}\right|}$ of $\left|\Delta Q_{t}^{k}\right|$ between 30 pairs of neighbouring provinces for a given year t and a given commodity category k, then deduct this mean value from those of the 30 $\left|\Delta Q_{ijt}^{k}\right|$. The equation $\overline{\left|\Delta Q_{ijt}^{k}\right|} - \overline{\left|\Delta Q_{t}^{k}\right|}$ can be performed based on the de-mean method. The final value calculating the variance in relative price changes is q_{ijt}^{k} and the variance is recorded as $\mathrm{Var}(q_{ijt}^{k})$. Therefore, as shown in Equations (1) and (2), the $\mathrm{Var}(q_{ijt}^{k})$ can be a proxy for the market integration index, which is the interaction between a pair of regions relative to their commodity price, and has a negative relation with market integration.

2.2. Data

The sample consists of a panel of 30 Vietnamese provinces showing their highest average GRDP contribution to GDP of 63 Vietnamese provinces over 14 years from 2005 to 2018. The province-level data are collected from the Statistical Yearbooks of 30 target provinces and the General Statistics Office (GSO) for the period of 2005 to 2018. The retail price indices by category and region are used to calculate the index of market integration, including Food and foodstuff; Beverage and cigarette; Garment, footwear, hat; Housing and construction materials; Household appliances and goods; Medicine and health care; Traffic; Postal services

and Telecommunication; Education services; Culture entertainment and tourism; Other goods and services.

Additionally, our data cleaning principles are as follows: (1) The year 2005 is selected as the starting year of the dataset. (2) We only use the regions having full data from 2005 to 2018; (3) Regarding the selection of commodity types, we omitted the commodities that were not included in the Statistical Yearbooks in 2005.

III. RESULTS

In this section, we present the degree of domestic market integration (DMI) based on the value of the provincial variances of relative price metrics $Var(q_{ijt})$. After processing the dataset, we get 420 (30 × 14) variance values of 30 pairs of neighbouring provinces in 14 years, forming 30 groups of time series: $Var(q_{ijt})$. To obtain the overall trend of the degree of domestic market integration, we calculate yearly mean value of the indicator $Var(q_{ijt})$ (30 observations per year). The average DMI over 30 Vietnamese provinces from 2005 to 2018 is presented in **Figure 1**.
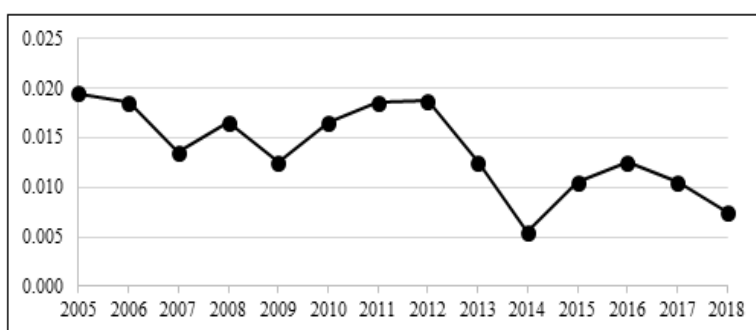

Figure 1: The domestic market integration index in Vietnam

As can be seen from **Figure 1**, the DMI is dramatically decreased after 2012. Additionally, the difference between the highest and lowest value is 0.013. Thus, we can posit the most province tends to be integrated from 2005 to 2018 and the linked between provinces are increased. This finding is consistent with results of **Table 1** showing mean of the average degree of each province.

Table 1: Descriptive statistics for the degree of each province.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Mean	7.02	12.47	8.75	8.13	12.27	12.27	23.27	16.27	14.33	15.65	20.33	22.13	24.20	20.20
Std dev.	3.48	4.15	2.67	3.51	1.42	4.72	1.57	5.50	4.46	4.18	2.98	2.60	1.40	3.00

Source: Author's estimation.

These results also suggest an increase of the market integration in Vietnam after 2012. Moreover, as seen in **Figure 1**, the fluctuation of the relative prices from 2005 to 2018 has experienced a process of amplification and then narrowing. Based on this observation, we infer that the Vietnam's market integration degree has been increasing because of the reform and opening of the market policy. This finding is also consistent to that revealed in Esiyok & Ugur (2018).

To more understand the evolution of market integration between regions from 2005 to 2018, we provide the network graphs considering ten provinces for two years, including 2005 and 2018, in **Figure 2**. For constructing the network, a binary matrix is firstly created by using the original DMI metrics. In particular, the DMI values are divided into one or zero value based on the threshold values. Therefore, an association between regions i and j indicates the high market integration between these two regions. Added to this, a region showing several links also has a high possibility of market integration with the other regions. For the purely domestic

market, more linkages (or levels) indicate a greater market integration from a macro perspective.
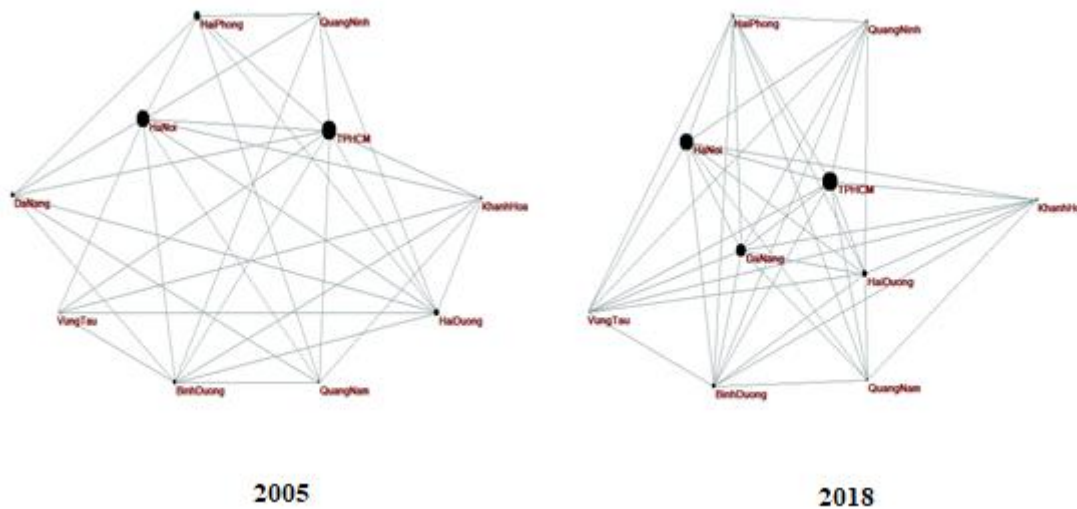

Figure 3: Networks of market integration (cut-off value: 0.02)

The results from **Table 1** and **Figure 2** reveal an appearance of segmentation to integration for the Vietnamese provinces. In fact, as shown in **Table 1**, the mean degree of each province increases from 7.02 in 2005 to 24.20 in 2017. This integration market trend is clearly illustrated in **Figure 2.**

Regarding the network graph in **Figure 2**, it can be seen that most of the regions are involved in the process of market integration. In 2005, most of the cities are connected with the others., however, the networks in 2018 are almost completed, with an existence of a core-periphery phenomenon in the market integration. In addition, the core nodes in 2018 more focus on the developed provinces, such as Ho Chi Minh, Ha Noi, or Da Nang. Generally, most of the cities showing the sharp increases in degrees are developed regions in Vietnam. Therefore, these results implies that the unification of regional markets in Vietnam has been occurring at the national and regional levels since 2005.

Furthermore, it is worth noting that Vietnam is an economy with huge differences between regions. Added to this, the marketization and related market integration processes may have different performances in different regions. Thus, the difference in the market integration process of the three economic regions, including the Red River Delta, Northern Midland and Mountainous, and Southeast region, is further investigated.

From the calculated market integration indicators, we take out 3 pairs of the neighboring regions and then use a one-way factor analysis of variance method to verify the statistically significant difference between the selected regions. In particular, we calculate the average time series of each pair of the neighboring region to obtain three sets of cross-sectional data X_{ri}, where r = 1, 2, 3 representing the three regions of Red River Delta region, Northern Midland and Mountainous region, and Southeast region, respectively. We then denote the mean value of the neighboring province pairs within each region. Let TSS represents the overall variation of X_{ri}, $TSS = \sum(X_{ri} - \overline{X})^2$; BSS represents the variance produced by the variation between groups, $BSS = \sum n_r(\overline{X_r} - \overline{X})^2$; WSS represents the residual variance caused by the variation within the group, $WSS = \sum(X_{ri} - \overline{X_r})^2$. The relationship between these three types of variance is $TSS = BSS + WSS$. If the overall variation TSS and the inter-group variation BSS are highly correlated, the value of the F statistic can reject the null hypothesis, in other words, there is no difference in the mean value between each group.

The result of the one-way variance test shows that F = 11.23 and the P-value is 0.002, therefore, the null hypothesis at a significance level of 1% is rejected. Thus, we argue that the degree of market integration among the three regions is at least not the same. However, the test result of F=11.23 only indicates that at least one group has a different mean from the other groups and does not reveal which two groups are

significantly different. To clarify this issue, we further use the Bonferroni method to perform a pairwise t-test to compare the mean values of multiple samples (such as Red River Delta region and Northern Midland and Mountainous region; Northern Midland and Mountainous region and Southeast region). The results are presented in **Table 2.**

Table 2. Results for multiple comparisons inter-groups (Bonferroni method)

Row mean – Col mean	Red River Delta	Southeast
Northern Midland and Mountainous	-0.00115 (0.003)	-0.00071 (0.001)
Southeast	-0.00017 (0.981)	

Note: P-value is in parentheses

As shown in **Table 2**, the differences between the Red River Delta region and Northern Midland and Mountainous region as well as between Northern Midland and Mountainous region and Southeast region are significant at the 1% level. In addition, the differences between the Red River Delta region and the Southeast region are negative and statistically insignificant. Based on these findings, it can be concluded that the relative price fluctuations in the Red River Delta region significantly exceeded those in the Northern Midland and Mountainous region from 2010 and 2018. This finding is supported by Góes & Troy (2017), Hong et al., (2019).

IV.   CONCLUSION

This study investigates the level of domestic market integration in Vietnam from 2005 to 2018 by using the price-related approach (Parsley & Wei, 2001). The findings of this study reveal that the commodity retail price index data of Vietnam's neighboring provinces and the degree of integration of the domestic commodity market are gradually improved in the period of 2005-2018. Additionally, the three major regions of North, Central, and South have different degrees of the market integration. Moreover, the difference between the Noth and South regions is not statistically significant.

The work done in this study provides a starting point for further research on the determinants of the market integration process in Vietnam regarding the relative price variance as a dynamic indicator of the degree of market integration. Overall, our findings show that the greater market integration has contributed to Vietnam's regional economic growth based on the macroscopic perspectives. Thus, further studies may help to better understand the relevant issues by exploring the microeconomic evidence. For example, researchers could study decision-making processes by local governors or raise awareness of how IMI increases.

REFERENCES

[1]. Bai, C.-E., Ma, H., & Pan, W. (2012). Spatial spillover and regional economic growth in China. *China Economic Review*, 23(4), 982–990.

[2]. Chien, V.L., & Huy, Ng. (2018). The Impact of Foreign Direct Investment on Income Convergence: Evidence from Provinces of Vietnam. *Southeast Asian Journal of Economics*, 6(1), 71-89.

[3]. Esiyok, B., & Ugur, M. (2018). Spatial Dependence in the Growth Process and Implications for Convergence Rate: Evidence on Vietnamese Provinces. *Journal of the Asia Pacific Economy*, 23(1), 51-65.

[4]. Fall, M. (2019). Impact of regional interactions on China's trade performance: evidence from a spatial econometric approach. *China Economic Journal*, 12(3), 1-16.

[5]. Góes, Carlos & Matheson, Troy. (2017). Domestic market integration and the law of one price in Brazil. *Applied Economics Letters*, 24(5), 284-288.

[6]. Herr, H., Schweisshelm, E., & Vu, T-M. (2016). The

integration of Vietnam in the global economy and its effects for Vietnamese economic development. *Working Paper No. 44*.

[7]. Hong T., Yu N., Storm S., & Gao. B. (2019). How much does regional integration contribute to growth? An analysis of the impact of domestic market integration on regional economic performance in China (1997–2011), *Economic Research-Ekonomska Istraživanja*, 32:1, 3189-3210.

[8]. Parsley, D., & Wei, S.J. (2001). Explaining the border effect: The role of exchange rate variability, shipping costs, and geography. *Journal of International Economics*, 55(1), 87–105.

[9]. Samuelson, P.A. (1954). The Transfer Problem and Transport Costs, II: Analysis of Effects of Trade Impediments, *The Economic Journal*, 64(254), 264-289.

[10]. Vu, T.T.A. (2016). Does WTO accession help domestic reform? The political economy of SOE reform backsliding in Vietnam. *World Trade Review*, 16(1), 85–109.

[11]. Vu, X.B., & Nghiem, H.S. (2016). Analysis of GDP trends and inequalities in Vietnam's provinces and groups of provinces. *Asian Economic and Social Society*, 6(7), 167-186.

[12]. Xu, Xinpeng. (2002). Have the Chinese provinces become integrated under reform? *China Economic Review*, 13(2–3), 116-133.

[13]. Young, A. (2000) The Razor's Edge: Distortions and Incremental Reform in the People's Republic of China, *The Quarterly Journal of Economics*, CXV(4), 1091-1135.