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Unveiling the Role of Price Variation in Shaping European Market Integration: A Panel Data Perspective

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Abstract

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Aqil Khan* is currently affiliated with the Directorate of commerce education and management science, Higher Education Archives and libraries, KP, Pakistan. Email: agilkhan47uop@gmail.com This study investigates the relationship between price variation and European market integration using a comprehensive data set on 27 European countries for the period of 1996 to 2020. The prime motive of this study is highlighting the role of price variation in affecting the market integration process within the European economies. This study employing the quantile regression approach to assess the extent to which price variation (PV) effect the level of integration in various European economies. The results of the quantile regression approach indicate that price variation, Gross Domestic Product (GDP), distance (DIS), trade barriers (TB), and institutional auality (IQ) are significant causing elements of market integration. This study finds that PV, DIS and IQ are negative related with market integration at all levels. Further, the empirical result also shows that with successive quantiles, the size of the PV, DIS and IQ coefficient are growing, which indicate that the effect of these factors are bigger in countries with high amount of market integration. On the contrary, the result of quantile regression shows the direct link of GDP with market integration at all levels. In addition, with successive quantiles, the extent of the GDP coefficient is growing, which intend that the effect of GDP is greater in countries with greater amount of market integration. Moreover, the results of this study also imply that TB inversely affect market integration at all quantiles. The findings from this study offer valuable insights for policymakers and market participants for better understanding of the dynamics of European market integration.

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Keywords: Price Variation, Market Integration and Quantile Regression

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INTRODUCTION

European Union, as a block of economic and political union of twenty-seven countries, has focused on market integration for the freely movement of goods, services, labor forces and capital within its territory. For the purpose, Euro-zone has actively contributed towards implementation of the Word Trade Organization reforms through removal of barriers and export diversification. Market integration has been one of the strategies towards globalization and economists believe that export diversification tends to increased economic growth of the host economy (Hammouda et al., 2006; Balaguer and Cantavella-Jorda, 2004). Market integration can be defined as phenomenon wherein formerly distinct or isolated markets establish interconnections, facilitating the unrestricted flow of knowledge, human and capital inflows across these markets. The process of integration can manifest itself across several scales, ranging from regional to worldwide, and it can have substantial economic, social, and political consequences. According to Hickscher-Ohlin (HO) model, market integration between nations occurs due to differences in the relative factor endowment. In particular, Lipsey (1963) has

discussed market integration in all of its aspects. These dimensions include the behavior of relative pricing, national price level, volume flows of traded products, and volume flows of foreign direct investment. In addition to the process of global market integration, there is a rising tendency toward the formation of regional integration. European Union (EU) is an important example of regional integration. Integration may be accomplished through the use of a variety of strategies. Regarding foreign trade, the European Union remained as the foremost global trader with the transactions of EUR 6.28 trillion in goods and services during the year 2021. International trade contributes about 21.5% of the Gross Domestic Product of the European Union.

The fundamental way of accomplishment of market integration is by the lowering tariff and non-tariff barriers. The policy makers have adopted elimination of variety of restrictions on international inflows of capital and good in the form of various stages of economic integrations. Moreover, non-tariff barriers namely; anti-dumping practices and quota embargo or sanction, are now days dominated strategies to impede international trade. Historically, European market integration has been a multifaceted process and notable milestones. Backed in 1957 during the Treaty of Rome by the six founding countries had aims to create common market through elimination of trade tariff and barriers among member countries (Baldwin and Wyplosz, 2015). The treaty of Rome by six founding countries has marked the beginning of European market integration which has subsequently concluded the formation of European Monetary System (EMS) in 1979, and the adoption of euro as a uniform currency in 1999. These developments significantly influenced the level of market integration. While studying the impact of euro on financial market integration, Eichengreen (2008) concluded that such progressions have foster market integration particularly in the financial market.

Campos and Coricelli (2002) stated that the expansion of the European Union (EU) due to joining of members from the Eastern Europe have further deepened market integration in the Europe, which led to higher financial linkages and more documented trade index. Existing literature have discussed various factors to foster economic integration. Like, Findlay (1978) stated that economic integration depends on economic stability, state investment policy, technological level of host economy and human capital (Pegkas, 2015). Other studies like Robinson (2001), Dollar and Kraay (2003) have argued that some factors like price variations among across the nations, GDP, geographical distance, technological innovation, and institutional quality and trade barriers remained some of the significant factors to strengthen market integration in the European Union (Makki and Somwaru, 2004).

Price variation exerts a significant influence on market integration, particularly within the context of global or regional markets. Market integration is intricately tied to the fluctuations in prices of goods or assets across these markets. As highlighted by Dumas and Solnik (1995), price variations serve as a pivotal catalyst in this process. Firstly, price disparities between distinct markets create arbitrage opportunities, enticing market participants to exploit these discrepancies by purchasing low in one market and selling high in another, thereby narrowing the price differentials and fostering market integration. Secondly, price variations act as signals of underlying supply and demand dynamics, shaping the flow of information across markets and influencing traders' decisions (Glosten & Milgrom, 1985). Thirdly, highly volatile price causes market efficiency to reduce (Kyle, 1985). Moreover, price variation encourages volatility that impacts the

attractiveness of cross-market activities, and prompt regulatory interventions to reduced price variation (Froot & Frankel, 1989). Hence, by diminishing price variation, it is termed that it improves market accessibility coupled with markets strengthening, which have important implications for market markets. GDP is also one of the fundamental indicators of a country's economic strength that attracts global investors and trading partners. Higher GDP signifies more robust economy attracting foreign direct investment that contributes to growth opportunities. As explained by Helpman and Krugman (1985), economically stable economies often have a more substantial domestic market, which can attract Foreign Direct Investment (FDI) and cross-border trade, contributing to market integration.

Furthermore, GDP plays a pivotal role in determining a country's weight and influence in international trade negotiations and organizations. Countries with larger GDPs often wield greater bargaining power in negotiations (Bown, 2018). Thus, GDP not only reflects a country's integration level but also influences its ability to shape the rules of global trade. Baldwin and Seghezza (1996) demonstrated that larger economies within the EU, such as Germany and France, often have more substantial roles in shaping the integration agenda and providing economic support to less-developed member states, thus fostering regional market integration in the Euro zone. Moreover, GDP serves as a barometer for economic stability and resilience which are the factors that can significantly impact market integration. Likewise, during economic crisis, countries with higher GDPs tend to exhibit more robust economic resilience mechanisms through implementation of fiscal stimulus, and absorb external shocks (Kose et al., 2017).

Geographical distance among the regions or countries has also considerable impacts on the degree of market & economic integration. Like Krugman (1991) in the "gravity model" underscores the importance of distance in trade and market integration. This model elaborates that there is inverse relationship between the volume of trade so called economic integration and geographical distance. The possible reasons of such inverse relationship could be due to higher transportation costs and more complex logistic system associated with longer distances. Hence, distance acts as a natural barrier to the flow of goods and services that impede market integration efforts. In addition, trade policies namely; trade & non-tariff barriers and quotas have also been a focal factor to determine market integration.

Heckscher-Ohlin model, predicts that trade barriers can disturb the pattern of comparative advantages; causing inefficient resource allocation along with reduced market integration (Heckscher, 1919; Ohlin, 1933). Besides these, it has also been viewed that trade barriers could possibly lead to segmentation of market: limiting cross-border competition and hindering market integration (See Anderson and Wincoop, 2004; Melitz, 2003 for similar results). On the other prospective, Ricardo (1817) while presenting the theory of comparative advantages advocated trade barriers to facilitate specialization and efficient resource allocation; leading to increased trade and market integration. Following Ricardo, Paul Krugman (1979) also viewed that trade barriers might promote market integration through exploitation of economies of scale in production process. Therefore, in the theoretical prospective of the existing studies, it is urged that trade barriers can either facilitate or impede market integration, depending on the specific economic circumstances of the regions. Institutional quality is also considered as important determinant for market integration in the existing literatures (Kaufmann et al.,

2005; Acemoglu et al., 2005; Rodrik et al., 2014). Strong institutions are characterized by efficient and transparent enforcement mechanisms, predictable regulatory environments that foster investors' confidence and reduce transaction costs (World Bank, 2019; Acemoglu et al., 2005). Moreover, higher quality of institutional performance enables unbiased competition that encourages foreign direct investment, and streamlines trade integration (Djankov et al., 2002). Hence, sound and transparent institutional framework serves as a cornerstone for creating an environment conducive to domestic and economic interactions which ultimately shape the degree of market integration in a given country or region (Kaufmann et al., 2005).

Conversely, weak institutional quality impedes market integration through different transmissions. It often results in inefficiency in legal system, uncertainty in property rights and insufficient financial supports that discourage businessman to trade at international level. Moreover, weak institutions can erode trust and fails in provision of fair business environment that is reluctant to engage in cross-border activities (Mauro, 1995; Robinson, 2003). This paper seeks to examine the impact of price variation in the case of 27 European countries during 1996-2021. In order to isolate the impact of price variation on European market integration, it is essential to control the impact of other factors namely: trade barriers, GDP, geographical distance and institutional quality on market integration.

Understanding these dynamics has important implications for economists, policy makers and traders who seek to direct the complexities of market integrations and enhance international trade for the members of European countries. This paper is organized in different parts: In section 1 introduction and basic theme of the study has been discussed. Section 2 discusses literature review and research gap. Rest of the paper explains methodology, results and discussions. In last, based on the results, conclusion and some policy recommendations have been discussed.

LITERATURE REVIEW

The determinants of integration are the focus of this article, which expands on the original subject of market integration. The existing literatures are quite instructive, although lacking the revealed patterns of market integration due to the influences of these determinants. There is vast of literature available on the determinants of market integration. Like, Some researchers Like Campos et al. (2019), Eichengreen (2008), Wyplosz (2005), Dumas and Solnik (1995) advocated that price variations across the market has significant impact on market integration.

Moreover, Bown (2018), Kose et al. (2017), Baldwin and Seeghezza (1996) and Helpman and Krugman (1985) claimed that level of national income can contribute in expansion of market integration. Geographical distance can also be treated as important determinant of integrating market across the counties (See Van Campenhout, 2007; Borchert and Yotov, 2016; Kugman, 1991; Ravallion, 1986; Ricardo, 1817 for similar results). According to Nicita and Gourdon (2013), Lau and Akhmedjonov (2011), Finsinger (1992) and Ali et al. (2018) have discussed trade barriers and institutional qualities in determining nations' behavior towards market integration. The literatures are discussed in details as follows:

Price variation and market integration

Price variation exerts a significant influence on market integration. Market integration, which characterizes the interconnectedness of markets often separated by geographical boundaries, is intricately tied to the fluctuations in prices of goods or assets across these markets. The impacts of price variations have been discussed in the existing literature in details. Like, Emorkaro and Ayantoyinbo (2014) focused on examining market integration and price variation in the local rice market (rural and urban) in Osun, Nigeria during the January-2000 and December-2010. Results indicate that there is both long and short run co-integration between price variation and market integration. Research by Baldwin and Jansson (2008) found that price convergence across European countries increased significantly after the implementation of the single market program. In the study of Sharp and Weisdorf (2013), the transatlantic commodity market integration was found during the eighteenth century for the case of US and UK countries.

Moreover, using the dataset of wheat in America and UK, their finding confirmed that there existed market integration even with the quite small price differences, and that exogenous factors like: trade policy and war & politics interrupted economic integration. Varela et al (2013) investigated the various factors of price variations and market integration for provincial dataset of Indonesia. They utilized the dataset for retail cooking oil, rice and sugar market for the periods of 1993-2007 and soybean and wholesale maize market for the periods of 1992-2006. In results, they concluded that there were lower price differences (12%-15%) and wider market integration for rice and sugar market. Moreover, the authors found that for maize, soybeans and cooking oil market, there were less integration and higher price variation. Berber et al. (2004) investigated the impact of introduction of euro on integration of consumer markets reflected by consumer prices for the periods of 1990-2003. It is observed that there has been a notable decrease in the variation of prices during the 1990s.

This implies that the measures taken to minimize economic obstacles at the beginning of the decade may have indeed resulted in a substantial enhancement of consumer market integration. Katrakilidis (2008) explored the long run linkages of price variations in milk and market integration among five selected European countries. The results revealed that milk market in the EU are strongly interdependent in term of prices and there is "perfect" degree of market integration. Nielson (2005) also examined the Law of one Price to determine the degree of market integration in the European first-hand market for whitefish and cod market. The study identified perfectly spatially integrated market for cod market and partially integrated market for whitefish in Europe. Moreover, Bakucs et al. (2019) investigated the geographic price transmission and its relationship to trade in the European dairy sector.

The authors have verified that both milk turnover and participation in the Euro-zone have played a significant role in facilitating optimal price transmission. Conversely, the distance between regions has been found to have a detrimental impact on price transmission. Fałkowski (2010) examined the transfer of pricing and market power in the Polish liquid milk market using vector error correction model. He found that short-and long-term asymmetries impact price variations and market integration (See Serra, 2003 for Spain; Bakus, 2015 for Hungry, for similar results).

Distance and market integration

Distance acts as a natural barrier to the flow of goods, services, and people, which can impede market integration efforts. This has been recognized by the theoretical framework of Krugman (1991) in the "gravity model" which underscores the importance of distance in trade and market integration. According to this model, the volume of trade or economic integration between two places is inversely proportional to their geographical distance and directly proportional. One possible reason of such inverse relationship can be due to higher transportation costs, greater logistical complexities, and elongated shipping times associated with longer distances. However, many of studies including; Goodwin and Piggot (2001), Rashid and Campenhout (2007) and Ravallion (1986), lack any sort of rigorous empirical study of the linkages. Similarly, Anderson and Wincoop (2004) viewed that there exist hardly any empirics that support statistically and economically negative impact of distance on bilateral trade (Coe et al., 2002; Head & Mayer, 2014).

Goodwin and Schroeder (1991) assessed the level of integration within the cattle markets in the United States. The analysis spans four distinct time periods, ranging from 1980 to 1987. A single test statistic is derived for every pair of markets examined, as well as for each time under consideration. The test statistics are subsequently employed as the dependent variable in the second step. The authors take into account four key aspects that impact the process of integration: the trade costs and hazards associated with market interactions (measured by the distance between markets), the level of market knowledge incorporated into pricing at a given market, the volume of market activity, and the extent of concentration within the packed market. Their study concluded that distance is one of the barriers in the way of market integration. The research undertaken by Goletti et al. (1995) examines the phenomena of rice market integration in Bangladesh over the period from 1989 to 1992. The study centers its attention on a total of 64 districts situated inside the nation, to discern the many characteristics that facilitate market integration.

The authors employed correlation coefficients on price series, co-integration coefficients, dynamic multipliers, and assessments of the speed of adjustment. The findings of the study suggest that integration is negatively affected by several factors, including market distance, telephone density, and labor strikes. The study also concluded that good influence on integration is observed when there is a greater dissimilarity in output and road density, since these features are conducive to the promotion of commerce. Borchert and Yotov (2016) analyzed that how globalization and other factors including distance affect economic integration over the period of 1986-2006 for low and higher income countries. In conclusion, they found that distance may jeopardize the market integration for the low-income countries.

Institutional quality and Market integration

Institution can be defined as the constraints devised by the human to structure political, economic and social interaction of the economy. It aims to reduce uncertainty through decrease in information asymmetries and promote mutual co-operation among the market actors through rule of law, property rights and rational agreement in business sector (Rodrik et al., 2014). A sound institutional framework, therefore, serves as a

cornerstone for creating an environment conducive by fostering investors' confidence and enables fair competition, ultimately encourage foreign direct investment, shaping the degree of market integration in a given country or region (Kaufmann et al., 2005; Acemoglu et al., 2005). Conversely, weak institutions can erode trust and fails in provision of fair business environment that is reluctant to engage in cross-border activities (Mauro, 1995; Robinson, 2003). The degree and the extent of regulatory activities through quality of the institutions and policies taken for the increased market integration has also been considered as important determinant of market integration (Finsinger, 1992). The multinational firm passes asymmetric information through distribution channels in foreign countries to affect consumers' purchase behavior. Whereas, it depends upon the national supervisory system and their trade policies that are meant to protect the imperfectly informed consumers.

Acemoglu and Robinson (2008) argued that differences in the degree of economic integration can be due to the differences in economic institutions. Studies have been done to analyze the role of institutional quality in market integration. Like, Ali et al. (2023) identified the determinants of market integration for the power industries in the top-10 oil producing countries during 2011-2020. Their result support that institutional factors like firm's size & age and reserve replacement positively affect vertical integration. Moreover, the country-level factors like the drilling productivity have positive and oil price and oil demand adversely impede vertical integration of the oil and gas firm. Álvarez et al. (2018) echo this sentiment, stating that economic integration through bilateral trade is boosted by higher institutional quality. In addition, Linders et al. (2005) found that transactions between nations are positively correlated with the quality of their institutions, regardless of their status as either importer or exporter. Similarly, Li and Samsell (2009) discover that nations with excellent institutions and governance system tend to have more trade volume compared to those who lack them.

Jalilian et al. (2007) supported the same relationship by quoting that improving institutions lessens informational gaps, lowers transaction costs and boosts financial incentives. In a similar vein, Chowdhury and Audretsch (2014) argue that stronger governance and higher-quality institutions lower default risks and trade costs, fostering market integration. Yu et al. (2015) concluded that better formal and informal institutions facilitate trade. These claims are also supported by research that shows a favorable and statistically significant relationship between trade and institutional quality (de Groot et al., 2005). Hence, the available literatures empirically and theoretically support the role of quality institutions in enhancing market integration. Reviewing the existing literature, it has been found that researchers have attempted to discuss the linkages of market integration with different variables. However, to the best of our knowledge, no study has been found to discuss the impact of price variation in different member countries in respect European countries. This stud has attempted to fill this gap. Moreover, the study has also incorporated the mediating role of other control variables which are namely; institutional quality, trade barriers, national income and geographical distance in enhancement of market integration.

Model Specification

This study investigates the impact of price variation on European market integration. The model specification for this study is given as:

Variation in Shaping European Market Integration	Ali, N, et.al., (2025)
$MI_{2,i,t} = \lambda_1 PV_{i,t} + \lambda_2 GDP_{i,t} + \lambda_3 Distance_{i,t} + \lambda_3 TB_{i,t} + \lambda_3 IQ_{i,t} + \varepsilon_{i,t}$	(1)

Where, MI is market integration, representing the level of European market integration. Price variation (thereafter "PV" is the independent variable, representing the price volatility or fluctuations across European countries. GDP, TB and IQ are national income, trade barriers and institutional. GDP, TB and IQ are the control variables, representing the economic size, income levels, geographical proximity, trade barriers and institutional factors respectively.

The dependent variable is "European Market Integration" or a suitable proxy that measures the degree of integration among the European countries. This variable is constructed using indicators such as trade flows, cross-border investment, or financial market linkages. The main independent variable is "Price Variation" or "Price Fluctuation," which represents the volatility or changes in prices of goods, services, or financial assets across European countries. This variable is proxied by consumer price indices. To isolate the impact of price variation on market integration, it is essential to control for other factors that may influence market integration. The control variables include:

- GDP or GDP per capita: To account for differences in economic size and development.
- Distance or geographical proximity: To consider the impact of physical distance on integration.
- Trade barriers or tariffs: To control for any restrictions on cross-border trade.
- Institutional factors: Such as legal frameworks, regulations, and political stability.

DATA AND METHODOLOGY

Data

The data for market integration (proxied by trade flows), price variation (measured by consumer price indices), distance, GDP, trade barriers for 27 European nations1 Vietnam for the time period of 1996 to 2021 were collected from the IMF (2022). The data on the institutional quality is collected from Worldwide Governance Indicators (WGI).

METHODOLOGY

Unit Root Test

To tackle the spurious regression issue, the first step of the econometric study was to use unit root analyses to establish if the model variables were stationary. Having a unit root in several variables makes it impossible to get reliable findings (Ali et al., 2013). When doing stationarity tests in panel data analysis, the independence of the nations is the main issue. There are two generations of unit root tests in panel data analysis, and they both have their own unique features. By using the CIPS unit root test to determine if the model's variables were stationary, this study adheres to the findings of Ali & Malik (2022).

¹ Austria, Belgium, Bulgaria, Croatia, Republic of Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden

The Asian Bulletin of Big Data Management Cointegration Test

We use the Westerlund (2007) test to determine if the variables in the model cointegrate over the long run. One group of techniques does not rely on cross-section dependency; these are first-generation tests. The second group consists of second-generation tests that fail to account for structural discontinuities but take cross-sectional dependency into account (Koç & Sarica, 2016). Testing those accounts for structural discontinuities in cointegration analyses is critical for obtaining realistic and impartial results. Therefore, we utilized Westerlund's (2007) panel cointegration test. We use the cointegration approach to find non-stationary variables with long-term relationships.

Quantile Regression Approach

Next, following (Ma et al., 2023), this research utizes the MM Quantile regression method to analyze the long-term coefficient of variables included in the model. The quantile regression is a statistical technique that investigate the link between several quantiles of the conditional distribution of the dependent variable, with the objective of understanding their interdependencies. MM quantile regression is a type of quantile regression that emphases on the solicitation of robust estimation approaches. The terminology of this technique is imitative from the manifestation "M-estimation for robust estimation and inference," which appropriately describes the essential approach. This feature permits for the consideration of how the effect of numerous features varies all through diverse quantiles of the distribution, which can be beneficial in a different circumstance. The equations employed in the MMQR approach are as follows:

$$\begin{split} MI_{it} \left(\tau I \gamma_{i}, \delta_{t}, X_{i,t} \right) &= \varphi_{i} + \lambda_{1,\tau} P V_{i,t} + \lambda_{2,\tau} G D P_{i,t} + \lambda_{3,\tau} D I S_{i} + \lambda_{4,\tau} T B_{i,t} + \lambda_{4,\tau} I Q_{i,t} + \upsilon_{\tau,i,t} \end{split} \tag{2}$$
Separate quantiles are given as: $\begin{aligned} Q_{0.25}(MI) &= \beta_{0.25} + \beta_{1,0.25} P V_{i,t} + \beta_{2,0.25} G D P_{i,t} + \beta_{3,0.25} D I S_{i} + \beta_{4,0.25} T B_{i,t} + \beta_{5,0.25} I Q_{i,t} + \upsilon_{0.25,i,t} \end{aligned} \tag{2}$ $\begin{aligned} Q_{0.5}(MI) &= \beta_{0.5} + \beta_{1,0.5} P V_{i,t} + \beta_{2,0.5} G D P_{i,t} + \beta_{3,0.5} D I S_{i} + \beta_{4,0.5} T B_{i,t} + \beta_{5,0.5} I Q_{i,t} + \upsilon_{0.5,i,t} \end{aligned} \tag{2}$ $\begin{aligned} Q_{0.75}(MI) &= \beta_{0.5} + \beta_{1,0.75} P V_{i,t} + \beta_{2,0.75} G D P_{i,t} + \beta_{3,0.75} D I S_{i} + \beta_{4,0.75} T B_{i,t} + \beta_{5,0.75} I Q_{i,t} + \upsilon_{0.75,i,t} \end{aligned} \tag{2}$ $\begin{aligned} Q_{0.75}(MI) &= \beta_{0.5} + \beta_{1,0.75} P V_{i,t} + \beta_{2,0.75} G D P_{i,t} + \beta_{3,0.75} D I S_{i} + \beta_{4,0.75} T B_{i,t} + \beta_{5,0.75} I Q_{i,t} + \upsilon_{0.75,i,t} \end{aligned} \tag{2}$ $\begin{aligned} Robustness Check \end{aligned}$

The present study employs the Fully Modified Least Square (FMOLS) method to conduct a comprehensive analysis of its robustness. The FMOLS method is an econometric technique commonly employed to estimate cointegrating relationships in situations characterized by the presence of non-stationarity and endogeneity. Time series data is particularly beneficial in this context. The mention of employing robustness tests suggests that we are seeking to validate the reliability and stability of the findings obtained from our initial cointegration research.

RESULTS AND DISCUSSIONS

The results of the test to determine the unit root are presented in table 2. It is evident that MI, GDP, DIS and TB are integrated of order one. However, the variables PV and IQ is integrated of order zero.

Table 1.		
Results of CIPS Unit Root		
Variable	I(0)	l(1)
MI	-1.212	-4.491***
PV	-3.381***	
GDP	-0.872***	-2.513***
DIS	-1.118	-4.206***
ТВ	-0.715	-2.997 ***
IQ	-3.765**	

Note: *** and ** means significant for 1%, and for 5% respectively.

The results of Westerlund cointegration test, reported in Table 5, suggest that the variables PV, GDP, DIS, TB and IQ are cointegrated with market integration in European nations. This is evident from significant test statistics.

Table 2. Cointegration Test

Statistic	Value	Z-value	P-value
Gt	-6.125	-8.081	0.000
Ga	-23.716	-3.382	0.000
Pt	-14.269	-5.403	0.000
Pa	-24.227	-5.328	0.000

Next, we employ quantile regression approach. The findings derived from the quantile regression methodology, as presented in Table 3, demonstrate that PV, GDP, DIS, TB, and IQ exhibit statistical significance as influential factors in relation to market integration. The results of the study provide intriguing insights into the influence of various factors on market integration (MI) at different quantiles. It is indisputable that photovoltaic (PV) technology exerts a detrimental influence on market integration. Based on the research findings, it can be observed that the process of market integration (referred to as MI afterward) is notably influenced by the presence of variable price fluctuations (referred to as PV henceforth).

Conversely, the coefficient of PV has a decreasing trend for the lowest quantile (Q0.25) and then increases when each successive quantile is examined. The negative coefficient of price variation shows that greater level of price variation leads to decreased levels of market integration. Moreover, this inverse relation can be attributed to the prospective role of price volatility as a deterrent to the process of market integration. In addition, the existing of greater price volatility has the ability to depress investors as well as enterprises from actively engaged in market, leading to a potential decrease in market integration (Hendro et al., 2022).

As we move from the lowest quantile (Q0.25) to higher quantiles, the coefficient of price variation (PV) shows a decreasing trend, that shows that economies situated in lower quantile the adverse effect of price variation are relatively less prominent. On the other hand, the adverse effect of price variation become increasingly significant as these economies move up to higher quantiles. The pattern witnessed is due to economies that are poorly market-integrated having the potential for higher price volatility, which might be due to lower trade or inefficient market operation. This argument is plausible because less integrated economies are subject to higher competitive pressures (Ahmed et al., 2022). The detrimental impacts of price volatility are even more significant with more

integrated economies, particularly higher quantiles, since market agents have greater expectations of stable and efficient prices. Gross Domestic Product (GDP) exerts a positive influence on market integration. Strikingly, the GDP coefficient is reduced in the lowest quantile (Q0.25) but increases with increasing quantiles. The positive coefficient captures a direct effect of greater GDP levels and increased market integration. Similar to PV, the coefficient of GDP is smaller in the lowest quantile (Q0.25) but increases with increasingly higher quantiles. Such a trend is indicative of weaker GDP effect in lowerincome economies but increasing effect with increasingly central economies (Zheng & Du, 2020). The higher the GDP per capita of countries, the more they develop more mature financial markets, infrastructures, and regulatory regimes supporting greater market integration.

Lower-income economies, on the other hand, are subjected to structural and capacity constraints curbing their access to bigger markets (Miyazawa et al., 2019). The distance index (DIS) exerts a negative influence on market integration, and the higher its coefficient, the larger its value is, as found to be in the upper quantile (Q0.25) compared to the lowest quantile (Q0.25) where its lowest value is placed. This negative coefficient is indicative of increased geographical distance having decreased market integration. Similar to the patterns of PV (Present Value) and GDP (Gross Domestic Product), the coefficient of DIS is found to be smaller in Q0.25 and increases with progressively higher quantiles. This pattern is indicative of weaker adverse impacts of geographical distance in economies found in lower quantiles but increasingly larger for bigger quantiles of importance. Geographical distance produces physical barriers leading to logistic and financial costs hindering commercial and financial dealings (Vogiazides & Mondani, 2020).

Geographies characterized by closer geographical distance have greater ease in access to markets with potential for stronger economic integration outcomes. Whereas with growing economies along the quantile dimension, an increased market connectiveness increases the negative impacts of geographic space (Bonga-Bonga & Manguzvane, 2023). Trade barriers (TB) have negative effects on market integration, but only at the highest quantile, and are negligible at lower and middle quantiles (Q0.25 and Q0.50). This indicates that trade restrictions highly discourage market integration only in economies at the highest quantile. The insignificance of the TB coefficient at lower and middle quantiles (Q0.25 and Q0.50), as opposed to its significance at the highest quantile, indicates that trade barriers, although overall negative, are less important for lower- and medium-income economies, which may have limited integration with global markets or encounter fewer trade barriers (Sheng et al., 2015).

On the other hand, richer economies with greater participation in global trade have Institutional quality (IQ) gains are positively correlated with increased market integration. However, the IQ coefficient is lower in the lowest quantile (Q0.25) but increases in higher quantiles. Empirical evidence reveals a positive correlation between institutional quality and the IQ coefficient, reflecting that better institutions encourage more market integration. The IQ coefficient is lower at the lowest quantile (Q0.25) but higher in higher quantiles, reflecting that institutional quality has weaker effects on market integration in poor economies but increasingly so as economies get richer and more developed (Canh et al., 2021). The same was the trend for other variables since the institutional quality (IQ) coefficient was lower in the lowest quantile (Q0.25). Effective economic transactions and

trust are based on sound institutions, such as legal institutions, protection of property rights, and regulatory institutions (Ortlieb & Knappert, 2023). Poorer-income economies are likely to face institutional constraints that prevent them from integrating well into wider markets. These findings emphasize the interdependent nature of various factors and market integration by income level, supporting the need to consider country-specific variables when investigating determinants of market integration. higher negative impacts from trade barriers (Felbermayr et al., 2018).

Institutional quality (IQ) increases are positively correlated with greater market integration. The IQ coefficient is lower at the lowest quantile (Q0.25) but rises through higher quantiles. Evidence indicates that the IQ coefficient and institutional quality are positively correlated, with stronger institutions preferring greater market integration. The IQ coefficient reduces at the lowest quantile (Q0.25) but rises at higher quantiles, revealing that institutional quality's impact on market integration is weaker in poorer economies but rises as economies get richer and more developed (Canh et al., 2021). This is consistent with other variables since the institutional quality (IQ) coefficient is lower at the lowest quantile (Q0.25). The determinants of trust and successful economic exchange rely on strong institutions, such as judicial institutions, property rights protection, and regulatory institutions that hinder them from integrating into larger markets. These results indicate the intricate interaction between determinants and market integration across income groups, and to country-specific factors when determining determinants of market integration.

Variables			MMQR	Estimates		
	Q0.25		Q0.50		Q0.75	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err
PV	-0.512***	0.114	-0.549***	0.126	-0.583***	0.116
GDP	0.072***	0.041	0.091***	0.036	0.098***	0.017
Dis	-0.712***	0.061	-0.813***	0.054	-0.892***	0.065
ТВ	-0.051	0.214	-0.041***	0.276	-0.037**	0.014
IQ	-0.312	0.013	-0.362*	0.061	-0.386*	0.017
Constant	-0.328	1.118	-0.419	0.218	-0.501	0.514

Table 3. Estimates of Quantile Rearession Method

Robustness Check: FMOLS Estimates

Variable	FMC	OLS
	Coef.	Std. Err.
PV	-0.635***	0.143
GDP	0.071***	0.002
DIS	-0.028**	0.008
ТВ	-0.418***	0.126
IQ	0.191***	0.027
Cons.	-1.281	0.891

This study employs FMOLS approach to check the robustness of estimates presented in table 4. It is evident that PV, GDP, DIS, TB and IQ are crucial determinants in influencing market integration. Hence, the estimates of QR are consistent with the estimates of FMOLS.

CONCLUSION AND POLICY RECOMMENDATIONS

This study's findings establish the statistical relevance of characteristics such as pricing variations, GDP, distance, trade barriers, and institutional quality as crucial elements in the relationship between market integration in Europe's member states. Through careful study and examination of pertinent data, we have gained valuable insights into the dynamics of European market integration. First, our research into variation in prices has shown how crucial it is to standardize pricing internationally in order to promote economic convergence. Disparities in pricing have the potential to slow down efforts to integrate markets. As a result, authorities in Europe should work towards achieving price parity and fostering integration is highlighted by the positive association between GDP and market integration. Stronger economies, as indicated by higher GDP, push for more market integration. Increased market convergence requires that nations with lower GDP levels prioritize economic growth.

In addition, accessibility is important for promoting economic cooperation because distance has a substantial effect on market integration. Trade and economic integration are more likely to flourish between neighboring nations. For this reason, it is crucial to focus on lowering transportation costs and improving infrastructure to break down geographical boundaries. Trade obstacles, including tariffs and non-tariff barriers, have a statistically significant negative effect on market integration. Countries can improve trade flows and advance European market integration by lowering these barriers. Trade agreements that reduce trade barriers and foster a more open and inclusive trading environment should be a top priority for policymakers, and they should work hard to negotiate and put into effect such agreements. Last but not least, excellent governance and transparent institutions are critically important in creating economic convergence, as seen by the positive correlation between institutional quality and market integration. Higher levels of market integration are typically seen in countries with robust institutional frameworks, robust legal systems, and transparent regulatory settings. To encourage greater market convergence among European countries, officials should work to enhance the quality of their institutions.

In sum, the findings of this study offer a new understanding of the dynamics at play in the European Union's market integration. There is statistical evidence that factors such as price variations, GDP, geographic distance, trade barriers, and institutional quality all have a role in this. Based on the findings, this study recommends that European policymakers should prioritize efforts to bring pricing into line with one another. Fair competition, the end of price discrimination, and increased price transparency are all regulatory measures that can help bring this about. It is possible to remove trade barriers and speed up market integration by bringing prices closer together. Market integration has been shown to increase GDP, so policymakers should prioritize initiatives that boost economic growth. Investments in infrastructure, education, R&D, and innovation can help bring this about. Nations can further their European market integration and contribute to regional convergence by improving their economic performance. Moreover, policymakers in Europe should prioritize enhancing infrastructure and connectivity due to the impact of distance on market integration. Increased trade and market integration can be facilitated by investing in transport, logistics, and digital

networks to lower transportation costs and improve connections. Since trade obstacles hamper efforts to integrate markets, authorities should seek to lower or eliminate them. Tariff reduction, elimination of non-tariff obstacles, and simplification of customs procedures are all possible outcomes of bilateral or regional trade agreements. Market integration can be improved by making trading conditions more accessible and welcoming to all participants. Given the correlation between strong institutions and flourishing economies, policymakers should prioritize changes that improve governance, regulation, and the rule of law. Trust in institutions is essential to market integration, as is equal opportunity for all and the ability to attract foreign investment.

Policymakers in Europe should also promote cross-border cooperation in scientific research, technological innovation, and the sharing of expert knowledge. The creation of shared digital spaces, coordinated investment plans, and international alliance building are all viable strategies for this goal. As a result of sharing knowledge, skills, and resources across borders, market integration is improved. In conclusion, these policy proposals focus on the identified issues affecting market integration in European nations. By taking these steps, the European market will become more unified and integrated, which will boost economic activity, boost competitiveness, and pave the way for regional convergence.

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