Export Resilience and Competitive Landscapes of Ornamental Foliage Plants in ASEAN-Plus Markets: Evidence from Pre-, During, and Post-COVID Periods

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Abstract. This study analyzes the impact of the COVID-19 pandemic in reshaping the competitive landscape of ornamental foliage plant exports (HS 0602) from Indonesia, Thailand, and Vietnam across three major ASEAN-Plus FTA markets: Japan (AJCEP), China (ACFTA), and South Korea (AKFTA). Utilizing Constant Market Share (CMS) decomposition for the 2017–2024 period, the research compares the pre-pandemic (2017–2019), pandemic (2020–2021), and post-pandemic (2022–2024) phases. Results indicate heterogeneous trajectories: South Korea emerged as the most resilient market with stable demand growth, while China faced severe market contractions (negative MGE). Key findings reveal a divergence in strategies, distinguishing between structural strength and market opportunism. Thailand and Vietnam dominated Japan and China through massive post-pandemic Market Share Effect (MSE) expansion, yet exhibited declining internal competitiveness. Conversely, Indonesia demonstrated qualitative resilience with a positive Competitiveness Effect (CE) of +43.1 in Japan, despite ongoing quantitative market-share erosion. The results suggest that zero tariff preferences alone are insufficient to ensure market dominance. Policy implications emphasize the need for strategic recalibration from mere tariff utilization toward strengthening non-tariff factors. The study concludes that export

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sustainability in Asia depends heavily on exporters' ability to convert internal competitiveness into tangible market share dominance.

1 Introduction

High-value horticultural sectors, particularly live plants classified under HS Code 0602 (other live plants, cuttings and slips; mushroom spawn), play a strategic role in the diversification of agricultural economies in Southeast Asia [1-2]. Within regional trade statistics, this code is largely represented by foliage and other potted ornamental species, making it a useful proxy for the leaf-ornamental segment of horticulture. Although the trade in this commodity group is global in scope, market dynamics in East Asia, especially Japan, China, and South Korea, serve as critical determinants for major exporters such as Indonesia, Thailand, and Vietnam. The significance of these regional markets is driven by geographical proximity, similarities in phytosanitary standards, and institutional support through formal economic cooperation frameworks under the ASEAN-Plus Free Trade Agreements (FTAs) [3-4].

These agreements include the ASEAN-Japan Comprehensive Economic Partnership (AJCEP), fully implemented since 2008 [3], the ASEAN-Korea Free Trade Area (AKFTA) since 2007, and the ASEAN-China Free Trade Area (ACFTA), which has eliminated tariffs on most agricultural products since 2010 [5]. These arrangements have substantially reduced import tariffs on ornamental plants, reaching 0% for many tariff lines, thereby theoretically eliminating fiscal barriers and facilitating the integration of regional horticultural supply chains [5-7].

However, the effectiveness of these tariff preferences in enhancing the competitiveness of member countries remains a subject of ongoing academic debate. Several studies suggest that tariff reductions alone are insufficient to guarantee market expansion without concurrent improvements in logistical efficiency and compliance with stringent non-tariff standards [5, 7-8]. This gap creates an urgent need to assess whether FTA instruments have generated tangible competitive advantages for Indonesia or merely facilitated greater market penetration by regional competitors with more efficient production structures. These challenges have been further compounded by the emergence of the COVID-19 pandemic [4, 9, 10]. The pandemic shock has necessitated market restructuring, wherein non-tariff factors, such as cold chain reliability, marketing digitalization, and the speed of varietal adaptation, have become more decisive than geographical proximity alone [11].

To date, most analyses of COVID-19 and agricultural trade have focused on staple crops and food security concerns [9, 12], while studies examining shifts in export-import patterns in China, Japan, and South Korea indicate varying degrees of disruption and recovery across countries [4]. Understanding how ornamental foliage plant exports have withstood the pandemic and how competitive positions have shifted among ASEAN suppliers is therefore highly relevant for policymakers seeking to safeguard farmers' incomes. For instance, based on data from the International Trade Centre [13], Indonesia's ornamental foliage plant exports to the Japanese market declined from USD 2,403 thousand in the pre-COVID period to USD 1,372 thousand in the post-COVID

period (a decrease of approximately 43%). In contrast, during the same recovery period, Vietnam recorded substantial growth in the Japanese market, increasing from USD 4,654 thousand to USD 5,531 thousand. A similar pattern is observed in the Chinese market, where Thailand's export value surged sharply from USD 270 thousand during the pandemic to USD 808 thousand in the post-COVID period. These performance disparities indicate that Indonesia has not optimally utilized the available FTA instruments compared to its regional competitors.

This study aims to address this gap by decomposing the growth of HS 0602 exports from Indonesia, Thailand, and Vietnam to three FTA markets, Japan, China, and South Korea, using the Constant Market Share (CMS) framework. By structuring the analysis into three distinct phases, pre-COVID (2017-2019), during the pandemic (2020-2021), and post-pandemic adjustment (2022-2024), the study isolates the effects of market demand (Market Growth Effect), market share expansion (Market Share Effect), and internal efficiency (Competitiveness Effect). This approach enables a precise identification of whether Indonesia's export underperformance or success in specific markets is attributable to exogenous fluctuations in global market conditions or to substantive shifts in its relative competitive position vis-à-vis regional competitors within the ASEAN-Plus cooperation framework.

2 Material and Methods

2.1 Data

Annual trade data for HS 0602 and total trade flows (2017–2024) were collected from the International Trade Centre (ITC) Trade Map and the United Nations Comtrade (UN Comtrade) database. The research focuses on three major exporting countries in Asia: Indonesia, Thailand, and Vietnam, and on three strategic partner markets within the ASEAN-Plus FTA framework: Japan, China, and South Korea. The data includes:

- Total imports of HS 0602 by each market from around the world
- Bilateral imports of HS 0602 from Indonesia, Thailand, and Vietnam
- Total exports of all products by each ASEAN country to their respective markets

All trade flows are measured in thousands of US dollars and represent annual values. This study adopts a three-stage periodization: 2017–2019 (Pre-COVID), 2020–2021 (During COVID), and 2022–2024 (Post-COVID). This determination refers to the stable-to-disruption timeframe in the horticulture trade literature [9, 12, 14], where 2020–2021 marks the peak disruption, and 2022 onwards indicates the recovery phase [15].

2.2 Data Analysis

Constant Market Share (CMS) breaks down changes in a country's exports into components that reflect market size, market allocation, and competitiveness effects [16]. For a single product (HS 0602) in a single destination (Japan, China, or Korea), CMS is formulated as:

$$\Delta X_a^b = X_a^{b,1} - X_a^{b,0} \quad (1)$$

decomposed into:

$$\Delta X_a^b = MGE_a^b + MSE_a^b + CE_a^b \quad (2)$$

where:

- $MGE_a^b = s_a^{b,0}(W^{b,1} - W^{b,0})$ = Market Growth Effect, the change in exports if the market share remains constant
- $MSE_a^b = W^{b,0}(s_a^{b,1} - s_a^{b,0})$ = Market Share Effect, the change due to shifts in bilateral market share
- $CE_a^b = \Delta X_a^b - (MGE_a^b + MSE_a^b)$ = Competitiveness Effect, a residual reflecting unobserved competitive dynamics

Here, $X_a^{b,t}$ = the exports of the country a to the market b in the period t; $W^{b,t}$ = ttotal world imports of HS 0602 to the market b; $s_a^{b,t} = X_a^{b,t}/W^{b,t}$ = market share. The average value over the period is used to smooth out annual volatility.

The dynamics of export performance are analyzed by decomposing total growth into three components: the Market Growth Effect (MGE), the Market Share Effect (MSE), and the Competitiveness Effect (CE) [17].

MGE measures export changes assuming a constant market share, reflecting growth driven purely by market size dynamics and representing the quantitative side of external demand [16, 18]. MSE (sometimes referred to as the Market Composition Effect in broader models) captures changes from shifting export distributions toward faster-growing segments, indicating a country's ability to quantitatively adjust patterns toward higher growth opportunities [19]. Meanwhile, CE acts as a residual component reflecting "true competitive performance" tied to internal efficiency and innovation; thus, it is interpreted as the qualitative dimension of export growth [18-19].

A positive MGE indicates market expansion; a positive MSE indicates market share gains; a positive CE indicates an improved competitive position [16-17]. The interpretation of resilience follows from strong or stable competitiveness effects during periods of crisis [14, 16-17].

3 Results

3.1 Market Growth Trajectories

Table 1 presents the market growth effect (MGE) for each exporter and market, alongside the overall growth rate of HS 0602 imports ($\Delta W/W_0$) to contextualise each country's exposure to market size changes. The results of the MGE decomposition indicate that market dynamics in the ASEAN-Plus region have heterogeneous effects on the export performance of Indonesian ornamental foliage plants and their competitors across the three observation periods. South Korea is the only destination that consistently signals positive growth across all periods, while Thailand has achieved the largest

structural benefits, with the highest MGE value during the pre-COVID expansion (478.6).

Table 1. Market Growth Effect (MGE) and HS 0602 import growth by market and period

Market	Period	Import Growth (%)	MGE Indonesia	MGE Thailand	MGE Vietnam
Japan	Pre→COVID	6.7%	161.2	219.3	369.2
Japan	COVID→Post	-12.4%	-237.6	-375.5	-577.8
China	Pre→COVID	-26.2%	-601.3	-79.6	-555.2
China	COVID→Post	-49.3%	-343.5	-133.2	-243.3
Korea	Pre→COVID	11.5%	103.4	478.6	209.4
Korea	COVID→Post	6.5%	67.8	121.0	107.9

In contrast, the Chinese market experienced the most severe contraction, exerting significant downward pressure on Indonesia, with the lowest MGE value of -601.3. The Japanese market saw moderate growth at the beginning of the pandemic (6.7%) before sharply declining post-COVID (-12.4%). This situation is detrimental to exporters with significant market shares like Vietnam [20]. Overall, this data indicates that export resilience in this region is heavily influenced by demand stability in partner countries, with Korea emerging as the most resilient market, while China and Japan pose major risks of export decline due to market shrinkage [4, 9].

3.2 Market Share Dynamics of Major ASEAN Exporters: Pre- vs. Post-COVID

Table 2 reports the Market Share Effect (MSE), which isolates how each exporter's market share shifted within each market and period. The analysis of the MSE reveals a contrasting shift in competitiveness among supplying countries, particularly in the post-pandemic period (post-COVID). In the Japanese and Chinese markets, Thailand and Vietnam recorded a very aggressive recovery in market share, as indicated by significantly positive MSE values (reaching +2396.1 for Vietnam in China). This indicates the success of their export strategy restructuring in reclaiming market dominance.

Table 2. Market Share Effect (MSE) by exporter, market, and period

Market	Period	MSE Indonesia	MSE Thailand	MSE Vietnam
Japan	Pre→COVID	-610.1	-435.4	-1144.8
Japan	COVID→Post	-347.4	1253.9	1661.4
China	Pre→COVID	-1350.8	62.2	-1449.9
China	COVID→Post	208.9	1324.6	2396.1
Korea	Pre→COVID	29.8	-2506.6	-342.8
Korea	COVID→Post	-147.5	-525.3	-406.5

In contrast, Indonesia continues to experience a decline in market share in Japan, with an MSE value of -347.4, indicating a quantitative erosion of market presence relative to other exporters in that market. Although Indonesia shows a minor recovery sign in China with a positive MSE value (+208.9), this performance is still far below the competitive acceleration of Thailand and Vietnam. Meanwhile, the South Korean market indicates that all major exporting countries experienced declines in market share during the post-pandemic period, signaling strong penetration by new competitors outside this ASEAN-Plus group.

3.3 Competitiveness Landscapes: Fundamental Strength or Opportunism

While the MGE reflects the influence of external demand volatility and the MSE measures the relative position shift of Indonesia compared to the global average growth, the CE serves as an internal determinant indicator [14]. The CE component captures strategic variables that are not explained by market expansion or standard market share shifts [12, 21]. This includes the efficiency of production cost structures, product quality advantages, innovation in plant varieties like Aglaonema and Monstera, and the optimization of export logistics systems [2, 5-6].

This distinction is crucial for determining whether increases in competitiveness are driven by fundamental forces, such as long-run structural efficiency, or by opportunism arising from temporary market disruptions [18, 19]. Data in **Table 3** present the results of isolating the competitiveness effect, which serves as a residual to capture structural competitive dynamics more deeply beyond simple market sizes and share shifts.

Table 3. Competitiveness Effect (CE) by exporter, market, and period

Market	Period	CE Indonesia	CE Thailand	CE Vietnam
Japan	Pre→COVID	-40,9	-29,2	-76,8
Japan	COVID→Post	43,1	-155,7	-206,3
China	Pre→COVID	-16,3	380,0	354,1
China	COVID→Post	-653,7	-1182,5	-103,1
Korea	Pre→COVID	-39,4	-288,0	3,4
Korea	COVID→Post	-26,6	-34,4	-9,6

The analysis of the CE component indicates that Indonesia's export of ornamental foliage plants (HS 0602) in the East Asian market is driven by fundamental strength rather than mere market luck. This is particularly evident in the Japanese market post-pandemic, where Indonesia was the only country that managed to reverse its internal competitiveness from negative (-40.9) to positive (+43.1). In contrast, Thailand and Vietnam experienced sharp declines in internal competitiveness in the same market, indicating that their market expansion was more opportunistic or reliant on spikes in external demand rather than strengthening internal production structures.

However, a drastic decline in internal competitiveness occurred across all major exporting countries in the markets of China and South Korea. Thailand recorded the

steepest decline in competitiveness in the Chinese market with a CE value of (-1182.5), followed by Indonesia (-653.7) and Vietnam (-103.1). This phenomenon indicates that the competitive advantage of the ornamental plant sector in the ASEAN-Plus region faces significant structural challenges in global market competition post-COVID.

4 Discussion

4.1 Market-specific impacts of COVID-19 and patterns of resilience

The dynamics of ornamental plant imports in Japan, China, and South Korea during the period under study reveal varying degrees of resilience to the COVID-19 shock [4]. Based on MGE analysis, South Korea stands out as the only destination market that consistently recorded positive import growth throughout all phases of the study, indicating that domestic demand for horticultural products exhibited low elasticity to pandemic-related disruptions [14]. This phenomenon is consistent with prior studies suggesting that mobility restrictions often stimulate increased consumption of household plants as part of indoor recreational activities.

Conversely, the implementation of stringent mobility restrictions in China during the COVID-19 pandemic triggered a substantial decline in import values, as reflected in sharply negative MGE values across all major exporters. This result is consistent with evidence indicating that agricultural trade declines during the pandemic were largely a consequence of demand-side contraction linked to economic recession, as opposed to supply-side constraints [9]. Declining consumer incomes during the pandemic tended to suppress imports of non-essential goods and labor-intensive commodities, including ornamental plants, which exhibit higher demand elasticity compared to staple food crops [14].

The divergence in MGE values across partner countries underscores that COVID-19 not only disrupted supply chains but also fundamentally reshaped demand profiles in East Asia. In Japan, consumer preferences shifted toward “interior green” or premium foliage plants, which function as aesthetic elements within home-based workspaces during the pandemic [22]. This helps explain why the Japanese market remained selective despite an overall contraction in volume. Meanwhile, South Korea demonstrated market resilience through the emergence of the pet plants (*ban-ryeo-sik-mul*) trend, whereby social isolation during the pandemic stimulated strong demand for small potted plants serving as psychological companions within urban apartment environments [23]. In contrast, China’s demand profile is largely driven by large-scale landscaping needs and mass supply chains, which are highly sensitive to physical logistics disruptions and price volatility [5, 6, 24]. These differentiated responses to the COVID-19 shock imply that exporters can no longer rely on a one-size-fits-all strategy, but must instead adopt market-specific business models tailored to the distinct characteristics of each FTA partner country.

4.2 Qualitative resilience amidst quantitative vulnerability

The export performance of ornamental foliage plants from Indonesia, Thailand, and Vietnam in maintaining market share reveals divergent strategies and capacities in

responding to market transformations. Based on the MSE, Thailand and Vietnam demonstrate significantly more aggressive market penetration in Japan and China during the post-pandemic period compared to Indonesia. The ability of these two competitors to achieve substantially positive MSE values (respectively, +1253.9 and +1661.4 in Japan) reflects their dominance in quantitative competitiveness, driven by optimizing export volumes and controlling large-scale distribution networks. In contrast, Indonesia records a negative MSE (–347.4) in the Japanese market, indicating a quantitative erosion of its market position due to weaker supply intensity relative to competing exporters [25-26].

Despite this aggregate decline in market share, the CE analysis reveals a form of market-specific resilience in Indonesia. In the Japanese market, Indonesia is the only country with a positive CE value (+43.1), while Thailand and Vietnam show negative CE values (–155.7 and –206.3, respectively). This phenomenon suggests that, from a qualitative perspective, Indonesia's internal factors, such as the standardization of superior plant varieties and the efficiency of specialized supply chains, have improved relative to previous periods [25]. The emergence of a positive CE alongside a negative MSE indicates that Indonesian products possess strong latent competitiveness; however, this advantage has not yet been translated into market dominance due to limitations in economies of scale and the relatively lower intensity of market penetration compared to leading competitors [16, 26].

Structurally, Indonesia's export position can thus be characterized as exhibiting "qualitative resilience but quantitative vulnerability." Thailand and Vietnam appear to prioritize competition through volume expansion and extensive control over distribution channels [20, 26-27], enabling them to maintain superiority in market share despite facing pressures on internal competitive efficiency.

The imbalance between Indonesia's qualitative advantage (positive CE) and its quantitative disadvantage (negative MSE) in the Japanese market reveals structural constraints that cannot be resolved solely through tariff preferences under FTA frameworks [7-8, 27]. This gap highlights disparities in production-supporting infrastructure among exporting countries. Nations with expansive MSE performance, such as Thailand and Vietnam, benefit from large-scale production capacities that facilitate market penetration through economies of scale [20, 28]. Conversely, evidence from China's *chrysanthemum* sector shows that sustained export competitiveness is closely linked to continuous upgrading of varieties, product quality, and organizational structures along the value chain [26]. By analogy, maintaining positive CE values in high-standard markets like Japan and South Korea requires systematic modernization of production systems and improvements in logistics and supply-chain coordination, rather than reliance on tariff preferences alone.

This necessity is further amplified by Japan's stringent non-tariff environment; while tariff preferences have expanded under various FTAs, significant trade costs persist through rigorous sanitary and phytosanitary (SPS) requirements, such as the 'zero-soil' policy [8]. In this context, Indonesia's positive CE value in the Japanese market during the post-pandemic period represents a strategic asset, indicating that its products are well-positioned and favorably received. Accordingly, the primary challenge is no longer limited to improving product quality, but lies in strengthening distribution capacity and

marketing strategies to convert internal competitive advantages into sustained market share growth [16, 29].

4.3 Policy implications for the utilization of ASEAN-Plus FTAs

The analysis yields three key insights for policymakers in exporting countries:

1. **Tariff preferences alone are insufficient.** ASEAN-Plus FTAs have reduced tariffs but have not automatically enhanced competitiveness. The tariff reductions under AJCEP, AKFTA, and ACFTA do not inherently improve export performance when domestic supply structures remain traditional. Governments must prioritize structural improvements in supply systems, from certified propagation to post-harvest handling, as fundamental prerequisites. Without such strengthening, trade liberalization policies risk becoming entry points through which technologically advanced regional competitors can dominate both domestic and partner markets.
2. **Market-specific strategies are essential.** Japan, China, and South Korea exhibit distinct demand profiles and competitive structures. ASEAN exporters must move beyond generic commodity-based export strategies. Countries exhibiting positive CE should be directed toward premium niche segments characterized by low price sensitivity but high aesthetic and technical standards. Conversely, for markets demonstrating stable positive MGE, policy focus should emphasize supply consistency by strengthening bilateral logistics partnerships.
3. **Frontier horticultural technologies are critical.** Post-pandemic analysis shows that ASEAN exporters are facing shrinking markets in Japan and China, with South Korea emerging as the only market still experiencing positive growth. Under these conditions, investments in smart farming, large-scale seedling propagation, and cold chain infrastructure are essential to maintain volume and secure regional market share. Without robust production technology and information systems, the current market shifts will be short-term maneuvers rather than sustainable competitive advantages.

5 Conclusion

This study concludes that the effectiveness of zero-tariff preferences under the ASEAN-Plus FTA framework (AJCEP, AKFTA, and ACFTA) is highly contingent upon the structural resilience and adaptive capacity of individual exporting countries. The CMS analysis confirms that the COVID-19 pandemic has triggered an uneven restructuring of horticultural markets in East Asia. South Korea emerges as the most resilient destination market, exhibiting stable demand growth throughout all periods, whereas the Chinese market experienced significant demand contraction due to logistical disruptions and shifts in domestic consumption patterns.

The principal findings reveal a divergence in competitive strategies among ASEAN suppliers, distinguishing between structural strength and market opportunism. Thailand and Vietnam dominate the Japanese and Chinese markets through substantial post-pandemic gains in market share (MSE). However, this pattern largely reflects opportunistic expansion driven by external demand surges, as evidenced by a

simultaneous decline in their internal competitiveness (CE). In contrast, Indonesia demonstrates underlying structural strength through resilient internal efficiency, as reflected in a positive CE in the Japanese market, even while facing quantitative vulnerability in overall market share.

The competitive shifts observed during the pandemic underscore that the effectiveness of FTAs is no longer determined solely by tariff preferences, but rather by the integration of volume expansion and internal quality resilience. This transformation signifies a broader shift in the determinants of ornamental plant trade in Asia, from price-based competition toward the mastery of technical standards and regional supply chain efficiency. Sustaining ASEAN export performance will require a strategic recalibration to convert latent competitive advantages into tangible market share gains in a competitive regional landscape.

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