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Dynamic Competitive Positioning of Container Ports: A Time-Series Growth–Share Analysis in the Middle East

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Abstract

Container ports occupy a strategic position within maritime transport networks because their competitive performance influences the distribution of cargo flows, connectivity between shipping services and hinterlands, and the spatial organization of regional logistics systems. Port competitiveness, however, is inherently dynamic: ports may experience rapid traffic growth from a small market base, while established hubs may retain substantial market shares despite slower growth. Yet, many existing assessments emphasize individual dimensions of port performance, such as efficiency, productivity, or market position, providing limited insight into how current market presence and medium-term growth interact to shape competitive positioning. This study develops a time-series-based portfolio approach to address this issue by jointly considering market position and growth dynamics in container port systems. The approach combines five-year aggregated container throughput as an indicator of relative market position with Compound Annual Growth Rate (CAGR) as a measure of medium-term growth, and integrates these indicators within the Boston Consulting Group (BCG) Growth–Share Matrix. The framework is demonstrated using harmonized throughput data for major container ports in the Middle East over the 2020–2024 period. The results reveal a strongly asymmetric regional competitive structure, characterized by a concentration of market share among established hubs and higher growth rates among ports with comparatively limited market presence. The analysis also reveals a substantial divergence between regional and national competitive positions, particularly for Iranian ports. While several Iranian ports exhibit above-average growth within the regional benchmark, their market shares remain considerably smaller than those of established regional hubs. At the national level, however, the dominant position of Shahid Rajaee contrasts with the emerging growth trajectories of smaller Iranian ports. These findings demonstrate that growth and market position provide complementary perspectives on port competitiveness and that the scale of benchmarking can substantially affect the interpretation of a port's competitive position. The proposed framework provides a transparent and parsimonious basis for comparative benchmarking of container ports and for identifying differences between established hubs, emerging ports, and ports experiencing weak growth within regional maritime systems.

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1. Introduction

Maritime transport constitutes a fundamental component of international trade and global supply chains, with more than 80% of global cargo volumes transported by sea (UNCTAD, 2023). Within this system, container ports occupy a particularly strategic position because they connect maritime shipping services with inland markets and logistics networks and influence the distribution of cargo flows across regions. As liner shipping networks have become increasingly consolidated and ports compete for gateway and transshipment cargo, understanding the competitive position of individual ports within regional port systems has become an important issue in maritime transport research. In this context, port competitiveness is not a static attribute. A port may increase its traffic rapidly while remaining a relatively small market participant, whereas an established hub may retain a substantial market position despite experiencing comparatively modest growth. Consequently, assessing port competitiveness requires consideration of both the current position of a port within its market and the trajectory through which that position evolves.

The competitive environment has become particularly complex in regions where ports with substantially different scales, functions, and network positions coexist. The Middle East provides an important setting in which to examine such heterogeneity because of its strategic location along major East–West and North–South trade corridors and the presence of large gateway and transshipment hubs. Ports such as Jebel Ali, Salalah, Hamad, and King Abdullah have strengthened their regional prominence through capacity expansion, technological development, and integration with global shipping networks (World Bank, 2024). At the same time, smaller ports continue to compete for gateway, feeder, and regional cargo flows. The coexistence of highly established hubs and emerging ports creates substantial differences in market presence and growth trajectories, making the region particularly relevant for comparative assessment of dynamic competitive positioning.

This issue is also relevant to the Iranian port system, which forms an important component of the broader Middle Eastern maritime network. Major Iranian commercial gateways—including Shahid Rajaee, Imam Khomeini, Bushehr, Chabahar, Khorramshahr, Bandar Lengeh, and Shahid Bahonar—perform important functions in national foreign trade and transit activities. However, their competitive positions are shaped by differences in scale, infrastructure, connectivity, access to shipping services, and exposure to external disruptions. Limited mother-vessel access, infrastructure constraints, and changes in maritime trade routes have affected the ability of Iranian ports to expand their role within regional container networks (PMO, 2023; PMO, 2024). Importantly, however, the competitive position of Iranian ports cannot be fully understood through a national comparison alone. Their relative position depends on the

benchmark against which market presence and growth are evaluated, particularly when they compete within a regional system dominated by large international hubs.

The measurement of port competitiveness has been addressed through a wide range of analytical approaches. Existing studies have examined market concentration, market structure, operational efficiency, productivity, connectivity, and other dimensions of port performance using indicators and techniques such as concentration ratios, the Herfindahl–Hirschman Index (HHI), Data Envelopment Analysis (DEA), and network-based approaches. These methods have generated important insights into the determinants and patterns of port competitiveness. However, many assessments focus primarily on a single dimension of performance or rely on cross-sectional indicators that may be sensitive to short-term fluctuations. Market share, for example, provides information about a port's current position within a market but does not indicate whether that position is expanding or contracting. Conversely, a high growth rate may reflect substantial expansion from a very small initial market base and therefore does not necessarily imply a strong competitive position. Considering these dimensions separately can therefore obscure important differences in the competitive trajectories of ports.

The Boston Consulting Group (BCG) Growth–Share Matrix provides a parsimonious portfolio perspective for jointly examining market position and growth. Originally developed for corporate portfolio analysis, the framework classifies entities according to their relative market position and growth dynamics into four broad categories (Boston Consulting Group, 1970). Although developed outside the maritime sector, portfolio-based approaches have also been proposed for the analysis of port competition and market structure (Notteboom & Rodrigue, 2008). The value of such an approach in the port context lies not in treating the resulting categories as direct measures of overall port performance, but in providing a structured representation of two complementary dimensions of competitive positioning. Day (1977), for example, emphasizes that growth–share interpretation should be considered in relation to competitive structure and organizational capabilities. In port systems, these considerations can be associated with infrastructure, connectivity, governance, hinterland access, and operational capabilities.

Despite the extensive literature on port performance and competitiveness, the joint analysis of market position and medium-term growth remains comparatively less developed. Much of the existing literature evaluates port competitiveness through efficiency, productivity, service quality, connectivity, or other individual dimensions, while relatively less attention is given to how market presence and traffic growth evolve together. Moreover, conventional cross-sectional comparisons may obscure medium-term competitive trajectories because a port's current market share does not necessarily reflect its growth momentum. Although portfolio approaches have been applied in maritime contexts, systematic application of a growth–share framework using consistent multi-year throughput data across a regional container port system

remains limited. This limitation is particularly relevant in heterogeneous maritime regions where established hubs and smaller emerging ports compete within the same network.

The present study addresses this gap by developing a time-series-based application of the BCG Growth–Share Matrix for the comparative assessment of container port competitive positioning. Rather than treating market share and growth as separate performance indicators, the study integrates the two dimensions to identify distinct competitive profiles within a regional port system. Five-year aggregated throughput is used to represent relative market position, thereby reducing the influence of year-to-year fluctuations, while Compound Annual Growth Rate (CAGR) is used to capture medium-term traffic growth. The resulting framework is applied to selected Middle Eastern container ports over the 2020–2024 period and is subsequently used to examine the competitive structure of the Iranian port portfolio.

The study addresses three related questions. First, how are container ports positioned when market presence and medium-term growth are considered simultaneously? Second, how does competitive positioning differ when ports are evaluated against a regional benchmark compared with a national benchmark? Third, what does the resulting portfolio structure reveal about the competitive trajectories of established and emerging ports? By addressing these questions, the study contributes to the port competitiveness literature in two ways. First, it provides a transparent and parsimonious framework for combining market position and medium-term growth in the comparative assessment of container ports. Second, it demonstrates the importance of benchmarking scale by showing that the same port can occupy substantially different competitive positions when assessed within a regional system or within its national port portfolio. The empirical application to Middle Eastern ports, including Iranian ports, provides a context in which these differences can be observed under substantial variation in port scale, growth, and regional market presence.

2. Literature Review

2.1. Port competition and the evolution of container port systems

Container ports are increasingly embedded in complex maritime logistics networks where competition is shaped not only by physical capacity but also by network connectivity, hinterland accessibility, operational reliability, and the ability to respond to disruptions. The evolution of container shipping toward hub-and-spoke configurations and the deployment of mega-vessels have intensified inter-port rivalry, making network position and service stability central determinants of competitiveness (Hayut, 1981; Rodrigue et al., 2017; UNCTAD, 2023). As containerization matured, ports transformed from simple gateways into logistics platforms, where competitive advantage is increasingly driven by connectivity, carrier preferences, and integrated supply chain performance rather than local demand alone.

This competitive environment has contributed to spatial concentration and the emergence of multi-port gateway regions, where a limited number of major load centers dominate traffic while smaller ports attempt to survive through specialization, niche strategies, or feeder functions (Notteboom, 2010). Market concentration dynamics also imply that hub ports often reinforce their dominance through cumulative advantage, economies of scale, and stronger links with global shipping alliances.

2.2. Conceptualizing port competitiveness: performance, efficiency, and strategic drivers

Port competitiveness is widely conceptualized as a multidimensional construct that integrates operational efficiency, service quality, cost structure, infrastructure capacity, governance, and connectivity to liner shipping networks. While early studies emphasized physical capacity and throughput, recent research highlights the growing importance of institutional quality, digitalization, and supply chain integration (UNCTAD, 2023; World Bank, 2023; World Bank, 2024). From the shipping lines' perspective, port choice is strongly influenced by reliability, turnaround time, terminal productivity, cost competitiveness, and the port's role in broader service networks (Kaliszewski et al., 2020).

Cross-country evidence further suggests that competitiveness drivers vary by economic context. Mdanat et al. (2024) demonstrate that ports in low- and middle-income settings face structural constraints related to investment capacity, governance, and operational modernization, which may limit competitiveness even when geographical location is favorable. This perspective is relevant for Iranian ports operating under restrictions that affect their ability to attract shipping services and integrate into global liner networks.

2.3. Efficiency benchmarking and performance gaps

A substantial body of literature measures port competitiveness through performance benchmarking, particularly using Data Envelopment Analysis (DEA). Comparative studies consistently show that efficiency differences across regions are significant and that many ports in the Middle East underperform relative to leading Asian terminals in technical efficiency and productivity (Technical efficiency comparison…, 2021). Danladi et al. (2024) confirm similar efficiency gaps in lower-middle-income contexts, linking underperformance to infrastructure constraints, limited scale economies, and suboptimal resource utilization.

More detailed comparative studies also highlight that performance differences are not explained by infrastructure alone. Zhang et al. (2024), comparing terminals in China and Korea, show that managerial practices and institutional arrangements strongly shape productivity outcomes. These findings collectively reinforce that throughput growth does not automatically translate into competitiveness unless accompanied by improvements in efficiency, service quality, and operational reliability. At the same time, global benchmarking initiatives such as the World Bank's Container Port Performance Index (CPPI) provide standardized comparisons

of vessel turnaround and operational performance, strengthening the empirical basis for competitiveness assessment (World Bank, 2023; World Bank, 2024).

2.4. Market concentration, cargo distribution, and hub dominance

Beyond efficiency, port competitiveness is influenced by market structure and concentration dynamics. Turgut (2025) demonstrates that market concentration and cargo allocation can vary substantially by cargo type, with dominant ports capturing disproportionate shares through scale economies and network advantages. This suggests that container port competition may exhibit "winner-takes-most" characteristics, in which leading hubs consolidate market power and constrain the growth potential of smaller ports.

In the Middle East, such dynamics are reinforced by the presence of major hub ports that compete for overlapping transshipment markets. Industry and market intelligence sources, including Drewry and Clarksons, indicate that the regional port system reflects both consolidation and maturity, with dominant hubs increasingly stabilizing market shares while emerging ports struggle to scale up (Drewry, 2023; Clarksons Research, 2024).

2.5. Transshipment competitiveness, location advantage, and disruption resilience

Transshipment capability is frequently identified as a decisive determinant of container port competitiveness. Hub ports benefit from central positioning along major shipping routes, deep-water capacity, high connectivity, and strong integration with liner shipping alliances. Because transshipment cargo is highly footloose, it can shift rapidly in response to changes in cost, service reliability, and disruption risk (Rodrigue et al., 2017; UNCTAD, 2023).

Recent studies emphasize that location advantage alone is insufficient. Martínez-Moya et al. (2025) show that transshipment port competitiveness depends on how geographic position interacts with network centrality and service connectivity. Moreover, disruption-driven research has gained prominence, particularly after the Red Sea crisis. Bedoya-Maya et al. (2025) demonstrate that disruptions can reshape competitive hierarchies by altering routing decisions, shifting flows, and changing network structure. For Middle Eastern ports, where geopolitical risk is structurally embedded, resilience and adaptability have therefore become integral components of competitiveness.

2.6. Strategic portfolio approaches and the relevance of the BCG matrix

While most port competitiveness studies rely on efficiency analysis (DEA/SFA), multi-criteria decision models, or network approaches, strategic portfolio frameworks remain relatively underutilized. Kishore et al. (2024), in a systematic review, note that although port performance measurement has expanded significantly, fewer studies adopt strategic positioning tools that jointly capture growth and competitive share.

The Boston Consulting Group (BCG) Growth–Share Matrix, originally developed for corporate portfolio analysis (Boston Consulting Group, 1970), offers a practical strategic lens for classifying ports into categories such as Stars, Cash Cows, Question Marks, and Dogs. Prior work has suggested that BCG-type approaches can be extended to port systems to interpret competitive structure and guide investment prioritization (Notteboom & Rodrigue, 2008). Day (1977) further argues that growth–share interpretation must be linked to competitive structure and resource capability, which in port contexts translates into infrastructure, connectivity, governance, and hinterland access. Empirical application of the BCG matrix in container port analysis has been demonstrated in Mediterranean markets, where the approach enabled differentiation between mature dominant ports and high-growth emerging competitors (Evaluation of Mediterranean market container ports…, 2024).

2.7. Port life cycles, hinterland connectivity, and the role of inland logistics

Ports, similar to industrial assets, follow life cycle dynamics in which growth may decline due to capacity saturation, spatial constraints, or intensified competition. The port life cycle concept has been extended through the dry port and inland logistics framework, suggesting that ports can sustain growth by strengthening hinterland connectivity and integrating inland terminals (Cullinane & Wilmsmeier, 2011). This is increasingly relevant under alliance-driven consolidation and mega-ship deployment, where only ports with high productivity and strong inland logistics systems can maintain competitive status (OECD/ITF, 2018). Ports that fail to modernize operational systems and hinterland corridors risk losing traffic to more efficient regional competitors.

2.8. Research gap and relevance to Iranian ports

Despite the growing literature on container port competitiveness, Iranian ports remain underrepresented in peer-reviewed studies. Iranian ports operate under distinctive constraints, including sanctions, limited foreign investment, and restricted integration with global shipping alliances, which affect both connectivity and service reliability. Official operational statistics and PMO reports suggest that although some Iranian ports have recorded positive growth, infrastructural bottlenecks and institutional limitations have constrained their ability to capture larger regional market shares (PMO, 2023; PMO, 2024).

The literature indicates that emerging ports can transition toward stronger competitive positions only if growth is supported by infrastructure investment, operational efficiency improvements, corridor activation, and stronger hinterland integration (Notteboom & Rodrigue, 2008; Cullinane & Wilmsmeier, 2011). In this context, combining a strategic portfolio framework with multi-year throughput analysis can provide a clearer picture of relative positioning and competitive gaps.

In summary, the literature confirms that container port competitiveness is shaped by operational efficiency, market concentration, transshipment connectivity, hinterland integration, governance quality, and resilience under disruptions. Dominant hubs sustain leadership through network centrality and cumulative advantage, while emerging ports require targeted investment and strategic alignment with shipping lines to expand market share (Kaliszewski et al., 2020; Martínez-Moya et al., 2025). However, a gap remains in applying portfolio-based strategic frameworks—particularly the BCG Growth–Share Matrix—using consistent multi-year time-series data to evaluate Middle Eastern ports, and especially Iranian ports.

This study addresses this gap by evaluating the competitive positioning of selected Middle Eastern container ports over 2020–2024 using CAGR as a growth indicator and aggregated five-year throughput as a robust market share measure, reducing short-term volatility and enabling strategic classification within the BCG framework.

3. Methodology

This study is classified as applied research in terms of its objective and is descriptive–analytical in nature. It adopts a comparative and data-driven approach to evaluate the competitive positioning of major container ports in Iran and the Middle East using the Boston Consulting Group (BCG) Growth–Share Matrix. The BCG framework has been widely employed in strategic portfolio analysis and has also been adapted in maritime studies to capture both market position and growth dynamics in port systems (Notteboom & Rodrigue, 2008; Wheelen & Hunger, 2018).

3.1. Study Area and Port Selection

The statistical population of this research comprises major container ports operating in the Middle East region. Ports were selected based on three criteria: (i) operational significance in regional container shipping, (ii) availability and consistency of throughput data, and (iii) relevance within the main maritime transport network of the region.

Accordingly, the regional ports included in the study are Jebel Ali (UAE), Salalah and Sohar (Oman), Hamad (Qatar), King Abdullah and Dammam (Saudi Arabia). In addition, the major Iranian container ports examined as the core of the comparative analysis include Shahid Rajaee, Imam Khomeini, Bushehr, Chabahar, Khorramshahr, Bandar Lengeh, and Shahid Bahonar.

3.2. Study Period

The analysis covers a five-year period from 2020 to 2024. This interval was selected to capture stable medium-term trends, reduce the influence of short-term fluctuations driven by geopolitical, economic, and operational disruptions, and enable a consistent growth assessment through the Compound Annual Growth Rate (CAGR). A five-year horizon provides a robust

basis for identifying structural strengths and weaknesses in port performance and competitiveness.

3.3. Data Collection and Sources

Data were collected through a library and documentary research method using secondary sources. Container throughput data (TEU) for Iranian ports were obtained from the official annual statistics published by the Ports and Maritime Organization of Iran (PMO, 2023; PMO, 2024). For regional ports, throughput statistics were extracted from the World Bank's port performance-related datasets and official statistical releases from the respective port authorities. To enhance consistency, all throughput data were cross-checked where possible with industry shipping intelligence reports and international port statistics sources.

Following data collection, a refinement process was conducted to ensure data completeness, remove inconsistencies, and standardize reporting formats across ports and countries. This step was necessary to ensure comparability in longitudinal and cross-port analysis.

3.4. Indicators and Analytical Framework

To position ports within the BCG Growth–Share Matrix, two key indicators were computed: market share and growth rate. Market share was calculated based on each port's aggregated five-year throughput relative to the total throughput of all ports included in the sample during 2020–2024. This multi-year aggregation reduces the impact of year-to-year volatility and provides a more reliable representation of each port's sustainable competitive position.

Growth performance was measured using the Compound Annual Growth Rate (CAGR), calculated as:

$$CAGR = 1 - (\frac{TEU_{2024}}{TEU_{2020}})^{\frac{1}{n}} \quad (1)$$

where n represents the number of annual intervals between 2020 and 2024.

In the BCG matrix visualization, bubble size was proportional to each port's container throughput in 2024, reflecting its operational scale and relative importance in the final year of the study period.

3.5. Data Processing and Visualization

All computations were performed using Microsoft Excel. The BCG Growth–Share Matrix was visualized using a Bubble Chart. To define the quadrant boundaries, the mean market share and the average CAGR of all ports were used as threshold values for the horizontal and vertical

axes, respectively. Finally, each port's position was interpreted based on its location within one of the four BCG quadrants: Stars, Cash Cows, Question Marks, and Dogs.

This approach provides an integrated assessment of both market position and growth trajectory, enabling a coherent comparison of Iranian ports with regional competitors and supporting strategic interpretation of their competitive standing.

4. Results

This section reports the results of the five-year market share estimates, the Compound Annual Growth Rate (CAGR), and the 2024 container throughput (TEU) for the selected ports. These indicators are subsequently integrated into the BCG Growth–Share Matrix to interpret the relative competitive positioning of each port within the regional container port system. The 2020–2024 dataset indicates a markedly concentrated regional structure, in which a small number of major hubs account for a substantial share of total container throughput, while the remaining ports operate with comparatively limited market shares and exhibit heterogeneous growth trajectories.

Table 1. Container Throughput Performance of Selected Middle Eastern Ports (2020–2024) [TEU]

PORT NAME	COUNTRY	2020	2021	2022	2023	2024	Total
IMAM KHOMEINI	Iran	118,198	128,504	120,748	67,492	87,611	522,553
BUSHEHR	Iran	37,159	40,635	61,219	57,905	79,327	276,245
CHABAHAR	Iran	27,822	18,976	25,896	66,142	93,231	232,067
KHORRAMSHAHR	Iran	19,479	20,650	21,726	25,563	31,572	118,990
SHAHID RAJAEE	Iran	1,469,488	1,756,505	1,957,580	2,175,554	2,423,828	9,782,955
BANDAR LENGEH	Iran	13,463	40,056	125,011	170,118	190,198	538,846
SHAHID BAHONAR	Iran	98,642	65,603	28,387	26,153	44,490	263,275
JEBEL ALI	UAE	13,488,000	13,742,000	14,000,000	14,472,000	15,536,000	71,238,000
SALALAH	Oman	4,340,000	4,500,000	4,504,000	3,794,000	3,305,000	20,443,000
SOHAR	Oman	801,830	725,447	724,619	818,110	942,051	4,012,057
HAMAD	Qatar	1,412,689	1,543,591	1,589,408	1,736,780	1,421,000	7,703,468
KING ABDULLAH	Saudi Arabia	2,153,963	2,813,920	2,905,306	2,931,000	2,980,000	13,784,189
DAMMAM (KING ABDULAZIZ)	Saudi Arabia	1,770,000	1,770,000	2,000,000	2,305,811	2,980,000	10,825,811
TOTAL	-	-	-	-	-	-	139,741,456

Table 1 summarizes the container throughput (TEU) of the selected Middle Eastern ports over the 2020–2024 period. It reports annual throughput values for each port from 2020 to 2024, along with the cumulative five-year total, which serves as the basis for subsequent market share calculations.

Table 2. Key Indicators of Selected Middle Eastern Ports (2020–2024)

PORT NAME	COUNTRY	COMPOUND ANNUAL GROWTH RATE (%)	MARKET SHARE (%)	CONTAINER THROUGHPUT (MILLION TEU)
IMAM KHOMEINI	Iran	-5.81	0.37	0.09
BUSHEHR	Iran	16.38	0.20	0.08
CHABAHAR	Iran	27.36	0.17	0.09
KHORRAMSHAHR	Iran	10.14	0.09	0.03
SHAHID RAJAEE	Iran	10.53	7.00	2.42
BANDAR LENGEH	Iran	69.83	0.39	0.19
SHAHID BAHONAR	Iran	-14.72	0.19	0.04
JEBEL ALI	UAE	2.87	50.98	15.54
SALALAH	Oman	-5.30	14.63	3.31
SOHAR	Oman	3.28	2.87	0.94
HAMAD	Qatar	0.12	5.51	1.42
KING ABDULLAH	Saudi Arabia	6.71	9.86	2.98
DAMMAM (KING ABDULAZIZ)	Saudi Arabia	10.98	7.75	2.98
TOTAL	-	-	100.00	-

Table 2 reports the key competitiveness indicators for the selected Middle Eastern ports, including 2024 container throughput (TEU), the aggregated five-year market share (2020–2024), and the Compound Annual Growth Rate (CAGR). These metrics constitute the main inputs for constructing the BCG Growth–Share Matrix and enable a direct benchmarking of Iranian ports against leading regional competitors.

Table 3. Key Indicators of Selected Iranian Ports (2020–2024)

Port Name	Country	Compound Annual Growth Rate (%)	Market Share (%)	Container Throughput (Million TEU)
Imam Khomeini	Iran	-5.81	4.45	0.09

Bushehr	Iran	16.38	2.35	0.08
Chabahar	Iran	27.36	1.98	0.09
Khorramshahr	Iran	10.14	1.01	0.03
Shahid Rajaee	Iran	10.53	83.37	2.42
Bandar Lengeh	Iran	69.83	2.24	0.19
Shahid Bahonar	Iran	-14.72	2.24	0.04
Total	-	-	100.00	-

Table 3 reports the performance indicators for the Iranian ports included in the study. For each port, it presents the 2024 container throughput (TEU), the aggregated five-year market share (2020–2024), and the Compound Annual Growth Rate (CAGR). These indicators form the analytical basis for constructing the domestic BCG matrix and enable an intra-national comparison of Iran's container port portfolio.

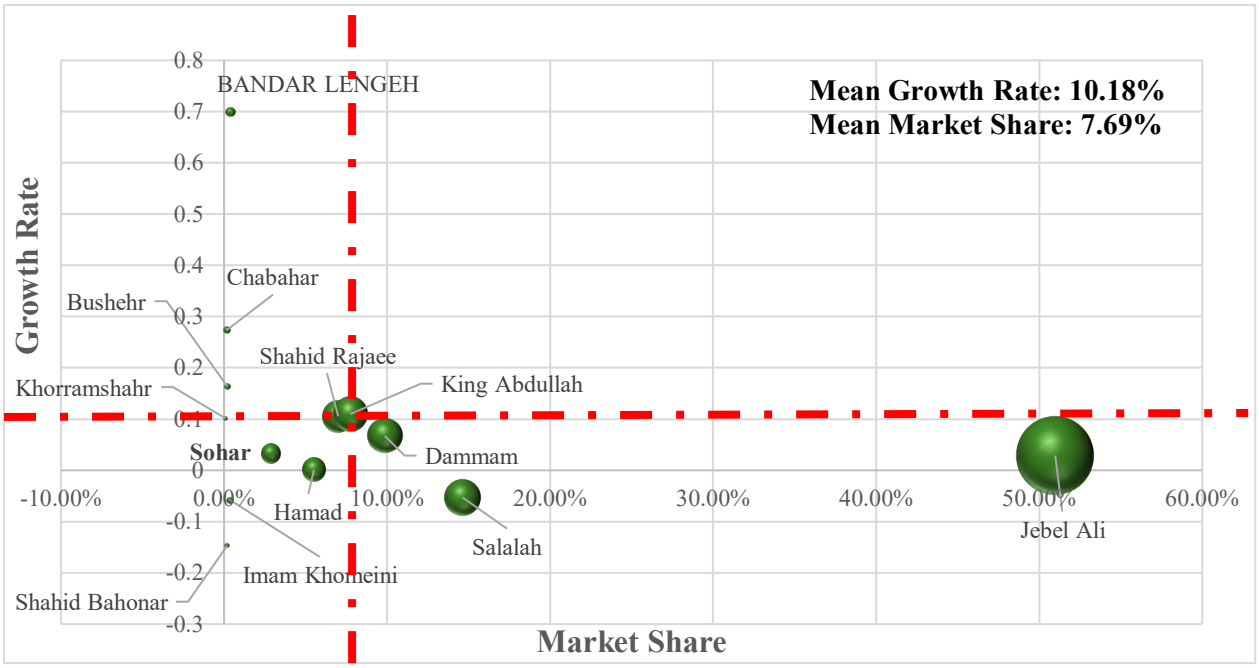


Figure 1. BCG Growth-Share Matrix for Selected Middle Eastern Ports (2020–2024)

Figure 1 presents the BCG Growth–Share Matrix as a bubble chart. The horizontal axis represents the aggregated five-year market share (2020–2024), while the vertical axis indicates the Compound Annual Growth Rate (CAGR) over the same period. Bubble sizes are proportional to the 2024 container throughput (TEU), reflecting the relative operational scale of each port. The red vertical and horizontal reference lines represent the sample mean values of market share and CAGR, respectively, thereby defining the four standard quadrants of the BCG framework.

The results show that none of the selected ports fall within the Stars quadrant. In other words, no port simultaneously exhibits an above-average market share and an above-average growth rate. This outcome suggests that, within the observed period, the regional container port system has been characterized by strong dominance of mature hubs, while high-growth dynamics have primarily occurred among ports with relatively limited market penetration.

The Cash Cows quadrant includes Jebel Ali, Salalah, and Dammam. These ports account for a substantial share of regional container throughput, but their CAGR remains below the regional average. Jebel Ali, represented by the largest bubble and positioned far to the right, illustrates the high concentration of container traffic and confirms its role as the region's principal transshipment hub. Similarly, Salalah and Dammam demonstrate strong market positions supported by large operational volumes, yet their growth trajectories indicate a mature stage with limited short-term expansion.

The Question Marks quadrant comprises King Abdullah, Shahid Rajaee, Khorramshahr, Bushehr, Chabahar, and Bandar Lengeh. These ports exhibit below-average market shares but above-average growth rates over 2020–2024. King Abdullah Port, as an emerging gateway in Saudi Arabia, demonstrates rapid growth despite its relatively smaller market base and may strengthen its competitive position if investment and shipping line connectivity continue. Notably, several Iranian ports—including Shahid Rajaee, Bushehr, Chabahar, Khorramshahr, and Bandar Lengeh—are also located in this quadrant, indicating latent competitive potential. While their current throughput remains far below leading hubs, their growth performance suggests that targeted infrastructure upgrading, operational improvements, and enhanced liner service connectivity could enable upward repositioning in the regional port portfolio.

The Dogs quadrant includes Hamad, Sohar, Imam Khomeini, and Shahid Bahonar. Ports in this category combine limited market share with weak or negative growth. Despite certain geographical and logistical advantages, Hamad and Sohar appear to face structural constraints in capturing market share against dominant regional rivals, resulting in stagnant performance. Among Iranian ports, Imam Khomeini and Shahid Bahonar display similarly weak competitive profiles, reflecting both limited market capture and insufficient growth momentum. Their positioning implies the need for strategic reassessment regarding their functional role in Iran's national port system, particularly in relation to container specialization and network integration.

Overall, the BCG matrix highlights a regional structure dominated by mature high-share ports concentrated in the Cash Cows quadrant, while growth is primarily observed among lower-share ports classified as Question Marks. For Iranian port policy, this pattern suggests that strengthening high-growth but low-share ports—particularly Chabahar, Bushehr, and Bandar Lengeh—may improve Iran's competitive standing in the Middle Eastern container port network over the medium term. Conversely, ports classified as Dogs require careful policy

review and potential role redefinition to prevent further marginalization within the national port portfolio.

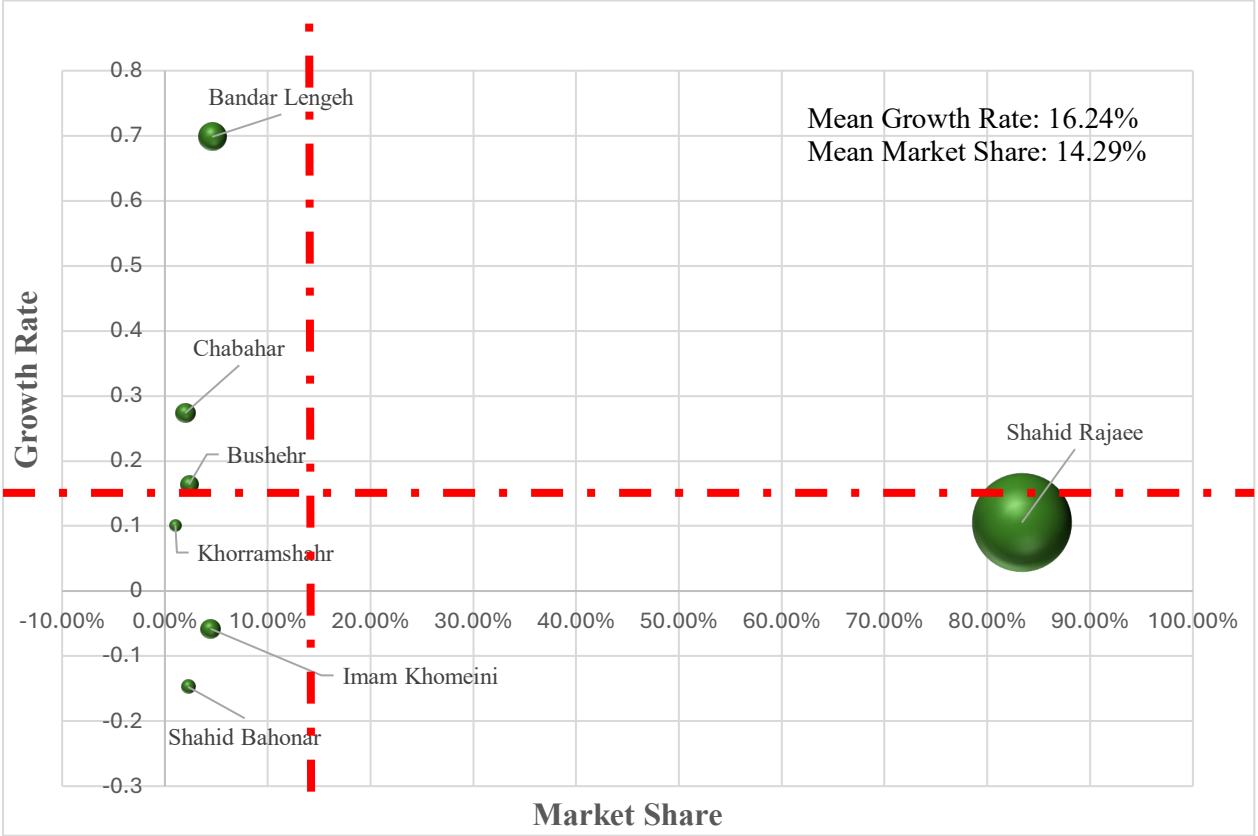


Figure 2. BCG Growth-Share Matrix for Selected Iranian Ports (2020–2024)

Figure 2 presents the competitive positioning of Iran's main container ports within a domestic benchmarking framework. Unlike the regional analysis, the quadrant thresholds in this figure are defined using the mean values of Iranian ports, allowing a more nuanced identification of relative performance and latent capacity within the national port portfolio.

Cash Cows – Shahid Rajaee Port.

With a dominant share of more than 83% of Iran's container throughput (TEU), Shahid Rajaee is positioned in the Cash Cows quadrant. This reflects its role as the country's primary container gateway and its strong market power. However, its CAGR remains below the national average, suggesting that its growth trajectory is more constrained than that of smaller emerging ports. This pattern is consistent with a mature hub profile, where maintaining competitiveness increasingly depends on operational modernization, capacity optimization, and service quality improvements rather than rapid volume expansion.

Question Marks – Chabahar, Bushehr, and Bandar Lengeh.

Chabahar, Bushehr, and Bandar Lengeh are located in the Question Marks quadrant due to their high growth rates combined with relatively limited market shares. The CAGR values are particularly notable, with Bandar Lengeh reaching approximately 70% and Chabahar about 27% over the study period. These results indicate that these ports have gained momentum from a small market base and may represent emerging nodes in Iran's container system. Their upward repositioning within the domestic portfolio is likely to depend on hinterland connectivity, logistics infrastructure, and the ability to attract stable feeder and regional liner services.

Dogs – Khorramshahr, Imam Khomeini, and Shahid Bahonar.

Khorramshahr, Imam Khomeini, and Shahid Bahonar fall within the Dogs quadrant, reflecting both low market shares and weak growth performance. Imam Khomeini and Shahid Bahonar exhibit particularly unfavorable growth patterns, including negative CAGR. This positioning suggests that sustaining a container-oriented competitive strategy may be challenging for these ports under current conditions. A functional reassessment—potentially emphasizing alternative roles such as bulk cargo specialization, Ro-Ro services, or regional support functions—may be required to improve their relevance within the national port system and avoid inefficient allocation of investment resources.

Finally, the absence of any Iranian port in the **Stars** quadrant, even under domestic benchmarking, is a notable structural outcome. It indicates that high-growth ports have not yet reached the operational scale necessary to become dominant, while the main hub port has experienced a relative slowdown in growth. This portfolio structure implies a dual challenge for Iran's port system: sustaining competitiveness of the primary hub while simultaneously scaling up emerging ports to achieve a more balanced and resilient national port network.

5. Discussion

The results provide several insights into the competitive structure and evolution of container ports in the Middle East. Rather than interpreting the BCG classifications as direct measures of overall port competitiveness, the results should be understood as a representation of the relationship between two complementary dimensions: relative market position and medium-term traffic growth. This distinction is important because a port can experience rapid traffic expansion without attaining a substantial market position, while a mature hub can maintain a dominant position despite relatively modest growth. The portfolio structure observed in the study therefore provides insights into the different competitive trajectories of ports within the regional maritime system.

5.1. Concentration of regional market position and the persistence of established hubs

The regional matrix indicates a strongly concentrated container port system, with a small number of ports accounting for a large proportion of cumulative throughput. Jebel Ali represents the most pronounced example of this concentration, with a substantially larger market share than the other ports included in the analysis. Salalah and Dammam also occupy relatively strong market positions, although their growth rates are below the regional mean. Their classification as Cash Cows reflects a combination of established market presence and comparatively moderate growth rather than weak performance in absolute terms.

This pattern is consistent with the broader literature on container port systems, which emphasizes cumulative advantage, economies of scale, network connectivity, and the concentration of traffic within major load centers (Notteboom, 2010; Rodrigue et al., 2017). As ports become integrated into liner shipping networks, established hubs may benefit from stronger carrier relationships, more frequent services, larger vessel calls, and greater opportunities to consolidate transshipment flows. These network effects can reinforce existing market positions and make it difficult for smaller ports to achieve comparable levels of market penetration.

The results are also consistent with the perspective that port competitiveness cannot be inferred from geographical location or physical capacity alone. Kaliszewski et al. (2020) emphasize the importance of factors such as reliability, turnaround time, terminal productivity, cost, and integration into shipping networks from the perspective of shipping lines. Similarly, Martínez-Moya et al. (2025) show that the competitive relevance of transshipment ports depends on the interaction between location and network connectivity. The concentration observed in the present analysis can therefore be interpreted as an outcome of accumulated market position within a broader maritime network rather than simply a reflection of port size.

At the same time, the absence of any port in the Stars quadrant is noteworthy. It indicates that, according to the selected benchmark and study period, none of the ports simultaneously combined an above-average market share with above-average growth. This does not imply an absence of competitive development. Rather, it suggests a structural separation between established market leadership and rapid traffic expansion. Large established hubs tend to have greater market shares but more moderate growth, whereas faster-growing ports generally start from smaller market bases.

5.2. Growth does not necessarily translate into market capture

A second important finding is the divergence between traffic growth and accumulated market position. Several ports classified as Question Marks exhibit growth rates above the regional mean while retaining relatively small market shares. This pattern is particularly visible among

a number of Iranian ports, as well as King Abdullah. The result demonstrates why growth should not be interpreted independently from market position.

High CAGR values can represent a meaningful expansion in traffic while still corresponding to a relatively small absolute market base. Bandar Lengeh provides the clearest example, with a very high growth rate over the study period but a limited cumulative market share. Chabahar also records substantial growth while remaining a small regional player. The same general pattern, although less pronounced, can be observed for Bushehr and Khorramshahr. Their classification reflects growth momentum rather than established market dominance.

This finding is consistent with the broader literature emphasizing that competitive advantage in container shipping depends on more than traffic expansion. Notteboom and Rodrigue (2008) argue that port competition needs to be understood in relation to market structure, network position, and the competitive environment. Similarly, the port life-cycle literature suggests that growth can be supported by improvements in hinterland connectivity and inland logistics, but sustained competitive development requires the integration of these functions into the wider logistics system (Cullinane & Wilmsmeier, 2011).

The distinction between growth and market position is particularly relevant for emerging ports. A rapidly growing port may be moving toward a stronger competitive position, but growth alone does not establish that such a transition will occur. To convert growth into sustained market capture, a port must attract recurring cargo flows, maintain service reliability, develop adequate hinterland connections, and establish stable relationships with shipping lines. Thus, the Question Mark classification should be interpreted as evidence of a particular competitive trajectory rather than as a prediction of future success.

5.3. Regional versus national benchmarking: the case of Iranian ports

One of the most important findings of the study emerges from comparing the regional and national matrices. The position of Shahid Rajaee changes substantially depending on the benchmark. In the regional analysis, the port is classified as a Question Mark because its market share is relatively small compared with the dominant regional hubs. In the national analysis, however, Shahid Rajaee is positioned as a Cash Cow, accounting for more than 83% of the aggregated container throughput of the Iranian ports included in the study.

This difference demonstrates that competitive position is inherently scale-dependent. A port can be highly dominant within one market while remaining a relatively small participant in a larger market. Consequently, national market leadership should not automatically be interpreted as regional competitiveness. The distinction is particularly important when evaluating ports in countries whose total container throughput is substantially smaller than that of the largest regional hubs.

For Iran, this result provides a more nuanced interpretation of the competitive structure of the national port system. Shahid Rajaee clearly occupies a dominant position within Iran's container port portfolio, but this domestic dominance does not translate into comparable regional market presence. The difference between the two matrices therefore highlights a structural gap between domestic concentration and regional integration. In practical terms, maintaining national dominance and strengthening regional competitiveness represent related but distinct objectives.

The finding also illustrates the analytical value of using more than one benchmarking scale. A national benchmark can identify the relative roles of ports within a country's own portfolio, whereas a regional benchmark provides information about their position in the broader maritime market. Neither perspective alone fully describes competitive positioning. The combination of both can reveal whether a port's apparent strength reflects genuine regional market presence or primarily its dominance within a smaller national system.

5.4. Emerging ports and the conditions for sustained competitive development

The positioning of Chabahar, Bushehr, and Bandar Lengeh as high-growth, low-share ports is particularly relevant to the interpretation of emerging port trajectories. Their growth rates indicate that traffic has expanded over the study period, but their market shares remain small relative to the established regional hubs. The results therefore point to a distinction between **growth momentum** and **competitive scale**.

For emerging ports, the central challenge is not simply to maintain high growth rates but to transform episodic or relatively small-base growth into stable and recurring market demand. Previous research indicates that this process is influenced by hinterland connectivity, infrastructure, operational performance, network centrality, and access to shipping services (Cullinane & Wilmsmeier, 2011; Kaliszewski et al., 2020; Martínez-Moya et al., 2025). In addition, the increasing importance of disruption resilience suggests that ports need to maintain service reliability and network adaptability when maritime routes are affected by geopolitical or operational shocks (Bedoya-Maya et al., 2025).

This interpretation is particularly relevant in the Middle Eastern context, where changes in maritime routing can alter the relative attractiveness of alternative ports. Disruptions such as those affecting Red Sea shipping routes may modify vessel routing, transshipment patterns, and cargo allocation across regional networks. Bedoya-Maya et al. (2025) demonstrate that disruption-induced changes can alter competitive relationships between ports by changing routing decisions and network structure. Consequently, a port's competitive trajectory should be understood not only through historical growth but also through its ability to retain and build upon new traffic under changing network conditions.

For Iranian ports, the ability to translate growth into regional market capture is also affected by structural constraints. PMO reports identify infrastructure limitations, restricted access to major shipping services, and broader external constraints affecting the development of Iranian ports (PMO, 2023; PMO, 2024). These factors help explain why relatively high traffic growth at some ports has not yet resulted in market shares comparable with established regional hubs. The results therefore support a distinction between **observed growth performance** and **realized competitive position**.

5.5. Low-growth ports and the question of functional differentiation

The opposite pattern is observed for ports located in the Dogs quadrant. Imam Khomeini and Shahid Bahonar combine limited market shares with negative growth rates, while other ports show relatively weak growth despite having more established positions. From a portfolio perspective, these results indicate that not all ports face the same competitive challenge.

For a port with persistently low or negative container growth, simply pursuing additional container volume may not necessarily represent the most appropriate strategic direction. Port competition increasingly involves specialization and functional differentiation, particularly where ports operate within a multi-port regional system. Notteboom (2010) highlights the emergence of multi-port gateway regions in which ports can perform differentiated functions rather than competing for identical cargo flows. Similarly, the development of dry ports and inland logistics networks can extend the functional life cycle of ports and support alternative forms of integration into regional logistics systems (Cullinane & Wilmsmeier, 2011).

Accordingly, the classification of a port within a low-growth portfolio position should not be interpreted as evidence that the port lacks strategic value. Instead, it indicates that its current container-market trajectory differs from that of faster-growing or more dominant competitors. Depending on its geographical, infrastructural, and logistical characteristics, a port may have opportunities to strengthen specialized functions, serve particular cargo segments, or support regional logistics networks. Such functional differentiation may be more appropriate than attempting to reproduce the competitive model of a dominant transshipment hub.

5.6. Implications for port competitiveness assessment

An important contribution of the analysis is methodological. The results show that market share and growth provide different but complementary information about port competitiveness. Market share captures the relative scale of a port within the selected market, while CAGR reflects the direction and magnitude of traffic change over time. Examining these indicators jointly makes it possible to distinguish, for example, between a mature high-share port, a rapidly growing small port, and a low-share port experiencing traffic decline.

This perspective complements the large body of research that evaluates port performance through efficiency, productivity, connectivity, and service indicators. DEA-based studies, for example, provide important information about the efficient use of inputs and outputs, while the World Bank's Container Port Performance Index provides standardized information on vessel turnaround and operational performance (World Bank, 2023; World Bank, 2024). These approaches answer different questions from the one addressed here. The present framework does not determine whether a port is operationally efficient; rather, it identifies how the port's observed market position relates to its medium-term traffic growth.

This distinction is important because a port may have high operational efficiency without having a large market share, or it may possess substantial market share while experiencing relatively slow growth. Consequently, the BCG framework should be viewed as a complementary strategic-positioning tool rather than a substitute for multidimensional port performance assessment. Its principal value is its ability to provide a simple visual representation of competitive trajectories and to support subsequent investigation into the factors underlying those trajectories.

The findings also reinforce the importance of avoiding a purely cross-sectional interpretation of port competition. A single year's throughput can be affected by temporary disruptions, changes in shipping schedules, or exceptional market conditions. By using aggregated throughput over five years and CAGR over the same period, the analysis reduces the influence of individual annual fluctuations and provides a medium-term representation of market position and growth. Nevertheless, the framework remains dependent on the selected period and benchmark. Different time windows or reference groups could produce different classifications, which reinforces the need to interpret the BCG categories as relative analytical positions rather than fixed attributes of ports.

5.7. Overall interpretation

Taken together, the results suggest that the Middle Eastern container port system can be characterized by a coexistence of established market dominance and dispersed growth opportunities. Established hubs retain substantial market positions, while higher growth is more frequently observed among smaller ports. This creates a competitive structure in which market leadership and growth momentum are not concentrated in the same set of ports.

For Iranian ports, this structure produces a particularly important distinction between national and regional competitiveness. Several Iranian ports demonstrate growth dynamics that are favorable relative to the regional benchmark, but their accumulated market shares remain limited. Shahid Rajaee, by contrast, dominates the national container portfolio while remaining relatively small in the regional market. The resulting divergence suggests that strengthening Iran's regional competitive position cannot be achieved solely through maintaining domestic

market concentration or increasing throughput at individual ports. It requires broader integration with shipping networks, hinterland logistics systems, and regional cargo flows.

The broader implication is that port competitiveness should be understood as a dynamic and relative concept rather than as a single observable attribute. The combination of market position and growth provides one useful lens through which different competitive trajectories can be identified. When complemented by evidence on efficiency, connectivity, infrastructure, service quality, and resilience, such a portfolio perspective can contribute to a more comprehensive understanding of how ports evolve within regional maritime transport systems.

6. Conclusion and Recommendations

This study examined the dynamic competitive positioning of selected container ports in the Middle East over the 2020–2024 period by jointly considering market position and medium-term traffic growth. Instead of treating port competitiveness as a single-dimensional outcome, the study employed the BCG Growth–Share Matrix to combine aggregated five-year throughput as an indicator of relative market position with Compound Annual Growth Rate (CAGR) as an indicator of growth dynamics. This approach provides a portfolio-based representation of how established and emerging ports differ in their current market presence and growth trajectories.

The regional analysis reveals a highly asymmetric competitive structure. A relatively small number of established hubs account for a substantial proportion of regional container throughput, while higher growth rates are more frequently observed among ports with comparatively limited market shares. Jebel Ali, Salalah, and Dammam are positioned in the Cash Cows quadrant, reflecting their substantial market presence combined with growth rates below the regional mean. In contrast, a number of ports, including King Abdullah and several Iranian ports, are positioned as Question Marks because their growth rates exceed the regional average while their market shares remain relatively limited. No port is located in the Stars quadrant under the regional benchmark, indicating that high market presence and above-average growth did not simultaneously characterize the selected ports during the study period.

The results also demonstrate the importance of the benchmarking scale in interpreting port competitiveness. The position of Shahid Rajaee provides a particularly clear example. At the regional level, its market share is relatively small compared with major Middle Eastern hubs such as Jebel Ali, resulting in its classification as a Question Mark. Within the Iranian port portfolio, however, Shahid Rajaee accounts for more than 83% of the aggregated container throughput and is therefore positioned as a Cash Cow. This difference does not represent a contradiction; rather, it demonstrates that competitive position is inherently relative to the market and benchmark against which a port is evaluated. A port can simultaneously be dominant within a national system and relatively small within a broader regional market.

The analysis further indicates that high growth should not be interpreted independently of market position. Bandar Lengeh and Chabahar, for example, recorded relatively high CAGR values during the study period, but their accumulated market shares remain small compared with established regional hubs. Similarly, other Iranian ports exhibit positive growth without reaching a substantial regional market position. These patterns suggest that traffic expansion from a limited market base does not automatically translate into regional competitive strength. The ability to convert growth into sustained market presence depends on factors that extend beyond observed throughput growth, including infrastructure, hinterland connectivity, operational performance, and access to shipping services. These factors are consistent with the broader literature emphasizing connectivity, service quality, operational reliability, and network integration as important dimensions of port competitiveness (Kaliszewski et al., 2020; Notteboom & Rodrigue, 2008).

The findings also highlight the heterogeneous trajectories of ports with weak or negative growth. Imam Khomeini and Shahid Bahonar, for example, combine relatively limited market shares with negative CAGR values, while Khorramshahr exhibits a low market share despite positive growth. Such differences indicate that ports occupying similar or neighboring positions within a portfolio may nevertheless require different strategic interpretations. A low-share port with positive growth represents a different competitive trajectory from a low-share port experiencing persistent traffic decline. The portfolio framework therefore provides a basis for distinguishing between emerging positions and weaker or contracting positions rather than evaluating ports solely according to their absolute throughput.

From a policy and management perspective, the findings suggest that port development strategies should be differentiated according to competitive position and growth trajectory rather than based solely on throughput volume. Established high-share ports require continued attention to productivity, reliability, capacity utilization, service quality, and network connectivity to maintain their position. For smaller ports experiencing relatively high growth, the key issue is not growth alone but the ability to translate growth into sustained market capture through improved hinterland connectivity, logistics integration, infrastructure, and liner service connectivity. For ports characterized by persistently low market shares and weak growth, strategic assessment of their future functional role may be warranted, including consideration of specialization in cargo segments or services for which they possess relevant capabilities.

For Iranian ports in particular, the results point to a dual challenge. First, the dominant position of Shahid Rajaee within the national container system needs to be considered in the context of its substantially smaller position within the wider Middle Eastern market. Second, emerging ports such as Chabahar, Bushehr, and Bandar Lengeh may require complementary improvements in infrastructure, connectivity, and service provision if their relatively high growth is to develop into a more substantial and sustained market presence. These implications

are consistent with the broader evidence that infrastructure, operational efficiency, hinterland integration, and connectivity to shipping networks influence the ability of ports to strengthen their competitive positions (Cullinane & Wilmsmeier, 2011; Mdanat et al., 2024; PMO, 2023; PMO, 2024).

More broadly, the study demonstrates the usefulness of combining market position and growth dynamics for comparative assessment of container ports. The BCG framework should not be interpreted as a comprehensive measure of port competitiveness, since it does not directly incorporate dimensions such as cost, productivity, service quality, connectivity, governance, or resilience. Rather, its contribution lies in providing a transparent portfolio representation that complements more detailed efficiency, network, and performance assessments. In this sense, the framework can serve as an initial benchmarking tool for identifying competitive trajectories and areas requiring further investigation.

Several limitations should also be acknowledged. First, the analysis relies primarily on container throughput, market share, and CAGR and therefore does not directly measure the operational, financial, institutional, or network dimensions of competitiveness. Second, the study period covers five years and may therefore capture medium-term rather than long-term structural changes. Third, the selected regional ports are constrained by data availability and consistency across countries. Future research could extend the framework by integrating additional indicators such as vessel connectivity, turnaround time, terminal productivity, port costs, hinterland accessibility, transshipment intensity, and resilience to disruptions. Such extensions could provide a multidimensional portfolio framework capable of examining not only where ports are positioned, but also the underlying mechanisms through which their competitive positions evolve.

Overall, the findings indicate that container port competitiveness should be interpreted as a relative and dynamic phenomenon. Market dominance and growth momentum represent distinct dimensions of competitive position, and their combination can reveal patterns that remain hidden when either dimension is examined independently. The proposed time-series-based portfolio approach offers a simple and transparent means of capturing these differences and provides a basis for comparing established hubs and emerging ports across different benchmarking scales. Its application to the Middle Eastern port system demonstrates how regional and national perspectives can generate substantially different interpretations of the same port, highlighting the importance of benchmark definition when evaluating competitive position in maritime transport systems.

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