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Analyzing Barriers to the Export Development of Brass Products Using a Mixed Qualitative-Quantitative Approach (Case Study: Yazd Province)

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Abstract

Export growth and development are considered fundamental pillars of economic sustainability for countries, requiring the identification and elimination of key structural barriers. In this regard, the present study aims to analyze the structural obstacles hindering the export development of brass products (slabs and billets) within the brass industry of Yazd province. Employing a mixed-methods research design, the qualitative phase involved semi-structured interviews with 22 industrial and academic experts. The data obtained from these interviews were analyzed through open, axial, and selective coding, resulting in the identification of seven key dimensions: trade relations, pricing, market access, regulatory frameworks, market competitiveness, limitations in banking services, and human resources. In the quantitative phase, exploratory factor analysis was applied to rigorously examine and confirm the structure and significance of these factors. The findings reveal that all identified factors play a vital and statistically significant role in the development of brass product exports. Addressing these dimensions can offer practical guidance to policymakers and industry stakeholders aiming to enhance the export performance of this sector. By presenting a well-defined conceptual model, this study provides valuable insights for reducing structural barriers and improving export conditions for brass products.

Keywords: Export Development, Structural Barriers, Factor Analysis, Brass Industry, Qualitative Analysis.

JEL Classification: (F13, L11, C38, L61, C80)

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INTRODUCTION

In the current era, extensive transformations driven by globalization, shifts in global supply chains, and the increasing complexity of economic structures have established international trade as a cornerstone of national growth and development (World Bank, 2020). Developing countries, particularly those seeking to reduce their dependence on the export of natural resources and oil, are increasingly in need of designing precise policies and models for the development of non-oil exports (UNCTAD, 2022). The brass products industry, including slabs and billets, is one such potential sector, with its technical characteristics, high added value, and diverse target markets offering a significant opportunity to contribute to the country's industrial exports. However, despite the existing structural capacities and human resources within the brass alloy sector, numerous obstacles—such as weaknesses in export infrastructure, legal and tariff constraints, foreign exchange rate fluctuations, quality challenges in production, and limited access to target markets—pose serious barriers to the development of exports in this sector (OECD, 2021). Yazd province, as one of Iran's hubs for brass slab and billet production, possesses significant industrial infrastructure and is well-positioned to play a more prominent role in the global value chain of these products. Nevertheless, realizing this potential necessitates the identification and removal of export barriers. While previous studies have addressed general export obstacles across various industries (Heidari et al., 2021; Norouzpour et al., 2020), the primary research gap lies in the lack of identification of barriers specific to the brass alloy industry, particularly the absence of a quantitative model based on confirmatory factor analysis for this sector. The innovation of the present research lies in its use of a mixed-methods approach and the presentation of a localized structural model for Yazd province, as a key region in Iran's brass alloy production. The findings of this study can significantly contribute to the formulation of operational strategies for policymakers, industry managers, and export activists. Furthermore, by offering recommendations for improving export processes, this research will help enhance the competitiveness of this industry at both the national and international levels. Addressing this issue is critically important not only from an economic perspective but also for achieving sustainable development goals and fostering regional growth (Porter, 1990; UNIDO, 2023).

METHODOLOGY

The present study is applied research in terms of its objective, aimed at identifying and modeling the barriers to the export development of brass alloy products. In terms of its nature and data collection method, it is descriptive-exploratory, as it analyzes the current situation and identifies the key factors and obstacles influencing the export of these products. The research method is a mixed-methods (qualitative-quantitative) design, comprising two main phases: a qualitative phase involving semi-structured interviews with experts in the brass industry to identify and extract the most significant barriers, and a quantitative phase employing Confirmatory Factor Analysis (CFA) to test the conceptual model. In the qualitative phase, the statistical population consisted of 22 experts in the brass alloy industry, including managers, senior specialists, and university faculty members, selected through purposive sampling. The inclusion criteria for experts included at least 5 years of experience in the relevant industry, a management or senior expert position in the export unit, and at least one published article or research project in the field of exports. Data were collected via semi-structured interviews. To enhance accuracy, data triangulation techniques were employed, involving the examination of diverse sources and comparative analysis of the obtained data. Data analysis was performed using qualitative content analysis with ATLAS.ti software. The analysis process involved open, axial, and selective coding, which ultimately led to the identification and categorization of the primary export barriers. For the quantitative phase, the statistical population comprised managers and experts active in the brass industries of Yazd province. The sample size was determined to be 384 individuals based on Cochran's formula, and stratified random sampling was employed. The primary instrument in this phase was a researcher-made questionnaire, developed based on the findings of the qualitative phase and distributed among the statistical population. Specifically, the questionnaire items were formulated based on 7 main categories and 35 sub-categories derived from the interviews, with each item measured on a five-point Likert scale.

To ensure validity, the questionnaire was reviewed by several experts in the field for content validation, and the Content Validity Ratio (CVR) was calculated for confirmation. For confirmatory factor analysis, LISREL and SPSS software were utilized to examine the relationships between the variables and export development barriers. Model fit indices such as RMSEA, CFI, and TLI were used to evaluate the quality of the extracted model.

RESULTS

In the open coding process, 177 codes were extracted from 22 interviews. After removing duplicate and similar codes, the data were categorized into common themes. Ultimately, 7 main categories were identified as the primary barriers to the development of brass product exports: "Trade Relations," "Pricing," "Market Access," "Regulatory Frameworks," "Market Competitiveness," "Limitations in Banking Services," and "Human Resources." Additionally, 35 sub-categories were extracted (see Table 2 in the main text). The conceptual model of the research was then depicted based on these findings. To assess the reliability of the measurement instruments, Cronbach's alpha coefficients were calculated for each variable, with values ranging from 0.71 to 0.78, indicating acceptable internal consistency. The Content Validity Ratio (CVR) and Content Validity Index (CVI) were also computed based on the evaluations of 22 experts. All items had CVR values above the critical value of 0.42, confirming their content validity (see Tables 3 and 4 in the main text). Confirmatory factor analysis was employed to test the measurement model. The factor loadings for most items were above 0.4, with a few exceptions (e.g., items HU1, HU2, HU3, and BA6) which were retained due to their theoretical and content importance as emphasized by experts during the qualitative interviews. The model fit indices (NFI = 0.92, NNFI = 0.94, CFI = 0.95, IFI = 0.95, RMR = 0.0096, GFI = 0.88, AGFI = 0.84) indicated an acceptable fit with the empirical data. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.881, and Bartlett's test of sphericity was significant (χ^2 = 5.962, df = 465, Sig. = 0.000), confirming the suitability of the data for factor analysis. The path analysis results, using LISREL, tested the seven hypotheses. The t-statistics for all hypotheses were greater than 1.96, confirming their significance at the 95% confidence level. The hypotheses and their corresponding t-values are summarized in Table 9 of the main text.

CONCLUSION

Through a comprehensive analysis of expert interviews, the study successfully identified and categorized the critical barriers to the export development of brass products. The seven main dimensions—Trade Relations, Pricing, Market Access, Regulatory Frameworks, Market Competitiveness, Limitations in Banking Services, and Human Resources—along with their 35 sub-components, were confirmed and validated through rigorous quantitative analysis. The findings reveal that among these, Human Resources (t=47.76), Limitations in Banking Services (t=45.88), and Market Competitiveness (t=43.42) exert the most significant impact on the export development of brass alloy products. These results are partially consistent with previous studies, such as Heidari et al. (2021) in the petrochemical industry, particularly regarding the role of regulations. However, the present research highlights a more pronounced effect of banking service limitations within the brass alloy sector, aligning with findings from Pourheidari et al. (2022) in the medical equipment industry and Rahimzadeh et al. (2023) in knowledge-based firms regarding the critical role of human resources. The study's practical implications are manifold. Policymakers and industry stakeholders should prioritize developing a skilled workforce by providing specialized training in international business, export management, and foreign languages to enhance human capital. To alleviate banking constraints, efforts should be directed toward simplifying international financial transactions, reducing related fees, and establishing more efficient mechanisms for currency exchange and letter of credit issuance. Enhancing market competitiveness requires investment in modernizing production equipment, improving product quality to meet international standards, and developing efficient logistics and supply chains. Given the study's geographical focus on Yazd province, future research should validate the findings at a national level.

Further studies could also explore individual characteristics of exporters or employ alternative qualitative methods, such as thematic analysis, to deepen the understanding of these dynamics. Ultimately, this research provides a robust conceptual framework and evidence-based insights that can guide strategic decision-making to overcome barriers and foster a more conducive environment for the export development of Iran's brass products.

Contribution of Authors

All authors have contributed equally to all stages of this research, including the conception and design of the study, data collection, analysis and interpretation of results, and the drafting and revision of the manuscript. All authors have read and approved the final version of the manuscript.

Ethical Approval

This research was conducted in compliance with the ethical principles of research and with the informed consent of all respondents. Participants were assured of the confidentiality of their responses and their right to withdraw from the study at any time without any consequences.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

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