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The Effect of The Degree of Neighborhood of Iran's Trade Partners on The Volume of Iran's Trade: a Spatial Panel Econometric Method

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EXTENDED ABSTRACT

INTRODUCTION

In today's world, international trade serves as one of the primary engines of economic growth for nations. For Iran's economy, particularly given its specific economic and political circumstances, analyzing the patterns and determinants of trade volume is of paramount importance. Traditional studies in this field have predominantly focused on bilateral relationships (e.g., between Iran and China) and macroeconomic variables.

This paper advances beyond traditional approaches by addressing a critical research gap: examining the indirect effects arising from the mutual relationships among Iran's trading partners themselves. In other words, this research does not merely analyze Iran's relationship with Country A or Country B; rather, it investigates how the relationship *between* Country A and Country B influences Iran's total trade volume. This concept is termed "neighborhood" or "closeness," which is defined not necessarily by geography, but by political, economic, or cultural proximity.

The primary research questions are:

1. Does closeness and the strengthening of relationships among Iran's trading partners affect Iran's trade volume?
2. What is the nature (positive or negative) and magnitude of this effect?

By employing spatial econometric models capable of measuring such Spillover Effects, this study seeks to provide a precise, evidence-based answer to these questions.

METHODOLOGY

The research methodology is quantitative, based on panel data analysis with a spatial econometric approach.

- Data Type: Annual Panel Data.
- Spatial Scope: 19 selected countries representing Iran's main trading partners (including China, Turkey, UAE, Germany, India, Russia, Brazil, Italy, etc.).
- Temporal Scope: 2016 to 2020.
- Software: Analysis was conducted using MATLAB and the toolbox developed by Álvarez et al. (2017).

The baseline model is a generalized gravity model expanded spatially. Following testing procedures, the General Nesting Spatial Model (GNSM) was selected as the final model, which is considered the most comprehensive specification.

- Model Components:
- y: Dependent variable (Logarithm of Iran's trade volume).
- x: Matrix of independent variables.
- w: Spatial weight matrix defining "neighborhood." In this study, WWW is constructed based on the intensity of bilateral trade between any two partners of Iran.
- ρ\rhoρ (Rho): Spatial lag coefficient of the dependent variable (neighboring spillover effects on Iran's trade).
- θ\thetaθ (Theta): Spatial lag coefficient of independent variables (exogenous spillovers).
- λ\lambdaλ (Lambda): Spatial autocorrelation coefficient of error terms.
- Research Variables:
- *Dependent Variable:* LTR (Logarithm of Total Trade Value - exports + imports - of Iran with each partner).
- *Independent Variables:* LGDP (Log GDP of the partner, indicating market size), LRER (Log Real Exchange Rate), LFDI (Log Inward Foreign Direct Investment to the partner), LTA (Log Average Tariff Rate), LTO (Log Trade Openness Index).
- Estimation Steps:

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1. Cross-Sectional Dependence Test: Confirmed using Pesaran (CD) and Breusch-Pagan (LM) tests.
2. Spatial Effects Test: Lagrange Multiplier (LM) tests confirmed significant spatial effects in the dependent variable, independent variables, and error terms.
3. Fixed vs. Random Effects: The Hausman test indicated a preference for the Fixed Effects model.
4. Final Spatial Model Selection: By comparing various models (SAR, SDM, GNSM, etc.), the GNSM was selected as the best model to describe the data.

FINDINGS

Econometric analysis of the data, following multiple diagnostic tests, led to the selection of the General Nesting Spatial Model (GNSM) with Fixed Effects as the Optimal Specification. This selection indicates that Iran's trade dynamics are simultaneously influenced by three types of spatial effects: spatial lag in the dependent variable (endogenous spillovers), spatial lag in independent variables (exogenous spillovers), and spatial autocorrelation in error terms (spillovers from omitted variables).

The most pivotal finding of this research is the positive and highly significant coefficient (+0.57) for the spatial lag of the dependent variable (ρ\rhoρ). This result provides strong statistical evidence supporting the main hypothesis, demonstrating that Iran's trade volume is positively influenced by spatial spillover effects resulting from the neighborhood of its trading partners. Specifically, this coefficient implies that a 1% increase in the neighborhood degree (political-economic closeness) among Iran's trading partners leads, through a synergy effect, to a 0.57% increase in Iran's total trade volume with this group of countries. This signifies the existence of positive network feedbacks; meaning that stability and convergence in the peripheral environment of Iran's partners create a Positive Externality for Iran's foreign trade.

Conversely, the spatial autocorrelation coefficient in the error terms (λ\lambdaλ) is estimated to be negative and significant (-0.73). This result reveals the complexity of spatial relationships, suggesting that unobserved shocks or omitted variables (such as regional political crises or shared financial fluctuations) that simultaneously affect neighboring partners have a negative, dampening effect on Iran's trade volume. Together, these

two coefficients indicate that while structural and observable convergence among partners is beneficial for Iran, the Iranian economy is simultaneously vulnerable to shared negative shocks within this network. The analysis of decomposed effects (Direct, Indirect, and Total) offers a deeper understanding of the mechanisms. For instance, the Trade Openness variable (LTO) has a large positive direct effect (+2.7) but a negative indirect (spillover) effect (-2.5). This nuanced finding suggests that increasing the openness of a single partner strongly boosts bilateral trade with Iran (direct effect), but when *all* neighboring partners simultaneously become more open, competition among them to attract trade increases, neutralizing part of this advantage through negative spillover effects (indirect effect). However, the total effect remains positive (+0.25).

Similarly, the economic growth of partners (LGDPP) has significant positive spillover effects (+0.78) on Iran's trade, indicating that economic prosperity in neighboring countries benefits Iran by increasing total regional demand. Finally, Tariff (LTA) and Real Exchange Rate (LTRW) variables showed significant negative effects on trade volume consistent with theoretical foundations, while FDI (LFDI) proved its complementary role in facilitating trade by generating positive direct and spillover effects.

CONCLUSION

By employing a spatial econometric framework, this study fills a key gap in Iran's trade literature, moving from purely bilateral analyses toward a network analysis of the country's foreign trade. The primary and undeniable conclusion is that Iran's commercial fate is significantly intertwined with the dynamics governing the relationships *among* its trading partners. The central finding of positive and substantial spatial spillover effects confirms the strategic hypothesis that convergence and stability in the environment surrounding Iran's trading partners act as a powerful driver for the country's trade growth, and the policy based on "benefiting from tension among rivals" lacks empirical basis.

This study suggests that Iran's economic diplomacy must transcend a linear, bilateral approach and envision a network-centric diplomacy architecture. Iran's economic interests lie not only in deepening ties with individual partners but also in playing an active role in encouraging and facilitating regional and international convergences that include Iran's main partners. However, the presence of negative effects stemming from spatial error

contains a significant policy warning: dependence on a trade network exposes Iran to systemic risks and shared regional shocks. Therefore, trade strategy must simultaneously include mechanisms for risk management and increasing resilience against shared crises among partners while exploiting convergence opportunities.

The decomposed findings regarding direct and indirect effects also highlight the necessity of adopting a two-level trade strategy: at the bilateral level, focusing on tariff reduction and increasing trade openness with a specific partner yields direct benefits; however, at the multilateral level, one must be wary of competitive effects resulting from simultaneous trade liberalization across the entire network.

As a path for future research, identifying the nature of the unobserved factors leading to negative spillovers in Iran's trade network (as indicated by the negative λ\lambdaλ coefficient) would be critical. Ultimately, this paper conveys the message to policymakers that in today's interconnected world, the perspective on foreign trade must shift paradigms from a bilateral game to strategic network management.

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