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What drives South Korea's trade volume? Gravity, migration and beyond

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Abstract

Purpose – This study aims to analyze South Korea's trade patterns to derive any meaningful policy implications.
Design/methodology/approach – Using an augmented gravity model with panel data from 186 countries over 2 decades (2000–2023), this paper applies various approaches, including pooled ordinary least squares, panel random effects, instrumental variables and so on.
Findings – This study finds that traditional variables, including gross domestic product (GDP) and distance, follow expected patterns, while migration emerges as a significant trade-promoting factor, especially among lower-income countries. Interaction terms confirm that migration and trade are more closely linked when partner countries have lower per capita incomes.
Originality/value – These findings contribute to the literature by suggesting that migration can complement Korea's trade strategy, particularly during periods of demographic decline. Additionally, while Asia-Pacific Economic Cooperation's role has strengthened, free trade agreements (FTAs) are showing a declining influence. A comparison of predicted and actual trade flows reveals under-traded partners, indicating unrealized trade potential. This study calls for better alignment between immigration and trade policy and a reassessment of Korea's FTA strategy.

Keywords Trade pattern, Gravity model, South Korea, New trade theory, Panel data
Paper type Research article

1. Introduction

South Korea is considered one of the world's most trade-dependent countries. For example, as of 2022, its trade-to-gross domestic product (GDP) ratio peaked at 96% (KOSIS, 2025c). If the global economy has low volatility, high dependence on trade would not be a significant problem. However, as protectionism and geopolitical tensions continue to constrain the global trade landscape, South Korea's heavy reliance on trade may increase its economic vulnerability. Therefore, it is essential to better understand the structural factors underlying its trade patterns.

In addition to external risks, a drastic demographic decline is also expected to severely impact the Korean economy. South Korea hit a record low total fertility rate of 0.72 in 2023, and despite a slight increase to 0.75 in 2024, it remains the lowest among Organisation for Economic Co-operation and Development (OECD) countries (KOSIS, 2025b). The persistent low birth rate can significantly affect the overall Korean economy, reducing both the labor population and the domestic market. Given these structural changes, demographic factors should also be considered when analyzing South Korea's trade patterns.

In this context, the recent public discourse has increasingly emphasized the role of immigration as a policy lever to counteract demographic decline. Media and academic

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commentaries highlight that immigration could help mitigate labor shortages, support regional economies, and sustain long-term growth in the face of rapid population aging (Kim, 2025a, b). Such debates underscore the urgency of examining how migration may influence South Korea's economic outcomes, including its trade relations.

Although this study does not directly focus on demographic change, it suggests the need to reexamine the range of variables that can affect trade. Accordingly, in addition to the traditional gravity model, this research examines the determinants of Korea's trade volume, including expanded socioeconomic factors such as migration. This paper therefore asks the following central question: To what extent do migration and other socioeconomic factors shape South Korea's trade volume, beyond the predictions of the traditional gravity model?

To address this question, the study employs an augmented gravity model using panel data from 186 countries from 2000 to 2023. Random effects estimation is adopted to allow for time-invariant variables such as distance and institutional dummies, while instrumental variable (IV) methods are further applied, following Wei (1996), to account for potential endogeneity.

The main findings show that GDP and per capita GDP are positively related to trade volume, while distance reduces trade flows in line with traditional expectations. Migration is found to promote trade, particularly with closer and lower-income countries. Additionally, the effects of Asia-Pacific Economic Cooperation (APEC) membership and free trade agreements (FTAs) vary over time, highlighting the need for a reassessment of the FTA strategy.

This study contributes to the existing literature in several ways. While previous research has examined the migration-trade nexus, few have done so in the context of South Korea with such comprehensive coverage. By using long-span panel data (2000–2023) for 186 countries and applying IV methods, this paper advances the empirical understanding of how migration and other structural factors – such as income levels and geographic distance – jointly shape trade patterns.

From a policy perspective, the findings suggest that migration policy can complement South Korea's trade strategy, particularly by strengthening economic ties with lower-income economies that present untapped trade potential. This has implications for both trade diversification and demographic challenges, as migration may partially mitigate the economic effects of Korea's declining labor force. It also sheds a light on neighboring countries, given that economic benefits from trade could be delivered (Kim, 2025a, b)

The remainder of the paper is structured as follows. Section 2 reviews the related literature. Section 3 describes the data and methodology. Section 4 presents the empirical results. Section 5 discusses the findings and policy implications. Section 6 concludes.

2. Literature review

The gravity model has long been used to estimate trade flows. Jan Tinbergen (1962) was the first to apply the gravity model to international trade in his pioneering work, *Shaping the World Economy: Suggestions for an International Economic Policy*. He argued that GDP is positively related to exports, while distance has a negative impact on exports. Linnemann (1966) expanded the model with additional variables such as population and trade policy indicators, contributing to the refinement of the gravity model.

The model became more sophisticated through Anderson's (1979) work which incorporated product differentiation and trade costs. Krugman (1980) further advanced the model by New Trade Theory, showing that increasing returns to scale and monopolistic competition may lead to trade between countries with similar economic profiles.

Bergstrand (1985) attempted to establish the theoretical basis for the gravity model, drawing on traditional trade theory and proposed a relationship between factor endowments and bilateral trade. However, there was a limitation in empirically simplifying the complex price terms. Since then, Bergstrand (1989, 1990) has tried to strengthen the microfoundations of the gravity model by introducing the Helpman–Krugman model (1987) and combining the new trade theory with the traditional theory. Later, Krugman (1991) extended the logic and

gave an insight that complements the gravity model's emphasis on trade and trade costs. Evenett and Keller (1998) examined both the Heckscher–Ohlin model and the increasing returns trade theory to see whether the models explain the performance of the gravity model well. They found that while the strict Heckscher–Ohlin model loses its power in explaining the performance of the gravity model, as production is unlikely to be perfectly specialized, when production is perfectly specialized, both theories become relevant. As a further development, Chaney (2008) provides a micro-level explanation for the empirical success of the gravity model.

A major breakthrough came with Anderson and Van Wincoop (2003), who introduced the concept of *multilateral resistance*. Their model demonstrated that showing the bilateral trade flows not only depend on bilateral trade costs but also on relative trade barriers with all other partners.

Meanwhile, the studies began to focus on policy-related variables in the model. For example, Baier and Bergstrand (2007) showed that FTAs significantly increase bilateral trade flows, while Egger (2008) highlighted the role of institutional variables. However, there were also some studies that have questioned the effects of institutional participation. Rose (2004), for instance, finds no systematic evidence that World Trade Organization membership increases trade among its members.

In the case of South Korea, Sohn (2005) applied the gravity model to examine the country's trade pattern, confirming that the gravity model fitted Korea's bilateral trade flows and that the results aligned with the Heckscher–Ohlin pattern. Additionally, the study offered policy suggestions by comparing the actual trade flows with those predicted by the model and found considerable gaps between the two, which he interpreted as "unexhausted trade potential," particularly for countries without FTAs with South Korea (Sohn, 2005). Since then, several studies have applied the gravity model, using various factors to examine South Korea's trade pattern.

In parallel, migration has also been widely studied in relation to trade. Mundell (1957) argued that factor movement could replace commodity trade within the framework of the Heckscher–Ohlin–Samuelson (HOS) model. As a result, the need for commodity trade may disappear because the free movement of labor equalizes factor prices. However, subsequent studies including Markusen (1983) have shown that trade and migration can be complementary to each other rather than substitutes if the constrained assumptions of the HOS model, such as perfect competition, the same level of technology and homogeneous preference, are relaxed.

Since then, the focus of studies has shifted to transaction-cost and network-based explanations. These studies argue that migration promotes trade by reducing information asymmetries and search costs (Rauch, 1999). In particular, in the case of differentiated goods, arm's-length markets where transactions are not standardized are less developed, and migrant networks facilitate trade by acting as informational bridges between the home and host countries.

Gould's (1994) pioneering work was one of the first to empirically integrate migration into a gravity framework using US *data* from 1970 to 1986. He found that immigration significantly increased both imports and exports, especially in the consumer goods sector. Gould interpreted these results as evidence of network effects and preference effects. Specifically, immigrants viewed trust-based business networks as reducing transaction costs while generating demand for home-country products ("nostalgia goods") to promote trade. More recent studies by Genç (2014) and Mashayekhi *et al.* (2017) confirmed that migration strengthens bilateral economic linkages. Recent studies also adopt a network-based approach to the trade–migration nexus, showing that countries with greater migration network centrality tend to trade more, thereby reinforcing the view that migrant corridors facilitate bilateral exchange beyond traditional gravity variables (Fagiolo and Mastrorillo, 2014).

Like this, the migration has increasingly recognized as a factor that interacts with traditional trade determinants. However, research focusing on South Korea remains limited.

Not only has the East Asian trade-migration nexus been less explored, but studies specifically addressing the South Korean case are even fewer, despite the country's high trade dependence and demographic challenges. This study thus contributes to the literature by introducing migration as an explanatory variable into the gravity model of Korea's bilateral trade flows.

3. Data and methodology

This study utilizes panel data from 186 countries spanning the period from 2000 to 2023. The 186 countries included in this study are those, excluding the one classified as "unknown," whose trade volume with South Korea exceeded 10 million USD as of 2023. The threshold of 10 million USD was set because countries with trade volumes below this level are generally very small or irregular partners. Therefore, by setting this lower bound, the study focuses on South Korea's major and consistent trading partners. Table A1 [1] offers the summary statistics of the variables used in the analysis.

The dataset covers 186 partner countries observed annually from 2000 to 2023, resulting in 4,464 potential observations. Although the panel is structurally balanced, some missing values lead to minor variations in the number of observations across models.

In addition to the summary statistics, Table A2 [1] presents the correlation matrix of the key variables. From the results, trade volume is highly related to the lagged GDP (0.82) and the size of migration (0.65). On the other hand, distance and being landlocked move inversely to trade, which aligns well with existing theory. APEC membership and participation in the FTA also have a positive relationship with trade. Overall, while most correlations remain within a moderate range, the relatively high correlation (0.82) between lagged GDP and trade volume suggests that potential multicollinearity should be interpreted with caution.

The variables in this study were selected based on the augmented gravity framework. The dependent variable is $trade_{ijt}$, which is the total trade volume between South Korea and its trading partner country, measured by the sum of import and export volumes. Based on the gravity model, the study includes core independent variables such as gdp_{jt-1}, $pgdp_{jt-1}$ and $distance_{ij}$; gdp_{jt-1} is the one-year lagged GDP of the trading partner country; $pgdp_{jt-1}$ denotes one-year lagged per capita GDP of the trading partner country; $distance_{ij}$ refers to the great-circle distance between Korea and its partner country. Additionally, the study includes $migration_{ijt-1}$, the one-year lagged number of migration, as the key variable of interest, while controlling for other dummy variables such as $landlocked_j$, $apec_j$ and fta_{ij}. These dummy variables are defined as follows: $landlocked_j$ equals 1 when the country is landlocked; $apec_j$ equals 1 when the country is a member of APEC and fta_{ijt} equals 1 when the partner country signed an FTA with Korea in year t. With these variables, this study suggests the following augmented gravity model:

$$\begin{aligned} lntrade_{ijt} = {} & \beta_0 + \beta_1 lngdp_{jt-1} + \beta_2 lnpgdp_{jt-1} + \beta_3 lndistance_{ij} \\ & + \beta_4 \left(lnpgdp_{jt-1}\right) * \left(lndistance_{ij}\right) + \beta_5 lnmigration_{ijt-1} \\ & + \beta_6 \left(lnpgdp_{jt-1}\right) * \left(lnmigration_{jt-1}\right) + \beta_7 landlocked_j + \beta_8 apec_j + \beta_9 fta_{ijt} + \epsilon_{ijt} \end{aligned} \tag{1}$$

Besides the dummy variables, all variables are log-transformed due to unit differences in each variable, and one-year lags are applied to address potential endogeneity issues.

Korea's trade volume data were obtained from the South Korea Customs Service and measured in thousands of USD at current prices. While it is generally preferable to use constant prices to account for inflation, the available trade data are measured in current prices (Oh and Prasai, 2012).

The GDP data (constant 2015, USD) are from World Development Indicators. In the gravity model, national GDPs are used as proxies for economic size, under the assumption that larger economies trade more because of their greater production and consumption capacities. Therefore, the coefficient of GDP is expected to be positive. Meanwhile, per capita GDP was calculated by dividing the GDP of each country by its population, with population data also obtained from World Development Indicators. As per capita GDP captures a country's income level, it is likely to be positively associated with trade volume. The distance variable in the model denotes the air distance between capital cities, which was obtained from the website www.distancefromto.net. As distance acts as a trade barrier, the estimated sign of distance is negative.

Migrant data were obtained from the KOrean Statistical Information Service (KOSIS). According to this source, international migrants are defined as "residents or persons who have resided continuously in the country for more than 90 days" (KOSIS, 2025a). Accordingly, this study utilizes this definition in its analysis. Numerous prior studies have also suggested a close relationship between migration and trade. For example, Jang *et al*. (2025) analyzed how trade affects migration by treating migration as a dependent variable. However, the reverse relationship is also theoretically and empirically plausible as migrant networks are known to reduce transaction costs, transmit market information and build trust between countries, which can ultimately facilitate bilateral trade (Genç, 2014; Mashayekhi *et al*., 2017). Therefore, this study investigates how migration affects trade by using it as a key independent variable in an augmented gravity model. It assumes that migrant numbers are positively associated with trade volume. Additionally, to address potential reverse causality, all variables are expressed in log-transformed forms.

Landlocked status is also considered an important control variable in the augmented gravity model. Landlocked countries often face limited access to logistic infrastructure, leading to higher trade costs. Therefore, it is expected to have a negative sign. Lastly, the FTA is managed by the Ministry of Trade, Industry and Energy, and the APEC member country list was retrieved from the official APEC website. As countries with FTAs with South Korea or APEC membership are likely to engage in greater trade, the coefficients for these variables are expected to be positive.

This study uses the random-effects model to analyze the panel data. While the fixed-effects model is known for producing reliable estimates by controlling for unobserved, time-invariant differences across countries and focusing on variables that change over time, it has one major drawback: it cannot include time-invariant variables, such as distance, landlocked status and APEC membership. Unlike the fixed effects model, the random effects approach assumes that there is no correlation between unobserved individual-specific effects and explanatory variables. This allows time-invariant variables to be included in the regression, which is particularly important in gravity model analysis. To address potential heteroskedasticity, this study used White's robust standard errors.

For robustness, the analysis is also conducted separately for 2 decades, 2000–2009 and 2010–2019. These periods are chosen to reflect the pre- and post-global financial crisis environments. The 2020s were excluded as COVID-19 may have affected trade.

Additionally, to address potential endogeneity, this study conducts an IV regression. Specifically, following McCallum (1995) and Wei (1996), the natural logarithm of population is employed as an instrument for GDP to account for possible reverse causality between GDP and trade. The rationale behind this is that population sizes tend to be closely linked with GDP, while they are unlikely to be directly associated with the error term in the regression model.

4. Empirical results

4.1 Overall regression results

The empirical results are shown in Table 1. The first column of pooled ordinary least squares (OLS) methods and random effect methods confirms that the model follows the basic pattern

Table 1. Regression results of the gravity equation

Variables	1. Pooled OLS models			2. Random effect models		3. Sub-groups		4. Interaction terms	
	Basic	β-coefficient	Augmented	Basic	Augmented	2000–2009	2010–2019	Distance	Migration
lngdp	0.894***	0.735***	0.760***	1.105***	0.926***	0.986***	0.747***	0.923***	0.938***
	(0.015)	(0.012)	(0.026)	(0.081)	(0.091)	(0.096)	(0.081)	(0.091)	(0.092)
lnpgdp	0.250***	0.136***	0.203***	0.495***	0.546***	0.532***	0.203**	−2.214**	0.744***
	(0.02)	(0.017)	(0.021)	(0.089)	(0.101)	(0.109)	(0.092)	(1.054)	(0.118)
lndistance	−0.833***	−0.160***	−0.493***	−0.704***	−0.543**	−0.689***	−0.712***	−3.346***	−0.487**
	(0.043)	(0.045)	(0.053)	(0.225)	(0.25)	(0.248)	(0.223)	(1.035)	(0.242)
lnmigration			0.078***		0.080**	0.054 (0.046)	−0.053	0.079**	0.615***
			(0.018)		(0.033)		(0.038)	(0.032)	(0.164)
landlocked			−0.916***		−0.654***	−0.553**	−1.023***	−0.662***	−0.649***
			(0.055)		(0.24)	(0.265)	(0.245)	(0.248)	(0.247)
apec			0.830***		0.11 (0.334)	0.103 (0.317)	1.260***	0.15 (0.339)	0.356 (0.279)
			(0.049)				(0.241)		
fta			0.338***		0.309***	0.433***	0.067 (0.056)	0.324***	0.371***
			(0.046)		(0.069)	(0.134)		(0.068)	(0.066)
lnpgdp # lndistance								0.327***	
								(0.125)	
lnpgdp # lnmigration									−0.065***
									(0.018)
Constant	−4.280***	−4.280***	−3.744***	−12.620***	−10.255***	−10.459***	−0.76	13.454	−12.636***
	(0.545)	(0.487)	(0.585)	(2.824)	(2.98)	(2.998)	(2.831)	(8.737)	(3.196)
Observations	4,152	4,152	3,745	3,990	3,589	1,346	1,601	3,589	3,589
R-squared	0.694	0.694	0.750	0.686	0.726	0.746	0.738	0.724	0.737

Note(s): Numbers in parentheses are standard deviations. ***, ** and * indicate significant at 1%, 5% and 10% levels, respectively. White-corrected standard errors were calculated to minimize heteroskedasticity issues. In random effect analyses, lngdp, lnpgdp and lnmigration are one-year lagged to tackle endogeneity issues

of the gravity model. The results reveal that the coefficients for GDP and per capita GDP are positive, while the coefficient for distance is negative, as expected in the previous section. Specifically, a 10% increase in a trading partner's GDP is associated with an 8.9–11% increase in trade volume. Additionally, a 10% increase in a trading partner's per capita GDP is related to an estimated 2.5–4.9% rise in trade volume. South Korea's relatively higher income status, which actively trades with high-income countries, implies that its trade pattern is based on Krugman's (1991) new trade theory, which incorporates increasing returns to scale and monopolistic competition, rather than the more traditional Heckscher–Ohlin model of inter-industry trade. However, as shown in the analysis using interaction terms (discussed in the next section), this result is dependent on geographic distance.

Regarding distance, a 10% increase in geographic distance between Korea and its trading partners is associated with an approximately 7.0–8.3% decrease in bilateral trade volume, which is consistent with the predictions of the gravity model. Additionally, to identify which of the core variables has the strongest effect on trade, standardized beta coefficients were examined. The results reveal that GDP has the greatest effect among them, with a coefficient of 0.735, approximately five times greater than that of per capita GDP and distance.

In the augmented model, which adds migration, landlocked status, APEC membership and FTA variables, migration is found to be positively and significantly associated with trade volume in both OLS and random effects methods. A 10% increase in migration is associated with approximately a 0.8% increase in trade. While it seems modest compared to other traditional factors, it still remains statistically robust and policy relevant. Meanwhile, this result is consistent with previous findings that migration can help strengthen economic linkages. Jang *et al*. (2025) mention that closer ties formed through migration may create additional channels for trade and investment between Korea and its partner countries. Many other studies have also discussed the channels through which immigration affects trade. One important channel is the promotion of exports through information and network effects. Rauch and Trindade (2002) showed that Chinese immigrant networks supported trust and contract enforcement between firms in the host country and those in the country of origin, which finally resulted in an increase in the host country's exports to China. In addition, immigration can contribute directly to production and firm activities when immigrants are employed within the firm (Hiller, 2013), and organized migrant networks may also lead to expansions in exports and investment (Baghdadi and Cheptea, 2010). From a policy perspective, more migrants contribute to the development of local economies, especially in less populated areas where trade activities are often limited. These findings suggest that accepting more migration can also benefit trade. Overall, the results suggest that migration does not replace traditional economic drivers but complements them by fostering networks and facilitating exchange.

In contrast, being landlocked has a strong negative relationship with trade. The estimated coefficients for the landlocked dummy variable imply that landlocked countries trade approximately 60% or 47% less than coastal countries, as calculated from $1-e^{-0.916}\approx 0.60$ and $1-e^{-0.654}\approx 0.47$, respectively.

Regarding APEC membership and FTAs, the results indicate that both variables are positively related to trade volumes; however, only the FTA is statistically significant. In Table 1, the results are broken down into two periods: sub-group models 2000 and 2010s. This division captures structural differences in global trade environments, with the 2000–2009 period reflecting the pre-global financial crisis era of active FTA expansion and globalization, while the 2010–2019 period corresponds to the post-crisis environment of slower trade growth, rising protectionism and greater geopolitical tensions. When the results from the 2 decades are compared, unexpected results are found. According to these results, APEC membership was negligible in the earlier years, but it became more effective and significant in the 2010s. In contrast, FTAs had a significant positive relationship with trade in the 2000s, but this effect diminished and became statistically insignificant in the 2010s. This implies that regional economic integration has gained growing relevance under APEC in recent decades.

In contrast, regarding FTAs, it is time to re-examine their effectiveness as their effects on South Korea's trade flows decrease over time.

A major caveat of splitting the sample is the reduction of statistical significance, which depends highly on the number of observations. The reduced sample increases the standard error for each sub-group, which leads to a smaller t-statistics, including for variables such as migration.

4.2 Interaction terms: conditional effects of distance and migration

The model includes two interaction terms to examine how the effects of distance and migration vary with the income levels of trading partner countries. The interaction between per capita GDP and distance ($lnpgdp_{jt-1}$* $lndistance_{ij}$) is positively and significantly associated with trade volume, suggesting that the negative effect of distance weakens as income increases. In particular, Figure A1(a) [1] indicates that the estimated threshold is $29,732 (corresponding to lnpgdp ≈ 10.2), above which the trade-reducing effect of distance decreases (see *Note* below Figure A1 for details). Thus, the gravity model is more salient for lower-income countries. South Korea trades with lower-income countries, particularly in nearby Asia. The results show that the Heckscher–Ohlin model with *inter*-industry trade is dominant in this area, while the new trade theory with *intra*-industry trade is dominant in countries that are further apart geographically.

In contrast, the association between per capita GDP and migration ($lnpgdp_{jt-1}$ * $lnmigration_{ijt-1}$) is negative, despite both variables showing positive individual associations with trade. The positive association between migration and trade particularly matters in lower-income countries. According to Figure A1(b) [1], the estimated threshold is $13,360, which corresponds to lnpgdp ≈ 9.5. This result suggests that the effect of migration on trade strengthens when a partner country's per capita income is below this level. For the relatively lower-income countries, migration does matter in determining trade volume. This implies that South Korea should design relevant policies to attract more migration to strengthen its commercial ties with certain developing countries.

In fact, Korea has implemented the Employment Permit System since 2004 to resolve the manpower shortage and expand human exchanges with Asian countries (NABO, 2023). Since its first implementation in 2004, the government has continuously expanded the system by increasing the number of industries available for employment and the number of sending countries. In addition, the Korean Government has steadily promoted a specialized foreign manpower policy, and recently, it has been improving the stay and employment system centered on skilled and professional manpower (E−7, D-10, etc.).

The results of this study are partly consistent with these institutional changes. In other words, the fact that the expansion of migration was statistically associated with the increase in trade suggests the possibility that the foreign workforce policy will have a positive effect on strengthening economic links between countries beyond simply securing a workforce. This can be interpreted as evidence that migration-related policies such as the employment permit system can contribute not only to the stability of the labor market but also to the expansion of trade networks and the revitalization of the local economy in the long run.

4.3 Robustness check with an instrumental variable

As a robustness check, Table A3 [1] provides regression results where population is used as an IV for GDP. Table A4 [1] reports the IV diagnostic statistics. The results reject under-identification and indicate that the instrument is sufficiently strong. Similar to Table 1, Table A3 [1] confirms the consistency with the gravity model, which shows positive coefficients for GDP and negative ones for distance. The coefficients for migration and other dummy variables (landlocked, APEC and FTA) also align with theoretical expectations, all of which confirm the robustness of the results.

4.4 Comparison of predicted and actual trade flows

Based on the gravity model estimation, this study examines Korea's trade relationships by comparing actual trade volumes with model-predicted trade values. According to Sohn (2005), the gravity model can be used to estimate a country's long-term trade potential. When actual trade falls below predicted levels, the gap may indicate the existence of unseen trade barriers, such as tariffs, non-tariff measures or regulatory restrictions. Since such barriers are difficult to measure, they are excluded from the model, and the resulting difference is interpreted as "unexhausted trade potential." To quantify this difference, the ratio of actual to predicted trade is used as an indicator of trade integration and under-trading (Sohn, 2005; Oh and Prasai, 2012).

Table A5 [1] indicates the countries whose trade ratios are less than 1. These values were calculated based on the results from the second column of the random effects regression model shown in Table A5 [1]. Countries in the table are considered to be trading less than what the model predicted, signaling that there might be potential trade barriers between Korea and those countries.

The analysis identifies several such cases. Latin American countries, including Argentina and Uruguay, along with several African countries, such as Uganda and Somalia, continue to exhibit lower-than-expected trade levels. Georgia, Armenia and Azerbaijan also fall into this group. These countries were emphasized under Korea's New Southern Policy during President Moon's term, but their trade volumes remain below the predicted levels. This suggests that diplomatic focus has not led to stronger trade performance. However, the incoming Lee administration, which took office on June 4, 2025, expressed its intention to revive and expand this policy framework. Thus, it remains to be seen whether these ties will yield greater economic returns in the near future.

Simultaneously, countries like Japan and Russia, despite being major trading partners, do not have bilateral FTAs with Korea and show trade ratios consistently below 1. These findings position them as promising candidates for future FTA negotiations.

Even among countries that have signed FTAs with Korea, some countries, including China, Canada, Australia and the United States, also show lower-than-expected trade performance, potentially due to ongoing political and trade tensions. These gaps, particularly those between Korea and the United States, could widen due to recent tariff policies under the Trump administration.

Also noteworthy is that many European Union (EU) countries, such as Latvia, Finland, Italy, Lithuania, Germany, Belgium, Austria, Romania, the Netherlands, Bulgaria, Greece and Poland, exhibit lower-than-expected trade performance. Although South Korea has signed an FTA with the EU as a bloc rather than with individual countries, the effects of the agreement are not evenly distributed. Even under a unified FTA framework, the actual trade increase with each member state does not equally occur among the EU member states. Thus, in some countries, the expected trade-enhancing effect of the FTA remains unrealized.

5. Policy directions based on under-trade analysis

For the past 2 decades, Korea has focused on expanding its FTA network. However, the results show that simply increasing the number of agreements no longer guarantees better trade performance. Thus, it might be time for Korea to shift from an extensive strategy towards a more intensive, performance-oriented approach. To do so, Korea's trade strategy should focus more on enhancing how useable and efficient the current agreements are in practice. Such an approach would help reduce the gap between Korea's trade potential and the actual trade performance observed in this analysis.

For instance, in the case of major trading partners that have already signed FTAs with Korea, such as China, the United States and the EU, Korea should consider upgrading the agreements to reflect new areas of trade. It might include digital services, green technologies

and resilient supply chains. These would help Korea in building a more effective trade network.

Separately, South Korea also needs to revise its trade strategy with countries that are not FTA partners but still record low levels of trade. African countries, for example, remain under-trading partners. This is largely due to weak logistical connectivity and the absence of formal trade agreements. UNCTAD (2023) also points out that many of these African countries face ongoing logistical barriers. In order to solve these problems, Korea can promote development support and capacity-building programs together with a cooperation system for specific industrial sectors. By doing so, Korea will be able to lay the groundwork for future trade expansion.

In the case of Latin America, Korea's trade strategy should prioritize existing cooperation channels, expanding investment and increasing the share of intermediate-good exports (Hong, 2025). Export diversification can be a way of reducing uncertainty in the trade environment. From a long-term perspective, as Hong (2025) notes, Korea should prepare for potential economic integration between the United States and Central America under the *Americas Act*, as it can reshape regional supply chains and open new opportunities for Korean firms.

Similarly, efforts are also needed to improve trade volume with countries under the New Southern Policy. In other words, there should be a strategy that can cover diplomatic exchange and trade promotion measures. These could include simplified customs procedures, improved transport infrastructure, and institutional support. Through these efforts, it can be expected that political cooperation will bring tangible economic outcomes.

6. Conclusion

This paper examined South Korea's trade pattern using the augmented gravity model, covering traditional and additional variables, including economic size, distance, migration, landlocked status, APEC membership and FTAs. The empirical results demonstrate that South Korea's trade pattern is fundamentally consistent with the gravity model. These findings indicate that GDP has the strongest effect on trade, followed by per capita GDP and distance. Regarding distance, the interaction term suggests that the trade-reducing effect is more prominent among lower-income countries.

Meanwhile, APEC membership and FTAs are positively related to trade volume, whereas landlocked status is significantly negatively associated with trade. Lastly, migration is found to be particularly effective in promoting trade with lower-income countries.

Given South Korea's low fertility rate-related demographic decline, expanding immigration policies is becoming inevitable. This study's findings indicate that migration promotes trade, particularly with low-income countries, suggesting that inviting more people from these countries not only contributes to population growth but also serves as a channel through which economic ties can be strengthened. Therefore, immigration policy should be strategically aligned with trade policy, particularly by encouraging migration from developing economies with high trade potential.

However, despite signing FTAs with Korea, some countries still exhibit lower-than-expected trade levels. This may be related to trade barriers, including political or non-tariff barriers, which are absent in the model. Since South Korea's two largest trading partners, China and the United States, are included in this group, Korea should consider how to improve trade environments and relations beyond formal agreements. Furthermore, for countries without FTAs whose trade volumes are also below predicted levels, Korea should consider signing FTAs with them.

Although this study tries to adopt several technical tools, further sub-group analyses, depending on the partner countries – developed vs. developing, or region-specific group – were not employed. All of these will be reserved for further study.

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Note

1. Please see Figure A1 and Tables A1 to A5 on the Online Appendix.

Supplementary material

The supplementary material for this article can be found online.

References

Anderson, J. (1979), "A theoretical foundation for the gravity equation", *American Economic Review*, Vol. 69 No. 1, pp. 106-116, available at: https://www.jstor.org/stable/1802501

Anderson, J.E. and Van Wincoop, E. (2003), "Gravity with gravitas: a solution to the border puzzle", *American Economic Review*, Vol. 93 No. 1, pp. 170-192, doi: 10.1257/000282803321455214.

Baghdadi, L. and Cheptea, A. (2010), "Migrant associations, trade and FDI", *Annals of Economics and Statistics*, Vols 97/98, pp. 71-101, doi: 10.2307/41219110.

Baier, S.L. and Bergstrand, J.H. (2007), "Do free trade agreements actually increase members' international trade?", *Journal of International Economics*, Vol. 71 No. 1, pp. 72-95, doi: 10.1016/j.jinteco.2006.02.005.

Bergstrand, J. (1985), "The gravity equation in international trade: some microeconomic foundations and empirical evidence", *The Review of Economics and Statistics*, Vol. 67 No. 3, pp. 474-481, doi: 10.2307/1925976.

Bergstrand, J. (1989), "The generalized gravity equation, monopolistic competition, and the factor-proportions theory in international trade", *The Review of Economics and Statistics*, Vol. 71 No. 1, pp. 143-153, doi: 10.2307/1928061.

Bergstrand, J.H. (1990), "The Heckscher–Ohlin–Samuelson model, the Linder hypothesis and the determinants of bilateral intra-industry trade", *The Economic Journal*, Vol. 100 No. 403, pp. 1216-1229, doi: 10.2307/2233969.

Chaney, T. (2008), "Distorted gravity: the intensive and extensive margins of international trade", *American Economic Review*, Vol. 98 No. 4, pp. 1707-1721, doi: 10.1257/aer.98.4.1707.

Egger, P. (2008), "On the role of distance for bilateral trade", *The World Economy*, Vol. 31 No. 5, pp. 653-662, doi: 10.1111/j.1467-9701.2008.01098.x.

Evenett, S. and Keller, W. (1998), "On theories explaining the success of the gravity equation", doi: 10.3386/w6529.

Fagiolo, G. and Mastrorillo, M. (2014), "Does human migration affect international trade? A complex-network perspective", *PLOS One*, Vol. 9 No. 5, e97331, doi: 10.1371/journal.pone.0097331.

Genç, M. (2014), *The Impact of Migration on Trade*, IZA World of Labor, doi: 10.15185/izawol.82.

Gould, D.M. (1994), "Immigrant links to the home country: empirical implications for United States bilateral trade flows", *The Review of Economics and Statistics*, Vol. 76 No. 2, pp. 302-316, doi: 10.2307/2109884.

Helpman, E. and Krugman, P. (1987), *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy*, MIT Press, Cambridge, MA.

Hiller, S. (2013), "Does immigrant employment matter for export sales? Evidence from Denmark", *Review of World Economics*, Vol. 149 No. 2, pp. 369-394, doi: 10.1007/s10290-013-0146-5.

Hong, S. (2025), "Korea's trade policy priorities with Latin America: future directions", *KIEP World Economy Brief Brief Series (No. 25-07)*, Vol. 25 No. 7, doi: 10.2139/ssrn.5897925.

Jang, H., Kim, J. and Oh, J. (2025), "Balanced regional development in South Korea through immigration, linked with development assistance", *Journal of the Asia Pacific Economy*, pp. 1-34, doi: 10.1080/13547860.2025.2460851.

Kim, S. (2025a), "Impact of near economic center on the economic growth of neighboring country", *Journal of Asian Business and Economic Studies*, Vol. 32 No. 1, pp. 66-77, doi: 10.1108/jabes-04-2024-0178.

Kim, Y. (2025b), *Korea Must Adopt Proactive Immigration Policies to Counter Demographic Crisis*, Aju News, available at: https://www.ajunews.com/view/20250421092351088

Korean Statistical Information Service (KOSIS) (2025a), *International Migration of Foreign by Sex and Citizenship*, KOSIS, available at: https://kosis.kr/statHtml/statHtml.do?orgId=101&tblId=DT_1B28022&conn_path=I2&language=en (accessed 1 June 2025).

Korean Statistical Information Service (KOSIS) (2025b), *Total Fertility Rate*, KOSIS, available at: https://www.index.go.kr/unify/idx-info.do?idxCd=5061 (accessed 1 June 2025).

Korean Statistical Information Service (KOSIS) (2025c), *Trade-to-GDP Ratio*, KOSIS, available at: https://www.index.go.kr/unify/idx-info.do?idxCd=4207 (accessed 1 June 2025).

Krugman, P. (1980), "Scale economies, product differentiation, and the pattern of trade", *American Economic Review*, Vol. 70 No. 5, pp. 950-959, available at: https://www.aeaweb.org/aer/top20/70.5.950-959.pdf

Krugman, P.R. (1991), "Increasing returns and economic geography", *Journal of Political Economy*, Vol. 99 No. 3, pp. 483-499, doi: 10.1086/261763.

Linnemann, H. (1966), *An Econometric Study of International Trade Flow*, Holland Publishing, Amsterdam.

Markusen, J.R. (1983), "Factor movements and commodity trade as complements", *Journal of International Economics*, Vol. 14 Nos 3-4, pp. 341-356, doi: 10.1016/0022-1996(83)90009-0.

Mashayekhi, M., Antunes, B. and Kidane, M.J. (2017), "Trade, migration and development", in *Handbook for Improving the Production and Use of Migration Data for Development. Global Knowledge Partnership for Migration and Development (KNOMAD)*, World Bank, Washington, DC, available at: https://www.un.org/en/development/desa/population/migration/publications/others/docs/handbook_GMG_Dec_2017.pdf

McCallum, J. (1995), "National borders matter: Canada-US. Regional trade patterns", *American Economic Review*, Vol. 85 No. 3, pp. 615-623, available at: https://www.jstor.org/stable/2118191

Mundell, R.A. (1957), "International trade and factor mobility", *American Economic Review*, Vol. 47 No. 3, pp. 321-335, available at: https://pages.ucsd.edu/~jlbroz/Courses/PS245/handouts/mundell_AER1957.pdf

National Assembly Budget Office (NABO) (2023), "Case studies and socio-economic effects of foreign workforce inflows in major countries", *National Assembly Budget Office*.

Oh, J. and Laxmi, P.P. (2012), "Does gravity matter? Evidence from Nepal's trade pattern", *International Area Studies Review*, Vol. 15 No. 2, pp. 67-82, doi: 10.1177/2233865912447086.

Rauch, J.E. (1999), "Networks versus markets in international trade", *Journal of International Economics*, Vol. 48 No. 1, pp. 7-35, doi: 10.1016/s0022-1996(98)00009-9.

Rauch, J.E. and Trindade, V. (2002), "Ethnic Chinese networks in international trade", *The Review of Economics and Statistics*, Vol. 84 No. 1, pp. 116-130, doi: 10.3386/w7189.

Rose, A.K. (2004), "Do we really know that the WTO increases trade?", *American Economic Review*, Vol. 94 No. 1, pp. 98-114, doi: 10.1257/000282804322970724.

Sohn, C. (2005), "Does the gravity model explain South Korea's trade flows?", *The Japanese Economic Review*, Vol. 56 No. 4, pp. 417-430, doi: 10.1111/j.1468-5876.2005.00338.x.

Tinbergen, J. (1962), *Shaping the World Economy: Suggestion for an International Economic Policy*, The Twentieth Century Fund, New York.

UNCTAD (2023), *Review of Maritime Transport 2023: Overview – Towards a Green and Just Transition*, United Nations Conference on Trade and Development, available at: https://unctad.org/publication/review-maritime-transport-2023

Wei, S. (1996), "Intra-national versus international trade: how stubborn are nations in global integration?", (NBER Working Paper No. 5531), National Bureau of Economic Research, Cambridge, MA, available at: https://www.nber.org/papers/w5531

Further reading

Korea Customs Service (2025), *FTA Trend in Korea*, Korea Customs Service, available at: https://www.customs.go.kr/engportal/cm/cntnts/cntntsView.do?mi=7304&cntntsId=2329 (accessed 12 May 2025).

World Bank (2011), *World Development Indicators Database*, World Bank Databank, available at: https://databank.worldbank.org/source/world-development-indicators

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