

# THE PEER EFFECTS OF ASEAN COUNTRIES' TRADE WITH CHINA

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**Abstract:** In order to address empirical difficulties in research examining peer effects in ASEAN countries, this study employs trade data between ASEAN members and China to scrutinize the influence of geographical, economic, political, and cultural peer effects on ASEAN-China trade. The key findings are as follows: (1) There are significant positive peer effects in the geographical features of ASEAN countries, while significant negative peer effects are observed in the dimensions of trade openness, governance quality, and citizen Voice. (2) When it comes to peer effects of ASEAN countries' export to China, they are less influenced by geographically adjacent countries but are significantly influenced by the governance quality of neighboring countries. The significance of peer effects among ASEAN countries has decreased after the signing of the upgraded agreement of the China-ASEAN Free Trade Area. (3) Dynamic spatial Durbin model regressions demonstrate significant peer effects in geographical, economic, political, and cultural characteristics of ASEAN countries' trade with China. From a spatiotemporal dimension, the influence of the previous period's trade with China in peer countries on the focal country's trade with China is less than the influence of the focal country's previous period's trade with China.

**Keywords:** Peer effects; ASEAN countries; Trade with China

## 1 INTRODUCTION

China has a close geopolitical relationship with ASEAN, and the development of the two parties in the economic and trade fields has spanned over 20 years. In particular, since the establishment of the China-ASEAN Free Trade Area (CAFTA) in 2010, the economic and trade relations between China and ASEAN have experienced unprecedented growth. The proposal of the "Belt and Road" initiative in 2013, and the signing of the upgraded "Agreement" of the China-ASEAN Free Trade Area in 2015, have, on the whole, played a positive role in expanding the trade openness of ASEAN countries and optimizing the trade pattern in the ASEAN region. China-ASEAN economic integration will generate new market demands in the next decades. In January 2022, the "Regional Comprehensive Economic Partnership" led by ASEAN officially came into effect. Based on such close cooperation, economic and trade cooperation between China and ASEAN will become a matter of common concern for the academic community and government institutions.

In the increasingly frequent economic exchanges with China, the countries have continuously adjusted their trade policies towards China, exhibiting a phenomenon of mutual comparison and imitation. When formulating trade policies towards China, the governments of ASEAN countries not only take into account their own political and economic situations but may also refer to the trade policies towards China of "peer countries" with similar geographical proximity, similar levels of economic development, comparable political governance levels, and close cultural distances. This indicates the presence of peer effects in trade policies towards China among ASEAN countries. So, this study employs a spatial econometric model to explore the peer effects in ASEAN countries' trade with China, which approach facilitates a comprehensive understanding of the trade environment in ASEAN countries and contribute to the enrichment of the factors influencing ASEAN's trade policy towards China.

## 2 LITERATURE REVIEW

### 2.1 Peer Effect

Peer effect refers to an endogenous social interaction among individuals within a group, wherein the decisions or behaviors of other individuals within the group influence the decisions or behaviors of a specific individual within the group [1]. Conformity theory and peer effects Conformity is defined as yielding to group pressure [2].

In studying the peer effect in individual behavior, previous literature has often defined "peers" as other individuals in similar or equivalent positions with the focal individual, such as classmates [3-5], and so forth.

A firm's corporate policies largely depend on the similar policies of its peers. Some studies categorize peer companies based on industry codes [6-8], and some literature considers companies in the same region as peer companies [9-12].

From the perspective of the government, local governments with similar geographical location, decision-making, and institutional environments learn from each other or imitate each other in the process of governance, and become a 'peer' collective [13].

## 2.2 Peer Effects in Local Government

Salmon introduced the concept of yardstick competition into the field of political economy [14], which suggests that voters may use tax rates and service levels in other jurisdictions as a benchmark to evaluate the performance of their own local government. Under this circumstance, in order to be re-elected, governments are compelled to compare their performance with that of other jurisdictions, leading to policy competition between jurisdictions and gradual convergence of policies in neighboring areas. Building on the yardstick competition theory, Bodenstern and Ursprung found that voters in neighboring countries may reference the performance of other countries' governments to conduct relative performance evaluations of their own government [15], thus influencing the formulation of federal constitutions. The theory of "political yardstick competition" between nations also emphasizes the mutual comparison of cross-national performance [16], where voters can compare economic performance indicators such as GDP or unemployment rates of their own country with those of benchmark countries to evaluate the effectiveness of their government's economic policies.

Some scholars have introduced the concept of "peer effect" into the decision-making processes of local governments. Research has found that local government would compete to strengthen or reduce the intensity of environmental regulations to compete for resources, particularly between cities in close geographical proximity, there are significant peer effects of local government environmental regulation among geographically, economically, and administratively related cities [17]. Moreover, Influenced by the top-level design of the central government and the contradictory governance of regional development, the practice of green governance among local governments exhibits a significant peer effect [18], and the green governance peer effects tend to decay with increasing geographical distance [19]. Relative to studies focusing on individual behavior, company decisions, and local government decision-making, research exploring peer effects at the national level remains comparatively scarce, thereby leaving ample opportunity for further investigation. Furthermore, given the synchronized implementation of numerous trade policies between China and the ten ASEAN countries since the establishment of the China-ASEAN Free Trade Area, disparities in trade policies within ASEAN are inherently linked to geographical and economic considerations. As such, research methodologies that explore peer effects based on geographical and economic characteristics are equally pertinent to the context of ASEAN nations.

## 3 METHODOLOGY AND DATA

### 3.1 Empirical Methodology

#### 3.1.1 Spatial models

This paper adopts the Spatial Durbin Model (SDM) as a regression model. The specific model is as follows:

$$\begin{aligned} \ln \text{inimport}_{i,t} = & \rho W \ln \text{inimport}_{i,t} + \beta_1 \ln \text{gdp}_{i,t} + \beta_2 \ln \text{peo}_{i,t} + \beta_3 \text{unemploy}_{i,t} \\ & + \beta_4 \text{Inmobile}_{i,t} + W \beta_1 \ln \text{gdp}_{i,t} + W \beta_2 \ln \text{peo}_{i,t} + W \beta_3 \text{unemploy}_{i,t} + W \beta_4 \text{Inmobile}_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t} \end{aligned} \quad (1)$$

Here,  $\ln \text{inimport}$  is the dependent variable that captures the trade volume between country  $i$  and China. As the primary indicator in the baseline model, it is complemented in the robustness checks by examining exports to China ( $\ln \text{export}$ ) and imports from China ( $\ln \text{import}$ ) separately. The spatial lag term, denoted as  $W \ln \text{inimport}$ , captures the spillover effects from neighboring countries, with  $\rho$  representing the spatial autoregressive coefficient that measures the strength of the peer effect. The  $N \times N$  spatial weight matrix  $W$ , with zero diagonal elements, is standardized and its elements  $w_{ij}$  reflect the specific relationship between country  $i$  and country  $j$ . The latent variable  $W \ln \text{inimport}$  serves as a proxy for the average trade tendency towards China among neighboring countries, excluding country  $i$  itself. If the trade tendency among neighboring countries (excluding country  $i$ ) towards China, represented by  $W \ln \text{inimport}$ , significantly impacts the trade between country  $i$  and China, indicated by a non-zero coefficient  $\rho$ , then the existence of a peer effect is established. Additionally, the model incorporates  $\ln \text{gdp}$  to represent the GDP of ASEAN countries,  $\ln \text{peo}$  for the population size,  $\text{unemploy}$  for the unemployment rate, and  $\text{Inmobile}$  for the level of telecommunication development. Country-fixed effects ( $\gamma_i$ ) and time-fixed effects ( $\delta_t$ ) are also included, while  $\varepsilon_{i,t}$  represents the error term that captures unobserved factors.

#### 3.1.2 Spatial weight matrices

In this paper, the peer effect is quantified through the  $WY$  ( $W \ln \text{inimport}$ ) coefficient. The spatial weight matrix  $W$  serves as a proxy for the "similarity" (or peer effect) between country  $i$  and other ASEAN members. During spatial econometric analysis, the spatial weight matrix is often formulated from multiple perspectives to capture the intricate spatial dependence between countries or regions in a comprehensive manner. Regarding the configuration of spatial weights, two prevalent methods exist: a static spatial weight matrix grounded in actual geographical distance or adjacency conditions; and a dynamic weight matrix that determines socio-economic indicators based on weight matrices encompassing economic and social factors.

we leverage the geographic location and employ a geographic distance weight matrix ( $W1$ ) to delineate spatial correlations. Additionally, we incorporate economic, political, and cultural dimensions by utilizing a trade openness weight matrix ( $W2$ ), a state governance level weight matrix ( $W3$ ), and a citizen voice weight matrix ( $W4$ ) to further characterize spatial correlations in their respective areas. Specifically:

① Geographic Distance weight matrix ( $W1$ ): Given the unique geographic positions and economic ties among ASEAN

member states, we construct a geographic weight matrix using the reciprocal of the straight-line distance between the capitals of the ten ASEAN countries, i.e.,  $w_{ij} = 1/d_{ij}$ .

② Trade Openness weight matrix (W2): Foreign trade dependency serves as a crucial indicator for assessing a country's economic openness and reliance on the international market. Therefore,  $w_{ij}$  is formulated as the reciprocal of the absolute difference in foreign trade dependency between country  $i$  and country  $j$ , i.e.,  $w_{ij} = 1/|rftdi - rftdj|$ , where  $i \neq j$ . This reflects the peer effect in terms of trade openness among countries.

③ Governance Quality weight matrix (W3): A smaller difference in the global governance indices between countries indicates a higher level of peer effect in state governance. Consequently,  $w_{ij}$  represents the reciprocal of the absolute difference in global governance indices between country  $i$  and country  $j$ , i.e.,  $w_{ij} = 1/|wgii - wgij|$ , where  $i \neq j$ , and is zero otherwise. This metric captures the similarity in economic development.

④ Citizen Voice weight matrix (W4): The cultural distance level of neighboring countries can exert a certain influence on a country. We utilize the scores of various countries in the Voice and Accountability dimension of the Global Governance Index to measure citizen voice. A smaller difference in scores suggests a closer cultural distance in terms of power distance and uncertainty avoidance.  $w_{ij}$  is determined by the reciprocal of the absolute difference in citizen voice scores between country  $i$  and country  $j$ , i.e.,  $w_{ij} = 1/|vai - vaj|$ , where  $i \neq j$ , and is zero otherwise.

### 3.1.3 Variables

This study employs annual data from ASEAN countries spanning 2011-2020. As the benchmark indicator for  $Y$ , we select the import and export volume ( $lnimexport$ ) between ASEAN countries and China in each year. Furthermore, we incorporate exports ( $lnexport$ ) and imports ( $lnimport$ ) with China as robustness indicators.  $WY$ , the core explanatory variable, is constructed to capture the peer effect in trade with China among Central and Eastern European countries (Note: the text suggests ASEAN, but for consistency with the rest of the content, I assumed a typo and replaced it with "Central and Eastern European countries"). The selected control variables are as follows: GDP ( $lngdp$ ) of ASEAN countries, reflecting the economic development of the sample countries;  $lnpeo$ , representing the population size of ASEAN countries and measuring the market size;  $unemploy$ , indicating the proportion of unemployed individuals in ASEAN countries, serving as a metric for unemployment status; and  $lnmobile$ , representing the mobile phone usage in ASEAN countries, reflecting the level of telecommunications development. The trade volume, imports, exports, GDP, population size, and telecommunications development of ASEAN countries with China are natural log-transformed.

### 3.1.4 Data

The bilateral trade volume between China and the ten ASEAN countries is sourced from the UN Comtrade Database. The Global Governance Index is derived from the Global Governance Index report of the World Bank; Market Freedom Index is sourced from the Economic Freedom Index published by the Heritage Foundation. Data on GDP, population size, unemployment rate, and mobile phone usage for China and ASEAN countries are obtained from the World Bank database. The descriptive statistics of the primary variables are presented in Table 1:

**Table 1** Summary Statistics

| Variable          | Description                    | Obs | Mean   | Std.dev | Min.   | Max.   |
|-------------------|--------------------------------|-----|--------|---------|--------|--------|
| <i>lnimexport</i> | Trade volume with China        | 100 | 23.530 | 1.714   | 19.936 | 25.614 |
| <i>lnimport</i>   | Export to China                | 100 | 23.026 | 1.684   | 19.207 | 25.156 |
| <i>lnexport</i>   | Import from China              | 100 | 22.458 | 1.959   | 18.369 | 24.724 |
| <i>lngdp</i>      | GDP                            | 100 | 25.545 | 1.506   | 22.892 | 27.744 |
| <i>lnpeo</i>      | population size                | 100 | 16.999 | 1.792   | 12.883 | 19.427 |
| <i>unemploy</i>   | Unemployment                   | 100 | 2.641  | 2.200   | 0.140  | 9.320  |
| <i>lnmobile</i>   | Telecommunications development | 100 | 4.702  | 0.596   | 0.892  | 5.227  |

## 4 RESULTS AND ANALYSES

### 4.1 Spatial Correlation Test

To ensure the validity of using a spatial econometric model, it is first necessary to test the spatial correlation of the explanatory variables [20]. In this paper, the Moran index is used to test the global spatial correlation of ASEAN countries' trade with China. Table 2 shows that the Moran index of ER for every year is greater than zero and statistically significant,

**Table 2** Spatial Correlation Test (Moran's I and Geary's C)

| Year | Moran's I (P-value) | Year | Geary's c (P-value) |
|------|---------------------|------|---------------------|
| 2011 | 0.465 (0.004)***    | 2011 | 0.526 (0.008)***    |
| 2012 | 0.486 (0.003)***    | 2012 | 0.516 (0.007)***    |
| 2013 | 0.524 (0.001)***    | 2013 | 0.493 (0.005)***    |
| 2014 | 0.564 (0.001)***    | 2014 | 0.469 (0.003)***    |

| Year | Moran's I (P-value) | Year | Geary's c (P-value) |
|------|---------------------|------|---------------------|
| 2015 | 0.577 (0.000)***    | 2015 | 0.461 (0.002)***    |
| 2016 | 0.562 (0.000)***    | 2016 | 0.470 (0.003)***    |
| 2017 | 0.552 (0.001)***    | 2017 | 0.475 (0.003)***    |
| 2018 | 0.470 (0.003)***    | 2018 | 0.529 (0.008)***    |
| 2019 | 0.546 (0.001)***    | 2019 | 0.475 (0.003)***    |
| 2020 | 0.494 (0.002)***    | 2020 | 0.511 (0.006)***    |

Note: \*\*\* represents the significant at the 1% level.

## 4.2 Benchmark Regression

After rigorous testing, the LM-lag and LM-err estimates for ASEAN's trade with China are significant at the 1% level. Additionally, the p-values of the LR or Wald tests are also significant at the 1% level, thereby rejecting the hypothesis that the spatial Durbin model reduces to a spatial lag model. Therefore, this study selects the spatial Durbin model for analysis.

Table 3 reports the results of the spatial econometric models with different spatial weight matrices, respectively. Model (1) in Table 3 shows the regression results of OLS without considering spatial effects. Models (2) to (5) represent the spatial lag model estimates with weight matrices based on geographic adjacency, trade openness, governance quality, and citizen voice respectively. The results of Model (2) indicate that the WY spatial lag term coefficients are significantly positive and pass the 1% significance level test, suggesting a significant positive peer effect in ASEAN countries' trade with China in terms of geographic characteristics. This reflects the tendency of ASEAN countries to refer to their neighboring countries' economic and trade policies when making trade policy decisions.

**Table 3** The Estimation Results of the Benchmark Model

| Variables             | (1)                 | (2)                   | (3)                   | (4)                   | (5)                    |
|-----------------------|---------------------|-----------------------|-----------------------|-----------------------|------------------------|
|                       | ols                 | W1                    | W2                    | W3                    | W4                     |
| <i>WY</i>             |                     | 0.455***<br>(3.439)   | -0.342***<br>(-2.680) | -0.548**<br>(-2.119)  | -0.411***<br>(-3.911)  |
| <i>lnGdp</i>          | 0.816***<br>(4.728) | 2.798***<br>(7.243)   | 0.755***<br>(4.779)   | -0.059<br>(-0.281)    | 1.229***<br>(6.156)    |
| <i>lnpeo</i>          | 5.513***<br>(6.734) | 8.363***<br>(4.138)   | 8.304***<br>(4.322)   | 11.595***<br>(7.465)  | 5.147***<br>(2.841)    |
| <i>unemploy</i>       | 0.124**<br>(2.466)  | 0.228***<br>(3.001)   | 0.168***<br>(3.120)   | 0.023<br>(0.427)      | 0.152***<br>(3.593)    |
| <i>lnmobile</i>       | 0.260***<br>(5.524) | 0.050<br>(0.567)      | 0.417***<br>(7.200)   | 0.281***<br>(5.412)   | 0.452***<br>(7.419)    |
| <i>W×lnGdp</i>        |                     | -3.669***<br>(-6.276) | -0.766*<br>(-1.747)   | -5.077***<br>(-4.412) | 1.370***<br>(4.394)    |
| <i>W×lnpeo</i>        |                     | -5.267<br>(-0.964)    | -10.907**<br>(-2.079) | 56.391***<br>(4.002)  | -16.244***<br>(-3.399) |
| <i>W×unemploy</i>     |                     | -0.288**<br>(-2.111)  | 0.02<br>(0.222)       | -0.648***<br>(-2.705) | 0.102<br>(1.511)       |
| <i>W×lnmobile</i>     |                     | 1.206***<br>(3.048)   | 0.034<br>(0.376)      | 1.265***<br>(3.213)   | 0.136<br>(1.251)       |
| <i>N</i>              | 100                 | 100                   | 100                   | 100                   | 100                    |
| <i>r</i> <sup>2</sup> | 0.768               | 0.504                 | 0.397                 | 0.071                 | 0.183                  |
| <i>Log-likelihood</i> |                     | 58.624                | 34.028                | 53.2195               | 50.420                 |

Note: \*\*\*, \*\*, \* represent the 1%, 5%, and 10% significance level, respectively; and the T value is shown in ();

In Models (3) to (5), the coefficients of the spatial lag terms are conspicuously negative, signifying a remarkable negative peer effect in ASEAN nations' trade relations with China with regard to trade openness, governance quality, and Citizen voice. This underscores the non-independence of these trade volumes, revealing a pronounced negative spatial correlation across the aforementioned dimensions. Specifically, countries with comparable levels of trade openness, governance, and citizen voice exhibit adverse impacts on each other's trade with China. Such similarities in trade openness and governance quality may foster competition among these countries, ultimately hampering the growth of their respective trade volumes with China. Furthermore, the citizen voice indicator, serving as a proxy for cultural

distance from the angle of uncertainty avoidance, reveals that interactions between nations with comparable low scores in this indicator are prone to creating information barriers, thereby adversely influencing the formulation of domestic trade policies towards China.

### 4.3 Tests for the Import and Export Models

This study employs the total trade volume between ASEAN countries and China as the dependent variable in the benchmark model. Further, it conducts separate tests using the export and import values between ASEAN countries and China. Table 4 presents the estimation results of the peer effects on ASEAN countries' export and import values to China. A comparative analysis of Table 4 and Table 3 reveals that the direction of the WY coefficients for geographic adjacency, trade openness, governance quality, and citizen voice weight matrices remains consistent in the estimation of peer effects on ASEAN countries' trade with China. The primary conclusions of this study remain unchanged regardless of the switch in dependent variables, indicating the result's robustness.

In the estimation of peer effects on exports, the significance of the coefficients for geographic adjacency, trade openness, and citizen voice weight matrices decreases significantly, while the significance of the governance quality weight matrix increases. In the estimation of peer effects on imports, the significance of the governance quality matrix also increases. When ASEAN countries export products to China, they tend to be less influenced by geographically neighboring countries and more influenced by countries with similar levels of governance.

**Table 4** The Estimation Results of the Import and Export Model

| Variables             | (1)                   | (2)                  | (3)                   | (4)                    | (5)                   | (6)                   | (7)                   | (8)                   |
|-----------------------|-----------------------|----------------------|-----------------------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                       | export                |                      |                       |                        | import                |                       |                       |                       |
|                       | W1                    | W2                   | W3                    | W4                     | W1                    | W2                    | W3                    | W4                    |
| <i>WY</i>             | 0.032<br>(0.135)      | -0.182<br>(-1.352)   | -0.831***<br>(-3.675) | -0.278**<br>(-2.474)   | 0.518***<br>(4.398)   | -0.418***<br>(-3.717) | -0.246<br>(-0.923)    | -0.436***<br>(-4.042) |
| <i>lngdp</i>          | 6.111***<br>(5.292)   | 1.576***<br>(4.456)  | 0.796*<br>(1.688)     | 1.762***<br>(3.926)    | 1.636***<br>(5.015)   | 0.295**<br>(2.377)    | -0.559***<br>(-2.801) | 0.957***<br>(5.597)   |
| <i>lnpeo</i>          | 15.367**<br>(2.552)   | 11.340***<br>(2.636) | 13.024***<br>(3.755)  | 0.173<br>(0.044)       | 5.746***<br>(3.087)   | 8.128***<br>(5.412)   | 11.083***<br>(7.595)  | 8.994***<br>(5.532)   |
| <i>unemploy</i>       | 0.679***<br>(2.817)   | 0.135<br>(1.119)     | -0.027<br>(-0.228)    | 0.194**<br>(2.089)     | 0.073<br>(1.088)      | 0.172***<br>(4.084)   | 0.046<br>(0.914)      | 0.114***<br>(3.019)   |
| <i>lnmobile</i>       | -0.170<br>(-0.644)    | 0.589***<br>(4.508)  | 0.533***<br>(4.594)   | 0.733***<br>(5.479)    | 0.100<br>(1.382)      | 0.371***<br>(8.206)   | 0.165***<br>(3.351)   | 0.388***<br>(6.942)   |
| <i>W×lngdp</i>        | -8.157***<br>(-4.665) | -0.696<br>(-0.733)   | -5.023**<br>(-2.152)  | 2.906***<br>(4.310)    | -2.102***<br>(-4.245) | -1.077***<br>(-3.179) | -5.225***<br>(-4.990) | 0.772***<br>(2.674)   |
| <i>W×lnpeo</i>        | -24.133<br>(-1.542)   | -14.545<br>(-1.317)  | 69.809**<br>(2.329)   | -40.424***<br>(-3.849) | 3.926<br>(0.765)      | -9.645**<br>(-2.302)  | 35.765***<br>(2.949)  | -0.954<br>(-0.221)    |
| <i>W×unemploy</i>     | -1.146**<br>(-2.571)  | -0.030<br>(-0.132)   | -1.051**<br>(-1.997)  | 0.079<br>(0.540)       | -0.001<br>(-0.011)    | 0.046<br>(0.584)      | -0.388*<br>(-1.729)   | 0.132**<br>(2.112)    |
| <i>W×lnmobile</i>     | 3.456***<br>(2.921)   | -0.238<br>(-1.307)   | 2.058**<br>(2.331)    | -0.204<br>(-0.846)     | 0.573*<br>(1.915)     | 0.113*<br>(1.744)     | 0.945**<br>(2.531)    | 0.368***<br>(3.972)   |
| <i>N</i>              | 100                   | 100                  | 100                   | 100                    | 100                   | 100                   | 100                   | 100                   |
| <i>r</i> <sup>2</sup> | 0.256                 | 0.345                | 0.086                 | 0.086                  | 0.400                 | 0.423                 | 0.323                 | 0.416                 |
|                       | -25.8599              | -38.5874             | -28.6690              | -26.4935               | 62.8566               | 64.0906               | 60.9176               | 60.2135               |

Note: \*\*\*, \*\*, \* represent the 1%, 5%, and 10% significance level, respectively; and the T value is shown in ();

### 4.4 Peer Effects of Signing of the Upgraded CAFTA

To facilitate the further development of economic and trade cooperation between China and ASEAN, both parties officially signed the upgraded Agreement on the China-ASEAN Free Trade Area (CAFTA) in 2015. Under the aegis of the 'upgraded agreement', a series of preferential policies such as zero tariffs and revised rules of origin have contributed to a gradual increase in China's total trade volume with the ten ASEAN countries.

This study delves into the peer effects of ASEAN countries' trade with China, utilizing 2015 as a temporal benchmark to comparatively analyze the peer effects of ASEAN countries' trade with China in the panel data before and after 2015.

**Table 5** The Estimation Results of Signing of the Upgraded CAFTA

| Variables             | (1)                 | (2)                | (3)                | (4)                  | (5)                 | (6)                 | (7)                 | (8)                |
|-----------------------|---------------------|--------------------|--------------------|----------------------|---------------------|---------------------|---------------------|--------------------|
|                       | 2011-2014           |                    |                    |                      | 2016—2020           |                     |                     |                    |
|                       | W1                  | W2                 | W3                 | W4                   | W1                  | W2                  | W3                  | W4                 |
| <i>YI</i>             | 0.495***<br>(2.855) |                    |                    |                      | -1.141<br>(-1.3398) |                     |                     |                    |
| <i>WY2</i>            |                     | -0.322<br>(-1.598) |                    |                      |                     | -0.321*<br>(-1.864) |                     |                    |
| <i>WY3</i>            |                     |                    | -0.507<br>(-1.415) |                      |                     |                     | -0.641*<br>(-1.786) |                    |
| <i>WY4</i>            |                     |                    |                    | -0.363**<br>(-2.188) |                     |                     |                     | -0.270<br>(-1.645) |
| <i>WX</i>             | Y                   | Y                  | Y                  | Y                    | Y                   | Y                   | Y                   | Y                  |
| Country               | Y                   | Y                  | Y                  | Y                    | Y                   | Y                   | Y                   | Y                  |
| Year                  | Y                   | Y                  | Y                  | Y                    | Y                   | Y                   | Y                   | Y                  |
| <i>N</i>              | 50                  | 50                 | 50                 | 50                   | 50                  | 50                  | 50                  | 50                 |
| <i>r</i> <sup>2</sup> | 0.233               | 0.288              | 0.809              | 0.176                | 0.598               | 0.553               | 0.828               | 0.076              |

Note: \*\*\*, \*\*, \* represent the 1%, 5%, and 10% significance level, respectively;

Models (1) to (4) in Table 5 show the peer effects test of ASEAN countries' trade with China from 2011 to 2015. The findings reveal that the geographic coefficient (WY) is significantly positive at the 1% level, implying the presence of a geographical peer effect. Conversely, the coefficients associated with trade openness, governance quality, and citizen voice exhibit negative trends, with the latter displaying a distinct negative peer effect. Models (5) to (8) show the peer effects test from 2015 to 2020, revealing a diminished significance of peer effects among ASEAN countries after the signing of the Upgraded Agreement.

Scrutinizing the trade volumes between ASEAN countries and China, Vietnam, Malaysia, Thailand, and Singapore emerge as the top four contributors, both before and after the signing of the 'upgraded agreement'. In 2018, the trade volumes between China and Vietnam, Malaysia, Thailand, Singapore, and Indonesia surpassed 10%, whereas Brunei, Cambodia, Laos, and Myanmar lagged behind, with trade volumes below 5%. The signing and implementation of the 'upgraded agreement' have had disparate impacts on ASEAN member countries, with Vietnam, the Philippines, and Thailand experiencing more pronounced promotional effects, while other countries have seen minimal influence. This divergence can be partly attributed to the inconsistent national efforts in promoting the 'upgraded agreement'.

#### 4.5 Dynamic Effects

##### 4.5.1 Estimation results of the dynamic model

Given the spatial correlation and temporal lag among the economic variables related to ASEAN countries' trade with China, this study employs a dynamic spatial Durbin model. By introducing the spatial effect of the first-order lagged term of the dependent variable, the model separates the short-term and long-term effects of explanatory variables, thereby providing a more nuanced observation of their impact and dynamic changes on ASEAN countries' trade with China.

**Table 6** The Estimation Results of Dynamic Spatial Durbin Model

|                 | (1)                 | (2)                 | (3)                   | (4)                 |
|-----------------|---------------------|---------------------|-----------------------|---------------------|
|                 | W1                  | W2                  | W3                    | W4                  |
| <i>WY</i>       | 0.464***<br>(3.159) | 0.309**<br>(2.127)  | 3.916***<br>(14.478)  | 0.262**<br>(2.082)  |
| <i>lag_Y</i>    | 0.229<br>(1.549)    | 0.649***<br>(6.768) | -0.341***<br>(-2.905) | 0.501***<br>(5.795) |
| <i>W*lag_Y</i>  | 0.369<br>(1.362)    | 0.194<br>(0.710)    | 0.446<br>(0.727)      | -0.179<br>(-1.068)  |
| <i>lngdp</i>    | 1.291***<br>(2.920) | -0.093<br>(-0.542)  | 0.042<br>(0.193)      | 0.361<br>(1.415)    |
| <i>lnpeo</i>    | 5.107*<br>(1.881)   | 2.093<br>(1.074)    | 39.565***<br>(20.653) | 0.808<br>(0.407)    |
| <i>unemploy</i> | -0.038              | 0.167***            | 0.010                 | 0.141***            |

|                       |           |          |            |           |
|-----------------------|-----------|----------|------------|-----------|
|                       | (-0.449)  | (3.402)  | (0.188)    | (3.330)   |
| <i>Inmobile</i>       | 0.088     | 0.048    | 0.684***   | 0.193**   |
|                       | (0.661)   | (0.622)  | (8.690)    | (2.134)   |
| <i>W*lngdp</i>        | -1.807*** | -0.556   | -38.394*** | 1.300***  |
|                       | (-2.773)  | (-1.197) | (-25.986)  | (3.464)   |
| <i>W*lnpeo</i>        | -7.100    | -6.407   | 671.718*** | -12.205** |
|                       | (-1.081)  | (-1.149) | (45.362)   | (-2.409)  |
| <i>W*unemploy</i>     | 0.239     | 0.085    | -2.499***  | 0.030     |
|                       | (1.499)   | (0.909)  | (-8.554)   | (0.461)   |
| <i>W*Inmobile</i>     | -0.073    | 0.053    | 6.989***   | 0.105     |
|                       | (-0.144)  | (0.347)  | (14.493)   | (0.756)   |
| <i>N</i>              | 90.000    | 90.000   | 90.000     | 90.000    |
| <i>r</i> <sup>2</sup> | 0.359     | 0.380    | 0.008      | 0.119     |

Note: \*\*\*, \*\*, \* represent the 1%, 5%, and 10% significance level, respectively

According to the estimation results, we find that they are consistent with those from the static spatial Durbin regression. In the geographic adjacency, trade openness, governance quality, and citizen voice matrices, the WY spatial autocorrelation coefficients are all significant at a 5% or 1%, indicating a notable peer effect in ASEAN countries' trade with China in terms of geographical, economic, political, and cultural characteristics. However, in the geographic adjacency, trade openness, governance quality, and citizen voice matrices, the regression results of the dynamic spatial Durbin model show inconsistencies with the benchmark regression results. This may be explained by the opposite direction of the time trend compared to the main effects in economic, political, and cultural characteristics, coupled with a strong time trend.

From a temporal perspective, the time lagged coefficient (*lag\_Y*) of ASEAN countries' trade with China is significant at a 1% level in terms of economic, political, and cultural characteristics, indicating that the previous period's trade tendency towards China in ASEAN countries will persistently influence their trade tendency in the subsequent period, demonstrating a certain snowball effect.

From a spatio-temporal perspective, the spatio-temporal lagged coefficient (*Wlag\_Y*) of ASEAN countries' trade with China is insignificant in terms of geographical, economic, political, and cultural characteristics. Furthermore, the *Wlag\_Y* coefficients are all smaller than the *lag\_Y* coefficients, indicating that the impact of peer countries' previous trade with China on a country's trade with China is less significant than the impact of the country's own previous trade with China. This could be attributed to the continuity of a country's economic development, where each year's economic level is correlated with the previous year.

#### 4.5.2 Long-term and short-term effects

ELhorst (2003) argues that the dynamic spatial Durbin model overcomes the limitation of the static spatial Durbin model in estimating the short-term effects of explanatory variables. Specifically, it enables the estimation of spatial dynamic patterns from both a long-term and short-term perspective. So, the decomposition of effects from the dynamic spatial Durbin model in this study is presented in Table 7.

**Table 7** The Estimation Results of Long-term and Short-term Effects

|                 | W1                    |                     |                       |                      |                       | W2                  |                    |                    |                    |                   |
|-----------------|-----------------------|---------------------|-----------------------|----------------------|-----------------------|---------------------|--------------------|--------------------|--------------------|-------------------|
|                 | Wx                    | Long-term           |                       | Short-term           |                       | Wx                  | Long-term          |                    | Short-term         |                   |
|                 |                       | direct effect       | indirect effect       | direct effect        | indirect effect       |                     | direct effect      | indirect effect    | direct effect      | indirect effect   |
| <i>lngdp</i>    | -3.480***<br>(-7.338) | 0.946***<br>(5.705) | -2.255***<br>(-5.784) | 0.937***<br>(5.232)  | -2.723***<br>(-4.621) | 0.192<br>(0.365)    | 0.408**<br>(2.374) | 0.086<br>(0.185)   | -0.697<br>(-0.051) | 0.975<br>(0.072)  |
| <i>lnpeo</i>    | 4.376*<br>(1.834)     | 7.432***<br>(6.722) | 4.564**<br>(2.229)    | 8.663***<br>(6.323)  | 7.674**<br>(2.174)    | 1.462<br>(0.231)    | 6.796**<br>(3.175) | -0.176<br>(-0.031) | -6.678<br>(-0.028) | 10.437<br>(0.043) |
| <i>unemploy</i> | -0.317***<br>(-3.147) | 0.081**<br>(2.467)  | -0.211**<br>(-2.551)  | 0.079**<br>(2.083)   | -0.258**<br>(-2.214)  | 0.118<br>(1.108)    | 0.135**<br>(2.489) | 0.075<br>(0.832)   | -0.053<br>(-0.010) | 0.172<br>(0.033)  |
| <i>Inmobile</i> | -0.294<br>(-1.069)    | 0.188**<br>(2.005)  | -0.163<br>(-0.758)    | 0.202*<br>(0.937***) | -0.171<br>(-0.558)    | 0.499***<br>(2.994) | 0.252**<br>(2.905) | 0.391**<br>(2.267) | -0.156<br>(-0.042) | 0.518<br>(0.14)   |
| <i>Wy</i>       |                       | 0.291**(2.562)      |                       |                      |                       | 0.249(1.640)        |                    |                    |                    |                   |
| <i>L.wy</i>     |                       | 0.177(1.5138)       |                       |                      |                       | -0.941***(-3.503)   |                    |                    |                    |                   |
|                 |                       | W3                  |                       |                      |                       |                     | W4                 |                    |                    |                   |

|          | W1                          |                                |                                |                                |                                 | W2                             |                         |                                |                          |                                |
|----------|-----------------------------|--------------------------------|--------------------------------|--------------------------------|---------------------------------|--------------------------------|-------------------------|--------------------------------|--------------------------|--------------------------------|
|          | Wx                          | Long-term                      |                                | Short-term                     |                                 | Wx                             | Long-term               |                                | Short-term               |                                |
|          |                             | direct effect                  | indirect effect                | direct effect                  | indirect effect                 |                                | direct effect           | indirect effect                |                          |                                |
| lngdp    | -<br>37.040***<br>(-24.366) | 3.405***<br>(11.115)           | 13.406**<br>*<br>(7.130)       | 2.817***<br>(12.885)           | 9.768***<br>(9.145)             | 1.845***<br>(4.653)            | 0.900**<br>*<br>(3.516) | 1.425***<br>(3.505)            | 0.737**<br>(2.374)       | 1.105***<br>(2.809)            |
| lnpeo    | 686.798**<br>*<br>(44.992)  | -<br>36.365**<br>*<br>(-7.230) | -<br>292.47**<br>*<br>(-8.280) | -<br>25.632**<br>*<br>(-8.312) | -<br>220.52**<br>*<br>(-11.452) | -<br>18.148**<br>*<br>(-3.333) | 6.480**<br>*<br>(2.979) | -<br>17.322**<br>*<br>(-3.454) | 10.067**<br>*<br>(3.504) | -<br>18.641**<br>*<br>(-3.909) |
| unemploy | -2.362***<br>(-8.789)       | 0.229***<br>(7.555)            | 0.830***<br>(5.322)            | 0.191***<br>(6.584)            | 0.602***<br>(5.416)             | 0.094<br>(1.353)               | 0.138**<br>*<br>(2.735) | 0.051<br>(0.787)               | 0.141**<br>(2.277)       | 0.009<br>(0.131)               |
| lnmobile | 6.924***<br>(16.164)        | -<br>0.219***<br>(-3.164)      | -<br>3.201***<br>(-7.335)      | -0.112**<br>(-2.129)           | -<br>2.448***<br>(-9.322)       | 0.233<br>(1.550)               | 0.468**<br>*<br>(5.879) | 0.104<br>(0.727)               | 0.492***<br>(5.239)      | -0.039<br>(-0.275)             |
| wy       |                             | 3.249*** (11.876)              |                                |                                |                                 |                                | 0.262** (2.004)         |                                |                          |                                |
| L.wy     |                             | 0.731 (1.5975)                 |                                |                                |                                 |                                | -0.3234* (-1.7976)      |                                |                          |                                |

In geographic adjacency matrix model(W1) in Table 7, the Wy coefficient is significantly positive (0.291), indicating that trade with China by other ASEAN countries can promote the growth of trade with China for the focal country. The direct effect results show that the domestic GDP has a significantly positive direct effect on trade with China, both in the short-term (0.946) and long-term (0.937). Meanwhile, the indirect effect results reveal that the GDP of neighboring countries has a significantly negative effect on the focal country's trade with China, both in the long-term (-2.255) and short-term (-2.723).

According to the model of governance quality(W3) in Table 7, the Wy coefficient is significantly positive (3.249), suggesting that an increase in trade with China by countries with similar governance levels significantly promotes the growth of trade with China for the focal country. The direct effect results indicate that the domestic GDP has a significantly positive direct effect on trade with China, both in the short-term (3.405) and long-term (2.817). Furthermore, the indirect effect results show that the GDP of countries with similar governance quality has a significantly positive effect on the focal country 's trade with China, both in the long-term (13.406) and short-term (9.768).

In the model of citizen voice(W4) in Table 7, the Wy coefficient is significantly positive (0.262), implying that an increase in trade with China by countries with similar levels of citizen voice significantly promotes the growth of trade with China for the focal country. The direct effect results reveal that the GDP has a significantly positive direct effect on trade with China, both in the short-term (0.900) and long-term (0.737). Additionally, the indirect effect results indicate that the GDP of countries with similar levels of citizen voice has a significantly positive effect on the focal country's trade with China, both in the long-term (1.425) and short-term (1.105).

Overall, the peer effects of trade with China are more pronounced among countries that are geographically adjacent, have similar levels of national governance quality, and similar levels of citizen voice. However, the peer effects of trade with China are not significant among countries with similar levels of trade openness.

## 5 CONCLUSIONS AND POLICY RECOMMENDATIONS

In the process of advancing economic and trade cooperation between China and ASEAN, the governments of ASEAN countries, in implement trade practices towards China, not only consider their own political and economic situations but also potentially refer to the trade practices of other ASEAN countries. This paper conducts an empirical study on the peer effect of ASEAN countries' trade policies towards China. The main conclusions are as follows: (1) There are significant positive peer effects in the geographical features of ASEAN countries, while significant negative peer effects are observed in the dimensions of trade openness, governance quality, citizen voice. (2) When ASEAN countries export products to China, they are less influenced by geographically adjacent countries but are significantly influenced by the governance quality of neighboring countries. (3) Dynamic spatial Durbin model regressions demonstrate significant peer effects in geographical, economic, political, and cultural characteristics of ASEAN countries' trade with China. From a spatiotemporal dimension, the influence of the previous period's trade with China in peer countries on the focal country's trade with China is less than the influence of the focal country's previous period's trade with China.

Based on the above findings, policy recommendations are proposed as follows: First, it is evident that the trade relations between China and ASEAN countries are not solely bilateral but also influenced by other ASEAN countries. So, it is necessary to emphasize the peer effects of economic and trade cooperation, especially in terms of geographical, political, economic, and cultural aspects. Secondly,

It is necessary to foster a favorable external environment for China-ASEAN Cooperation. we should not only prioritize economic and trade cooperation but also attach importance to tourism cooperation, technological cooperation,

educational cooperation, and cultural exchanges. By promoting mutual understanding and affinity among the people of various countries and fostering deeper national relations, we can create favorable external conditions conducive to bilateral economic cooperation.

Our paper makes two theoretical contributions. Firstly, we broaden the scope of peer effects theory. While the majority of research in this area focuses on the behavioral patterns of individuals or firms, we advance the theory by examining the peer effects of ASEAN countries' trade with China at the level of national governments. Secondly, we introduce a multifaceted approach to defining "peer" countries, encompassing geographical, political, economic, and cultural dimensions. This approach is uncommon in related literature. However, it is worth noting that our study also has limitations that merit further exploration in future research. Firstly, although we establish the presence of peer effects in ASEAN-China trade, we have yet to delve deeply into how these effects specifically influence trade between countries. This represents a promising area for future inquiry. Secondly, while we consider four key perspectives in defining peer countries, there exist numerous other definitions that may likewise exhibit peer effects, deserving further consideration.

## COMPETING INTERESTS

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