The determinants of China’s outward foreign direct investment: a vector error correction model analysis of coastal and landlocked countries

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Abstract
An essential objective of China’s outward foreign direct investment (OFDI) is to expand international trade and access to overseas markets to garner resources and improve transportation routes. This study identifies the determinants of China’s OFDI activities in the short and long term, focusing on 138 countries that are part of China’s Belt and Road Initiative (BRI). It is the first study to evaluate the system’s contribution of location determinants, including the four factors of economy, logistics, energy, and politics, to China’s OFDI by employing a vector error correction model with panel data from 2007 to 2019. In addition, we compare the influence of the variables in coastal and landlocked countries. Panel Granger causality and impulse response tests, variance decomposition, and forecast analysis were conducted to analyze and forecast China’s OFDI. The results show that China’s OFDI in both coastal and landlocked countries is statistically sensitive to the variables of economy, energy, logistics, and politics in host countries engaged in the BRI. It also shows that improving logistics infrastructure and the political investment environment in landlocked countries, this can positively attract China’s OFDI.

Keywords OFDI · Locational determinants · VEC model · AUTO-ARIMA forecasting · BRI

1 Introduction
The economic crisis and following global health pandemic have significantly impacted the global foreign investment market by affecting the global economy and trade (Duan et al. 2020; Fang et al. 2021). The rise of trade protectionism has
exacerbated this impact, especially in terms of outward foreign direct investment (OFDI) in developing countries (Ran and Liu 2018; Wang and Liu 2020; Zhao et al. 2020). As a developing country representative, China’s OFDI model is different from that of developed countries in terms of motivation and geography (Buckley et al. 2007; Huang and Wang 2011; Jin et al. 2021). The “going global” strategy proposed in 2001 and the Belt and Road Initiative (BRI) proposed in 2013 by the Chinese government are different from any existing investment models in terms of the policy.

Since implementing its reform and opening-up policy in 1978, China has achieved an average annual economic growth rate of more than 9%. In 2010, it surpassed Japan to become the world’s second-largest economy after the USA. Its conservative overseas investment strategy adopted before 2001 and the subsequent “going global” strategy gradually encouraged overseas investment by Chinese enterprises. This then accelerated after Xi Jinping’s government put forward the BRI in 2013 as part of a foreign expansion policy (The Economist 2015).

The Xi Jinping government’s active promotion and implementation of the BRI can be regarded as one of the most important driving factors, especially when matched by the potential host country’s demand for infrastructure construction. The BRI can stimulate economic growth globally, including countries in Asia and Africa. In particular, countries along the Belt and Road with underdeveloped infrastructure, low investment rates, and low per capita income can increase their trade volumes. China can also ensure its energy security and raw material supply by establishing infrastructure to access these resources (Hofman 2015; Huang 2016). The BRI covers 145 countries and more than four billion people. The total economic volume of Belt and Road countries is approximately US $21 trillion, accounting for nearly 65% of global land output and 30% of maritime production (Swaine 2015). Hence, the BRI is an essential strategy, not just an economic initiative, for China, the world’s largest developing country and one of its fastest-growing economies (Holodny 2015).

The BRI has become core to China’s “going global” strategy. From a political and economic point of view, its purpose is to stimulate China’s entry into overseas markets by developing economic partnerships among member states and strengthening connections through logistics infrastructure to achieve national energy security. With the extension of the going global system and further opening up to the outside world, not only has the volume of China’s OFDI increased, but the number of investment regions and investment industries has also expanded.

As the Chinese government continues to encourage the construction of the BRI and the “going global” strategy continues to expand, China’s OFDI levels have increased rapidly. The 2020 World Investment Report published by the United Nations Conference on Trade and Development (UNCTAD) shows that China became the largest developing country investor in 2019, ranking second in terms of OFDI flow and third only to the USA and the Netherlands in stocks globally. In the same year, China established more than 44,000 foreign direct investment enterprises in 188 regions around the world, accounting for nearly 80% of the world’s countries, investing in 433 projects in 18 major industries, including
energy, logistics infrastructure, manufacturing, agriculture, and services (UNC-TAD 2020).

China’s active promotion of foreign direct investment is not the unilateral purpose of economy, energy security, logistics infrastructure, and politics, but the multi-level effect of these factors. Specifically, its motives include expanding international trade and overseas markets, ensuring access to natural resources and transportation routes, increasing regional and global influence, and promoting national security. This expansion of power is especially true in Eurasia and Africa (Buckley et al. 2007; Cheung and Qian 2009).

Although host countries welcome China’s OFDI to promote economic development, it has also caused political and environmental issues and debt in host countries. China’s investment in the USA, Europe, Japan, and India has also caused severe fears and friction. Therefore, when examining China’s OFDI, it is necessary to consider the political environment, economic conditions, and geographical factors of the host country as well as the more traditional factors of domestic economy, energy, and logistics infrastructure (Hofman 2015; Tow and Envall 2011).

Since 2000, research into China’s OFDI has increased with China’s OFDI. However, existing research on investment location mainly focuses on the influence of individual factors such as the economy (Buckley et al. 2007; Cheung and Qian 2009; Zhang and Daly 2011), energy (Deng 2004; Hong and Sun 2006), policy (Cheung and Qian 2009; Cheng and Ma 2009), and infrastructure (Liu et al. 2018; Sheu and Kundu 2018; Chan et al. 2019; Wen et al. 2019; Ali et. 2021). As a result, there are limitations in considering the comprehensive connection between these factors. The interaction of many factors determines the location of foreign direct investment, so it needs to be analyzed from a broader perspective.

The purpose of this research is to analyze the impact of host country characteristics on the targeting of China’s OFDI, using economic, energy, logistics infrastructure, and political factors. In addition, it analyzes the differences in these factors in different geographical environments (coastal and landlocked countries). This study comprehensively analyzes the factors influencing Chinese OFDI and improves the existing research methodology. This study is the first to evaluate the contribution of the location determinants system, including the four elements of the economy, logistics, energy, and politics, to China’s OFDI by employing a vector error correction model.

Based on the previous discussion, this study addresses some critical research questions: (1) Can the host country improve the quality of its infrastructure (mainly logistics infrastructure) to attract China’s OFDI? (2) Are resource-rich countries better able to attract China’s OFDI than less rich countries? (3) Is China’s OFDI more inclined toward countries with advanced investment environments (mainly political)? And (4) Does China’s OFDI differ for coastal countries and landlocked countries? As a result, this study aims to identify the determinants that attract China’s OFDI to provide policy implications for countries seeking this investment—with a specific focus on developing countries.

The remainder of this paper is organized as follows. Section 2 provides a literature review. Section 3 introduces the variables and methods used. The empirical
results are shown in Sect. 4, and the model is validated in Sect. 5. Recommendations for China’s OFDI in developing countries are made in Sect. 6 as a conclusion.

2 Literature review

China needs to promote technological innovation and industrial upgrading and seek overseas markets with new growth potential to continue its strong economic growth. Therefore, in the context of the economic structural transformation and excess production capacity in China, the “going global” and BRI strategies have been proposed to support the realization of continued economic growth.

China’s current stage of economic development has further enhanced the credibility of the BRI. With structural changes in China’s domestic economy, its overseas investments have gradually shifted toward manufacturing instead of being limited to natural resource exploitation. China’s investment through the BRI specifically provides countries located along its route with additional incentives to participate in the initiative. Although the BRI offers a package of stimulus measures such as financing and convenient registration, which promotes investment, the differences and instability in the economic, logistics, political, and legal environments of the countries along the Belt and Road remain obstacles to investment by Chinese companies (Qi and Liu 2015).

2.1 Logistics infrastructure

In the context of globalization and intensified competition between countries, logistics plays a vital role in the competitiveness of countries. Commercial transactions and imports and exports are increasingly dependent on logistics efficiency and infrastructure, which significantly affect the overall competitiveness of nations (Saidi et al. 2020).

Roller and Waverman (2001) found that investment in logistics infrastructure increases a country’s economic growth, emphasizing the importance of a high-quality logistics system to attract foreign investment into the host country (see also Lu and Yang 2006; Hong 2007; Talley et al. 2014; Saidi et al. 2020). Khadarroo and Seetanah (2008), using a dynamic time series in a vector error correction model (VECM), found that infrastructure development has significantly increased the attractiveness of FDI. Lean et al. (2014) confirmed the long-term positive and two-way relationship between logistics infrastructure and economic growth using a dynamic structural model. Similarly, Evangelista and Sweeney (2009) and Chu (2012) pointed out that the importance of logistics exceeds the limits of private enterprises and has become the main engine of economic growth in developed and developing countries.

Logistics and transportation closely interact with each other. Infrastructure such as roads, railways, airports, and seaports are crucial for constructing an efficient intermodal transport system, allowing foreign companies to reduce their transport and storage costs and deliver orders faster and more reliably. This study considers
logistics capacity and the impact of logistics infrastructure quality and different modes of transportation not mentioned in the existing literature when examining Chinese OFDI.

### 2.2 Economy and energy

Generally speaking, larger host country markets attract more FDI and provide more opportunities for foreign investors. Therefore, the host country’s GDP is usually considered an essential determinant of FDI flows (Buckley et al. 2007; Chakrabarti 2001). Solarin and Shahbaz (2015) studied the relationships between Malaysia’s OFDI, capital and trade opening, and economic growth. They pointed out that OFDI and economic development, capital, and trade openness have positive correlations.

China’s international currency reserves and exports to developing countries promote FDI, indicating that some investment in developing countries promotes exports. However, China’s investment is driven by market-seeking and resource-seeking behaviors (Cheung and Qian 2009; Buckley et al. 2007). Further, Ye (1992) and Zhan (1995) also stated that ensuring a continuous supply of resource inputs is essential for China’s OFDI. Several researchers have shown that China tends to invest in natural resource-rich countries with coal, iron ore, and other resources (Cheng and Ma 2009; Deng 2004; Hong and Sun 2006; Morck et al. 2008). Pradhan (2017) use the example of Indian auto companies to study the technology spillovers of OFDI. Girma (2005), Kimura and Kiyota (2006), Melitz and Giancarlo (2008), and Mayer et al. (2016) have also verified the technology spillover effects of foreign direct investment from different studies.

Economic and energy factors are essential factors for China’s OFDI. Existing studies generally use variables such as GDP or international trade to represent the markets for investment in target countries. However, using a variable to represent an industry or sector has apparent limitations. There is no distinction between domestic and international markets. The same is true for the energy industry. Volatile energy, non-volatile energy, and technical resources are part of resources and should be used to express the energy factors of the target investment country. Unlike existing studies, this study uses a series of data to maximize the representation of the variables’ characteristics to overcome this limitation.

### 2.3 Policy factors

Abundant natural resources tend to be associated with poor institutional quality, such as laws, individual rights, and government regulation. Hajzler (2014) reported that countries with poor institutional quality tend to provide foreign investors with mineral acquisition rights at a low price to attract OFDI. Although the risks associated with resource expropriation are higher, these countries may have a larger share of OFDI in the resource sector.

Some researchers have shown that the investment behavior of Chinese companies is significantly affected by government policies. Through the approval
system and currency control mechanism, authorities can allocate OFDI according to national goals (Cheung and Qian 2009). The higher the openness of a country to international investors, the more attractive it is likely to be as a destination for FDI (Chakrabarti 2001).

Buckley et al. (2007) showed that China’s OFDI is significantly affected by political factors, finding that investment in countries with poor institutional governance is a significant characteristic of China’s OFDI (see also Ramasamy et al. 2012). Kolstad and Wiig (2012) used FDI flow data to examine the interaction between resources and institutions and their impact on Chinese investment. They found that Chinese investors prefer countries with abundant natural resources and poor political conditions. Ramasamy et al. (2012) found that state-owned enterprises tend to have a different attitude toward institutional risk compared to private enterprises, which tend to have a lower tendency to accept institutional risk. Moreover, the inflow of FDI is inversely proportional to the degree of corruption in the host country, both in the home and the host country. Hence, improved systems of governance significantly increase the FDI flow between two countries (Wei 2000; Bénassy-Quéré et al. 2007).

State-owned enterprises mainly carry out China’s OFDI as the principal investor (Zhao and Lee 2021). The BRI put forward by the Xi Jinping government and the investment in the member countries of the BRI all have a particular political color (Cheung and Qian 2009). The political factor is not only reflected in the political environment of the investment host country mentioned in existing studies, but also in the international relations between the target country and China. This additional aspect is included in our study.

Compared with existing research, this research has the following characteristics: first, considering the imperfectness of individual factors on the impact of Chinese OFDI, this study adopts a system of influencing factors consisting of several factors to study the location decision of China’s OFDI.

Second, the empirical methodology is improved. Most of the existing studies use one type of data to represent industries or sectors, which has limitations. In contrast, this study uses data series to represent the investment environment of investment host countries comprehensively and uses principal component analysis to reduce the dimensionality of the panel data.

Third, in contrast to existing research models, this research uses the VECM model to examine China’s OFDI’s short-term and long-term location determinants system simultaneously.

Finally, this research uses impulse response analysis and variance decomposition analysis to analyze the dynamic influencing factors of China’s OFDI, using a forecast model to predict the future trends of China’s OFDI.

As a result, the understanding of the role and impact of factors influencing OFDI has been improved. It complements existing studies of OFDI influencing factors and specifically those in relation to developing countries.
3 Methodology

3.1 Model specification

Economy, logistics, energy, and politics are all considered essential factors behind China’s OFDI because they meet its purpose and facilitate the accumulation of capital in host countries for investment and create more employment opportunities to promote their economic development. Based on previous research (Qi and Liu 2015; Buckley et al. 2007; Hong and Sun 2006; Li et al. 2018; Saidi et al. 2020), the Cobb–Douglas production function is considered in this study to reflect the impact of the independent variables on OFDI and is expressed as

\[
Y_t = f(E_t, K_t, L_t, P_t) = E_t^\alpha K_t^\beta L_t^\gamma P_t^\delta
\]

where \(Y\) denotes OFDI, \(E\) represents economy, \(K\) denotes energy, \(L\) denotes logistics, and \(P\) represents politics. \(\alpha\), \(\beta\), \(\gamma\), and \(\delta\) are the elasticity coefficients of economy, energy, logistics, and politics on OFDI, respectively. The log-linearized reduced version, which takes into account the comparison of the independent variables, is as follows (the estimated parameters are the OFDI elasticity of each regressor):

\[
\ln Y_t = \alpha_i + \lambda_i + \ln E_i + \alpha \ln K_i + \beta \ln L_i + \gamma \ln P_i + \varepsilon_{it}
\]

(2)

From Eq. (2), we use the panel data regression method to empirically research the relationship between the investment environment of host countries and China’s OFDI. \(\alpha_i\) is the cross-section fixed effect, \(\lambda_i\) is the time constant, and \(\varepsilon_{it}\) is the error term. We select several indicators from economy, energy, logistics, and political factors to represent the investment environment of host countries:

**Coastal country:**

\[
\ln OFDI_{it} = \gamma_0 + \gamma_{11} \ln DMAR_{it} + \gamma_{12} \ln IMAR_{it}
+ \gamma_{13} \ln VSOU_{it} + \gamma_{14} \ln VSOU_{it} + \gamma_{15} \ln TSOU_{it} + \gamma_{16} \ln INFQ_{it}
+ \gamma_{17} \ln SATC_{it} + \gamma_{18} \ln LATC_{it} + \gamma_{19} \ln DPOL_{it} + \gamma_{110} \ln IPOL_{it}
+ \alpha_i + \lambda_i + \varepsilon_{it}
\]

(3)

**Landlocked country:**

\[
\ln OFDI_{it} = \beta_0 + \beta_{21} \ln DMAR_{it} + \beta_{22} \ln IMAR_{it}
+ \beta_{23} \ln VSOU_{it} + \beta_{24} \ln VSOU_{it} + \beta_{25} \ln TSOU_{it} + \beta_{26} \ln INFQ_{it}
+ \beta_{27} \ln SATC_{it} + \beta_{28} \ln LATC_{it}
+ \beta_{29} \ln DPOL_{it} + \beta_{210} \ln IPOL_{it} + \alpha_i + \lambda_i + \varepsilon_{it}
\]

(4)

where \(\alpha_i\) is the cross-section fixed effect, \(\lambda_i\) is the time constant, and \(\varepsilon_{it}\) is the error term. Considering that the traditional ordinary least squares estimation technique might result in a biased estimation because of the presence of endogeneity and serial correlation (Arellano and Bond 1991; Blundell and Bond 1998), we consider the model as per Pedroni (2001) and Li et al. (2018). Then, we conducted a panel-based VECM to evaluate the short- and long-term impacts of the target country’s
investment environment in terms of economy, energy, logistics, and politics on China’s OFDI. The optimal lag order is determined according to the unconstrained vector autoregressive model and multiple information criteria. The VECM is as follows:

\[
\Delta \ln OFDI_t = \delta + \delta_{11} \Delta \ln DMAR_{it} + \delta_{12} \Delta \ln IMAR_{it} \\
+ \delta_{13} \Delta \ln VSOU_{it} + \delta_{14} \Delta \ln NVSO_{it} + \delta_{15} \Delta \ln TSOU_{it} \\
+ \delta_{16} \Delta \ln INFO_{it} + \delta_{17} \Delta \ln SATC_{it} + \delta_{18} \Delta \ln LATC_{it} \\
+ \delta_{19} \Delta \ln DPOL_{it} + \delta_{110} \Delta \ln IPOL_{it} \\
+ \nu EC_{t-1} + \alpha_i + \lambda_t + \epsilon_t
\]  

(5)

\[
EC_{t-1} = \ln OFDI_{it-1} - \delta - \epsilon_{11} \ln DMAR_{it-1} \\
- \epsilon_{12} \ln IMAR_{it-1} - \epsilon_{13} \ln VSOU_{it-1} - \epsilon_{14} \ln NVSO_{it-1} \\
- \epsilon_{15} \ln TSOU_{it-1} - \epsilon_{16} \ln INFO_{it-1} \\
- \epsilon_{17} \ln SATC_{it-1} - \epsilon_{18} \ln LATC_{it-1} \\
- \epsilon_{19} \ln DPOL_{it-1} - \epsilon_{110} \ln IPOL_{it-1}
\]  

(6)

where \(\Delta\) is the first difference, \(EC_{t-1}\) is the error correction term, \(\nu\) is the revision coefficient, \(\delta\) is a constant, \(\delta_{1i}\) represents the short-term relationship between OFDI and the independent variables, and \(\epsilon_{1i}\) represents the long-term relationship. \(\alpha_i\) is the country fixed effects, \(\lambda_t\) is the time fixed effects, and \(\epsilon_t\) is the error term.

### 3.2 Variables

Previous studies have primarily used one type of datum to represent the attribute of a variable. For example, Liu et al. (2001), Kang and Jiang (2012), and Ramasamy et al. (2012) used GDP to represent market capacity, GDP per capita to represent labor costs, and telephone lines per 100 people to represent infrastructure. Saidi et al. (2020) used the length of roads and the number of individuals using the Internet (% of the population) to describe transport and logistics infrastructure. However, there are limitations in using only one data source to represent the entire industry. Therefore, based on the investment motives in Dunning’s (1988) foreign investment theory, we collected as many variables related to foreign investment motives as possible and used principal component analysis to carry out dimensionality reduction on the data.

To test the suitability of the principal component analysis, we first tested the variables using the Kaiser–Meyer–Olkin (KMO) test and Bartlett’s test of sphericity. The correlation between the variables is judged by comparing the size of the simple correlation coefficient with the partial correlation coefficient between the variables. When the correlation is strong, the partial correlation coefficient is much smaller than the simple correlation coefficient, and the KMO value is close to 1. Bartlett’s test is used to examine whether the correlation matrix is a unit matrix, that is, whether each variable is independent. It takes the correlation coefficient matrix of the variables as the starting point and the null hypothesis that the correlation coefficient matrix is a unit matrix.
Table 1  KMO and Bartlett’s tests

| Variable group | Economy | Logistics | Energy | Politics |
|----------------|---------|-----------|--------|----------|
| KMO Measure of Sampling Adequacy | 0.666 | 0.548 | 0.766 | 0.865 |
| Bartlett’s Test of Sphericity | 4658.130 | 4370.949 | 7946.666 | 10,372.621 |
| Approx. Chi-square | df | 6 | 21 | 28 | 21 |
| Sig | 0.000 | 0.000 | 0.000 | 0.000 |

Table 1 shows the results of the KMO and Bartlett’s tests. The KMO values are both greater than 0.5, and the significance levels of Bartlett’s test are both less than 1%. Therefore, the correlation coefficient matrix is significantly different from the identity matrix. According to the KMO metric provided by Kaiser (1974), the original variables are suitable for factor analysis. "Appendix 1" presents the results of the principal component analysis. Altogether, 32 variables are summarized into nine independent variables.

3.3 Data source

China’s OFDI varies significantly by geographic area, economy, energy, and logistics. After removing samples with missing variables and tax havens, we obtain a dataset consisting of the panel data for 138 member countries (102 coastal countries and 36 landlocked countries) of the BRI from 2007 to 2019. Compared with time-series and cross-sectional data, panel data provides more information and allows higher degrees of freedom, thereby improving forecasting accuracy (Lee and Chang 2008). "Appendix 1" also shows the proxies used for the main variables and data sources. Considering that Chinese investment in offshore financial markets such as Hong Kong, the Cayman Islands, and the British Virgin Islands is mainly for reinvestment, this is excluded from our analysis. Our dependent variable is China’s annual FDI flows into a host country. "Appendix 2" shows the descriptive statistics of the variables.

4 Empirical results

As shown in Fig. 1, we identified the variables after the model specification and, following variable selection, conducted the empirical analysis. To avoid the possibility of spurious regression and ensure the validity of the estimation, we tested the data prior to estimating the VECM model. The first step was to use the panel unit root test to test the stationarity of the time-series data, as the panel unit root test has higher power than the unit root test based on individual time series (Mahadevan and...
Asafu-Adjaye 2007). In the second step, to avoid spurious regression, we conduct a cointegration test of the long-term equilibrium relationships between the variables (Yuan and Kuang 2010). Compared with traditional cointegration analysis, panel cointegration can reduce the collinearity between variables and allows heterogeneity between countries (Mahadevan and Asafu-Adjaye 2007). Finally, we used the VECM to measure the short- and long-term relationships. "Appendix 3" shows the correlation matrix. The correlation coefficients between variables are all less than 0.7, indicating no autocorrelation problem between variables.

**Fig. 1** Analysis process

- Model Specification
  - Variables
  - KMO and Bartlett's Test: Test the Suitability of Principal Component Analysis
  - Principal Component Analysis: Data Dimension Reduction

- Variable Detection
  - Correlation Matrix: Multicollinearity Detection
  - Panel Unit Root Test: Stability Test of Variables
  - Panel Cointegration Analysis: Long term Equilibrium Test

- Empirical Analysis
  - VECM Model: Regression Analysis both long term and short term
    - Granger Grange Causality Test: Causality Analysis
    - Impulse Response Analysis: Dynamic Impact Analysis
    - Variance Decomposition Analysis: Contribution Analysis between Variables

- Forecast Analysis
To avoid the pseudo-regression problem, we first conducted a panel unit root test on the variables to detect their stability (Li et al. 2018). The literature suggests that panel-based unit root tests have higher power than unit root tests on individual time series. The panel tests have two components. The first is the same root process tests, including LLC’s test (Levine et al. 2002), and the IPS statistic (Im et al. 2003), and the other is for different root process tests, including the ADF-Fisher Chi-square test and PP-Fisher Chi-square test (Dickey and Fuller 1979). We adopted these four tests and presented the results in Tables 2 and 3. Given the inconsistency among the four tests’ effects, we adopted the Fisher tests (ADF-Fisher and PP-Fisher) because these tests are more suited than the other tests for a finite sample with a random component (Maddala and Wu 1999). The results confirm that all variables’ level data and first difference data are stationary for coastal and landlocked countries.

4.1 Panel unit root test

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4.2 Panel cointegration analysis

We conducted a panel cointegration test to test a long-term equilibrium relationship between OFDI and the variables. To perform the cointegration test, we employed Kao’s (1999) test, which uses the regression residuals to construct test statistics and is suitable for homogeneous and heterogeneous panel data. Table 4 presents the
results. The Kao statistics of landlocked and coastal countries significantly reject the null hypothesis of non-cointegration, indicating a cointegration relationship between China’s OFDI and the independent variables, i.e., there is a long-term equilibrium relationship between them.

### 4.3 Empirical results

#### 4.3.1 Empirical results of coastal countries

Table 5 presents the estimation results for coastal countries. The negatively significant coefficients of lagged EC confirm the long-run equilibrium in the model; OFDI adjusts from shock toward a long-run equilibrium at a speed of about 0.987. This is as expected, indicating that markets, energy, and logistics infrastructure influence China’s OFDI.

The economic variable (ECON) and volatility energy (VSOU) are shown to positively impact China’s OFDI in the short and long term. This proves that China’s OFDI is biased toward countries with dynamic markets and abundant energy resources such as oil and natural gas in both the short and long term (Cheung and Qian 2009; Hayakawa et al. 2013; Chang 2014; Hajzler 2014).

In a divergence from the earlier research of Chang (2014) and Cheng and Ma (2007), the results for technology resources (TSOU) show a negative impact on
China’s OFDI both in the short and long term. This indicates that while China’s OFDI focuses on countries rich in natural resources, it is also interested in those with undeveloped technology. Investing in countries with abundant natural resources can provide energy for exporting to China, thus ensuring China’s energy security. At the same time, investment in countries lacking technological resources is conducive to increasing China’s manufacturing exports. Because the manufacturing industry in countries with less advanced technology is also a concern, importing technology and products has become an excellent way to improve the technical level rapidly (Hobday 2003).

In terms of logistics infrastructure and political factors, only land transportation capacity (LATC) is shown to positively impact the short term (Iwanow and Kirkpatrick 2009). It shows that in the long run, compared with logistics infrastructure and political factors, China’s OFDI is more inclined to consider economic and energy factors in coastal countries. An active market is more conducive to the sale of the products of the investing companies and a high level of bilateral trade.

### 4.3.2 Empirical results of landlocked countries

Table 6 presents the estimation results for landlocked countries. The negatively significant coefficients of lagged EC confirm the long-term equilibrium in the model; OFDI adjusts from the shock toward the long-run equilibrium at a speed of about 1.113.

| Variable  | Coefficient | Std. Error | t-Statistic | Prob.  |
|-----------|-------------|------------|-------------|--------|
| Long term |             |            |             |        |
| ECON      | −0.766***   | 0.140      | −5.458      | 0.000  |
| NVSO      | 0.043       | 0.048      | 0.893       | 0.372  |
| VSOU      | 0.341*      | 0.196      | 1.742       | 0.082  |
| TSOU      | −0.055      | 0.059      | −0.923      | 0.356  |
| INFQ      | −0.193**    | 0.089      | −2.169      | 0.031  |
| SATC      | −0.055      | 0.101      | −0.447      | 0.655  |
| LATC      | −0.527***   | 0.171      | −3.073      | 0.002  |
| DPOL      | −0.102      | 0.193      | −0.528      | 0.598  |
| IPOL      | −0.009      | 0.035      | −0.255      | 0.799  |
| Short term|             |            |             |        |
| ΔECON     | −0.761***   | 0.106      | −7.184      | 0.000  |
| ΔNVSO     | 0.079**     | 0.034      | 2.337       | 0.020  |
| ΔVSOU     | 0.402***    | 0.138      | 2.925       | 0.004  |
| ΔTSOU     | −0.040      | 0.041      | −0.978      | 0.329  |
| ΔINFQ     | −0.340**    | 0.150      | −2.275      | 0.024  |
| ΔSATC     | −0.096      | 0.064      | −1.502      | 0.134  |
| ΔLATC     | −0.068      | 0.077      | −0.890      | 0.374  |
| ΔDPOL     | −0.237*     | 0.132      | −1.796      | 0.073  |
| ΔIPOL     | 0.005       | 0.024      | 0.199       | 0.842  |
| EC        | −1.113***   | 0.051      | −21.671     | 0.000  |

*, **, and ***Indicate significance at 10%, 5%, and 1%, respectively
Economic factors negatively impact China’s OFDI in the short and long term. This indicates that China’s OFDI is biased toward economically undeveloped countries in the short- and long-term. This is a significant difference, showing that while China is more interested in economically developed coastal countries, it is more interested in financially undeveloped landlocked countries. One reason may be that markets in landlocked countries face more uncertainty (Faye et al. 2004).

Non-volatile energy (NVSO) shows positive effects in the short term, and volatile energy sources (VSOU) demonstrate positive results in both the short and long term. This indicates that whether it is a coastal or landlocked country, China’s OFDI tends to be focused on more resource-rich countries in both the short and long term.

What’s interesting is that our research differs from other research findings such as Ekici et al. (2016) and Halaszovich and Kinra (2020) in that the infrastructure quality (INFQ) and land transportation capacity (LATC) is shown to harm China’s OFDI in the long term. This suggests that China’s OFDI prefers landlocked countries with undeveloped infrastructure and logistics capabilities. It is most conducive for China to use its strong logistics infrastructure construction capabilities in these countries.

In terms of political factors, the results show no difference between Buckley et al. (2007), Kolstad and Wiig (2012), and Ramasamy et al. (2012). Domestic politics (DPOL) has a negative impact in the short term, indicating that China’s OFDI prefers landlocked countries with undeveloped domestic political environments. Unlike private enterprises, which tend to favor countries with lower political risks, state-owned enterprises may invest in countries with a higher political risk (Ramasamy et al. 2012). Most of China’s OFDI flows into developing countries, and these countries as a whole generally have a higher level of political risk. Chinese companies’ relative lack of experience in establishing and managing large-scale overseas investments may contribute to insufficient investigation and risk assessment when carrying out OFDI projects (Wong and Chan 2003; Ma and Andrews Speed 2006), or it could be they are prepared to take on this higher risk with the backing of the Chinese government as part of the larger picture of China’s OFDI strategy. Our analysis of political risk also found potential flaws in political risk measurement standards, which are usually calculated from the perspective of developed countries. Such indexes may need to be recalculated to capture better the views from emerging economies such as China (Buckley et al. 2007).

5 Model validation

5.1 Empirical results of the panel Granger causality test

To further analyze the causal relationship between China’s OFDI and the investment environment of host countries, panel Granger causality tests were used to test the variables of coastal and landlocked countries. Table 7 shows that there is a unidirectional relationship between OFDI and the ECON in coastal countries, compared to a bidirectional causality relationship from the ECON to OFDI in landlocked countries. China’s OFDI is therefore seen to promote the development of the host country’s ECON and vice versa. However, although the ECON
of coastal countries may attract China’s OFDI, the latter does not significantly promote their development.

There is a bidirectional relationship between OFDI and TSOU for the energy group in coastal countries. Furthermore, there is a bidirectional relationship between OFDI and SATC for the logistics group in coastal and landlocked countries and bidirectional causality from LATC to OFDI in landlocked countries. There is a unidirectional relationship between DPOL, IPOL, and OFDI for the political group in coastal and landlocked countries. Compared to the market-based (dumping of goods) model of developed countries, China’s OFDI model, based on logistics infrastructure and energy of host countries and political factors, can actively attract China’s OFDI.

### 5.2 Impulse response analysis

Although the VECM model is good at illustrating the short-term and long-term effects between variables, it cannot explain the dynamic effects of changes over time. To overcome this, we conducted impulse response analysis and variance decomposition analysis. Impulse response analysis, in particular, is very effective at observing the impact of a unit shock imposed by a specific variable on other variables.

| Null hypothesis: | Coastal countries | Landlocked countries |
|------------------|--------------------|----------------------|
|                  | $F$-Stat | Prob. | $F$-Stat | Prob. |
| ECON → OFDI      | 6.103*** | 0.002 | 13.630*** | 0.000 |
| OFDI → ECON      | 1.774   | 0.170 | 4.518*   | 0.011 |
| NVSO → OFDI      | 1.225   | 0.294 | 0.312    | 0.732 |
| OFDI → NVSO      | 1.713   | 0.181 | 6.923*** | 0.001 |
| VSOU → OFDI      | 4.162** | 0.016 | 23.722***| 0.000 |
| OFDI → VSOU      | 4.912***| 0.008 | 2.348*   | 0.097 |
| TSOU → OFDI      | 5.613***| 0.004 | 8.338*** | 0.000 |
| OFDI → TSOU      | 24.556***| 0.000 | 0.023    | 0.977 |
| INFQ → OFDI      | 0.916   | 0.400 | 32.452***| 0.000 |
| OFDI → INFQ      | 15.532***| 0.000 | 0.105    | 0.901 |
| SATC → OFDI      | 16.367***| 0.000 | 21.525***| 0.000 |
| OFDI → SATC      | 29.086***| 0.000 | 19.623***| 0.000 |
| LATC → OFDI      | 17.383***| 0.000 | 31.215***| 0.000 |
| OFDI → LATC      | 0.702   | 0.496 | 6.586*** | 0.002 |
| DPOL → OFDI      | 32.498***| 0.000 | 1.724    | 0.180 |
| OFDI → DPOL      | 0.825   | 0.438 | 11.171***| 0.000 |
| IPOL → OFDI      | 4.057** | 0.018 | 0.975    | 0.378 |
| OFDI → IPOL      | 2.182   | 0.113 | 6.129*** | 0.002 |

*, **, and *** Indicate significance at 10%, 5%, and 1%, respectively.
The impulse response function describes the impact of the endogenous variables (current value and future value) when imposing one standard deviation of the size of the effect on the random error. For the VECM, the emphasis is not on a specific parameter of the model but on the analysis of the direction of the impulse response of each variable in the system, time delay effect, and stability process. To study the impact of the investment environment on China’s OFDI and clarify the current and future effects of a standard deviation shock from the random error term on the endogenous variables, this study employs the generalized impulse responses following Koop et al. (1996) and Pesaran and Shin (1998). The impulse response function curve is obtained when impulse responses of the variables are illustrated for 10 periods.

As shown in Fig. 2, the variable OFDI (lnY) has a certain lag. With a one standard deviation rise in the VSOU, and SATC, the effect of OFDI (lnY) turns positive in three periods, and other periods show weak adverse effects. In the long run, only the INFQ continues to have a promotion effect on FDI (lnY); ECON, NVSO, TSOU, LATC, DPOL, and IPOL have a negative effect on FDI (lnY), only NVSO has a weak negative impact, and all other variables show significant adverse effects. This indicates that the economics variable ECON, energy variables (NVSO, TSOU), logistics variable LATC, and politics variables (DPOL, IPOL) have a negative effect on OFDI (lnY) in the long term, and only INFQ has a positive impact on OFDI (lnY) in the long term. Overall, VSOU and SATC show weak adverse effects. The
results of NVSO, TSOU, LATC, IPOL, and DPOL are consistent with the empirical analysis results and are negative in the long term.

Figure 3 shows the impulse response relationship between the investment environment variables of landlocked countries and China’s OFDI. Regarding the influence of independent variables on OFDI, the impact of OFDI (lnY) has a certain lag. With a one standard deviation rise in the VSOU, SATC, the effect of OFDI (lnY) is negative in three periods. With a one standard deviation rise in the INFQ, the OFDI (lnY) effect only becomes positive in the second period. In the long run, the ECON, NVSO, and LATC show a negative impact, and DPOL and IPOL show a positive effect. ECON, VSOU, INFQ, and LATC are consistent with the empirical analysis results. ECON, INFQ, and LATC are negative, and VSOU is positive in the long term.

5.3 Variance decomposition analysis

Variance decomposition analysis is an analysis that measures the relative importance of individual variables in the model. Compared with impulse response analysis, variance decomposition analysis can observe the contribution rate of other variables to a specific variable and analyze the mutual influence and intensity between variables.

Variance decomposition is a statistical method for uncovering simplifying structures in a large set of variables. The technique uses the predicted variance in the variables at different points in time to explain the other impacts and compare the magnitude of the variables. The VECM adopts the variance decomposition method.
for its decomposition analysis. Compared with impulse response analysis, variance decomposition can analyze the intensity of the relationships between variables by examining the variance contribution rate of each structural shock to the change in the endogenous variables. We set the number of periods to ten. Tables 8 and 9 show the variance decomposition results.

In coastal countries, OFDI’s volatility is primarily affected by itself. Although the variance contribution rate of ECON to INFQ drop from 17.79% to 17.68%, the former still has a solid ability to explain the latter. The variance contribution rate of the OFDI and ECON to IPOL reaches 25.41% and 17.92%, indicating that OFDI and ECON have a reliable explanatory power for LATC. The variance contribution rate of the OFDI to ECON is 25.41%, meaning that OFDI has solid explanatory power.

Table 8 Results of the variance decomposition (coastal countries)

| Period | OFDI | INFQ | LATC | OFDI | INFQ | ECON | LATC | OFDI | ECON |
|--------|------|------|------|------|------|------|------|------|------|
| 1      | 100.00 | 74.97 | 17.79 | 48.94 | 19.90 | 22.03 |
| 5      | 83.09  | 67.24 | 17.70 | 43.96 | 22.47 | 18.45 |
| 10     | 81.04  | 67.19 | 17.68 | 41.77 | 25.41 | 17.92 |

Table 9 Results of the variance decomposition (landlocked countries)

| Period | OFDI | VSOU | TSOU | OFDI | VSOU | ECON | TSOU | OFDI | ECON | INFQ | INFQ | ECON | NVSO |
|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1      | 100.00 | 88.44 | 5.63  | 56.88 | 33.48 | 89.40 | 5.01  | 1.17  |
| 5      | 70.53  | 59.80 | 15.41 | 45.08 | 34.09 | 48.43 | 10.10 | 13.70 |
| 10     | 63.07  | 57.04 | 15.26 | 44.42 | 34.25 | 47.56 | 10.27 | 14.27 |

| Period | SATC | LATC | DPOL |
|--------|------|------|------|
| 1      | 38.41 | 5.63  | 43.72 | 61.07 | 8.81  | 55.90 | 27.34 |
| 5      | 29.29 | 12.31 | 36.46 | 41.13 | 21.06 | 39.06 | 23.28 |
| 10     | 28.75 | 12.30 | 36.34 | 34.25 | 26.89 | 38.43 | 22.97 |
for ECON. The variance contribution rate of the ECON to VSOU and TSOU is 11.85% and 26.32%, respectively, indicating that ECON has solid explanatory power for VSOU and TSOU. The contribution rate of variance among the other variables is less than 10%, showing weak explanatory power.

OFDI’s variance decomposition drops from 100% to 63.07% for landlocked countries, indicating that its volatility is primarily affected by itself. The variance decomposition rate of ECON to VSOU, TSOU, INFQ, SATC, and DPOL is greater than 10%, which shows that ECON has a good ability to explain them. The variance decomposition rate of the OFDI to SATC and LATC is greater than 10%, indicating that the OFDI has relatively good explanatory power for transportation capacity. The variance decomposition rate of the NVSO to the variance in INFQ is greater than 10%, indicating that the NVSO has relatively good explanatory power for INFQ. The variance decomposition rate among the other variables is less than 10%, indicating weak explanatory power.

5.4 AUTO-ARIMA forecast analysis

To understand the growth trend behind China’s OFDI, we conducted a forecast analysis of China’s OFDI in coastal and landlocked countries after the empirical research. Due to a lack of recent data from the Ministry of Commerce in China, we used the 2007–2020 data from the American Enterprise Institute to forecast 2021–2025. To verify China’s OFDI model, we used the AUTO-ARIMA model to predict China’s OFDI. The ARIMA model requires the model residuals to be white noise, and we conducted a white noise test using the Q statistic test, i.e., the residuals have no autocorrelation. Combining the AIC (Akaike Information Criterion: the lower the value, the better) and Q statistics results shows the model meets the requirements.

| Year | Coastal | Growth rate | Landlocked | Growth rate |
|------|---------|-------------|------------|-------------|
| 2007 | 36,558  | –           | 36,658.15  | –           |
| 2008 | 53,488  | 46.31%      | 53,768.14  | 46.67%      |
| 2012 | 79,878  | 2.79%       | 81,808.12  | 0.99%       |
| 2016 | 123,838 | – 4.43%     | 127,948.1  | – 5.02%     |
| 2020 | 42,830  | – 57.49%    | 45,110     | – 55.62%    |
| 2021 | 108,406 | 153.11%     | 112,158    | 148.63%     |
| 2022 | 112,721 | 3.98%       | 116,712    | 4.06%       |
| 2023 | 117,036 | 3.83%       | 121,266    | 3.90%       |
| 2024 | 121,351 | 3.69%       | 125,820    | 3.76%       |
| 2025 | 125,666 | 3.56%       | 130,374    | 3.62%       |

Information Criterion

AIC: 318.442
BIC: 320.998
Q-sta: 0.112
P-sta: 0.738

AIC: 318.184
BIC: 320.741
Q-sta: 0.050
P-sta: 0.823
Table 10 shows the forecast results. With the global economic slowdown and influence of the COVID-19 epidemic that emerged in late 2019 and spread globally in 2020, the global OFDI market has faced unprecedented pressure and challenges. The FDI growth rate of coastal and landlocked countries is shown to have declined from 46% in 2008 to −57% and −55% in 2020, respectively. The forecast results for coastal and landlocked countries indicate, however, that the overall impact of the pandemic on OFDI is likely to be short term in nature and could return to positive growth as soon as 2021—the predicted growth rates are 153.11% and 148.63%, respectively, before falling back between 3.5% and 4%.

6 Conclusion

China’s OFDI strategy is an ambitious plan to strengthen the ties between China and other Asian, African, and European countries by transferring domestic overproduction and capital to countries with weak infrastructure and/or are underdeveloped. The BRI offers these countries an opportunity to improve their logistics infrastructure, develop energy resources, and benefit from these development projects.

Our analysis provides significant evidence that China’s OFDI focuses on countries with abundant natural resources and undeveloped technology, implying that investment in volatile and non-volatile natural resources can ensure China’s energy security through investment, development, and import processes. At the same time, investment in countries lacking technological resources is conducive to expanding China’s manufacturing exports. This is because the manufacturing industry in countries with less advanced technology is also a concern, importing technology and products has become an excellent way to improve the technical level rapidly (Hobday 2003). Our findings suggest that good logistics infrastructure and stable political environments show a negative impact on China’s OFDI. Specifically, the underdeveloped logistics infrastructure facilitates China’s ability to exert a robust transportation infrastructure. In turn, good logistics infrastructure is essential for energy development as it provides the ability to develop the energy resources of the target country. As state-owned enterprises have shown a strong preference for political risks (Kolstad and Wiig 2012; Ramasamy et al. 2012), most of China’s OFDI flows to developing countries occur where the overall level of political risks is generally high. In addition, the relative lack of experience of Chinese enterprises in overseas investments could also be seen as one reason for investing in a country with a higher political environment risk compared to other more experienced investors (Wong and Chan 2003; Ma and Andrews Speed 2006).

Our study shows that China’s OFDI is different from traditional investment models in terms of location determinants. It is suggested that developing countries should learn from China’s OFDI experience and governments of investment recipient countries formulate or adjust their policies accordingly to benefit from this new style investment model. For example, developing countries could prioritize investment in different areas, industries, and sectors. Transport sectors in developing countries can use China’s logistics infrastructure investment expertise to transform
or build new infrastructure. Energy sectors in developing countries can also use China’s concern for energy to develop energy resources.

Energy companies in the countries they invest in should actively seek cooperation and pursue an outward-looking policy, using China’s technology to improve their production systems and access to China’s vast market to achieve industrial profitability. Governments are recommended to establish a favorable policy framework to encourage companies to adopt FDI. This can be achieved by removing institutional and legal barriers to OFDI, reducing or waiving taxes for investing companies and local enterprises, creating opportunities for fair adoption of investment, and establishing efficient information sharing platforms.

This study analyzes and outlines China’s unique system of outward FDI influencing site selection determinants, with China’s outward FDI as the subject. China’s OFDI model driven by trade and market access provides significant opportunities for developing countries to improve infrastructure and develop natural resources, compared to the traditional investment models of developed countries.

Our study has some limitations: we did not examine the spillover effects of regional logistics infrastructure and did not include a spatial correlation analysis of the model. New economic geography theory incorporates spatial factors into the study of economic equilibria, opening up a new era of economic research. Hence, future research aims to establish models at different geographical levels to test the regional spillover effects.

**Appendix 1: Definitions and principal components of the variables**

| Variable (principal component) | Definition | Source | References |
|-------------------------------|------------|--------|------------|
| OFDI                          | OFDI       | Foreign direct investment (million $) | Ministry of commerce in China | Kang and Jiang (2012) |
| Market (ECON)                | PGDP       | PGDP (million $) | World Bank | Kang and Jiang (2012); Ramasamy et al. (2012) |
|                              | GDP        | GDP (million $) | World Bank | Buckley et al. (2007) and Zhao and Lee (2020) |
|                              | IMPO       | Imports ($)    | WTO        | Buckley et al. (2007) and Zhao and Lee (2020) |
|                              | EXPO       | Exports ($)   | WTO        | Buckley et al. (2007) and Zhao and Lee (2020) |
|                              | AIIBS      | AIIB share ($) | https://www.aiib.org/en/index.html | Buckley et al. (2007) and Zhao and Lee (2020) |
| Non-volatile energy (NVSO)   | ORER       | Ore reserves (/) | BP Statistical Review 2020 | Zhao and Lee (2020) |
|                              | PORE       | Ores and metals exports (% of merchandise exports) | World Bank World Development Indicators | Zhao and Lee (2020) |
| Variable (principal component) | Definition | Source | References |
|-------------------------------|------------|--------|------------|
| Volatile energy (VSOU)        | OILR       | Oil reserves (barrels) | BP Statistical Review 2020 | Cheng and Ma (2007) |
|                               | GASR       | Gas reserves (trillion cubic meters) | BP Statistical Review 2020 |
|                               | PFUE       | Fuel exports (% of merchandise exports) | World Bank World Development Indicators |
| Technical resources (TSOU)    | PATE       | Patent applications, residents (/) | World Bank World Development Indicators | Ramasamy et al. (2012) |
|                               | PMAN       | Manufacturing exports (% of merchandise exports) | World Bank World Development Indicators | Bevan and Estrin (2004) |
|                               | PHTE       | High-technology exports (% of manufactured exports) | World Bank World Development Indicators | Zhao and Lee (2020) |
| Infrastructure quality (INFQ) | PORQ       | Quality of port infrastructure (1–7) | Global competitiveness report 2006–2018 | Zhao and Lee (2020) |
|                               | ROAQ       | Quality of roads (1–7) | Global competitiveness report 2006–2018 |
|                               | AIRQ       | Quality of air transport infrastructure (1–7) | Global competitiveness report 2006–2018 |
|                               | RAIQ       | Quality of railroad infrastructure (1–7) | Global competitiveness report 2006–2018 |
| Shipping capacity (SATC)      | PTRA       | Container port traffic (TEU) | World Bank World Development Indicators | Saidi et al. (2020); Micco and Serebrisky (2006) |
|                               | LSCI       | Liner shipping connectivity index (/) | World Bank World Development Indicators |
|                               | MOCS       | Mobile cellular subscriptions (per 100 people) | World Bank World Development Indicators |
| Land transportation capacity (LATC) | RTRA     | Railways, goods transported (million ton/km) | World Bank World Development Indicators |
|                               | RLIN       | Rail lines (km) | World Bank World Development Indicators |
|                               | DIST       | Distance (km) | Google Maps |
|                               |            |            |            |
| Variable (principal component) | Definition | Source | References |
|--------------------------------|------------|--------|------------|
| Domestic politics (DPOL)       |            |        |            |
| RULA                           | Rule of law (/) | Worldwide Governance Indicators | Kang and Jiang (2012); Zhao and Lee (2020); Ramasamy et al. (2012) |
| COCO                           | Control of corruption (/) | Worldwide Governance Indicators |            |
| GOEF                           | Government effectiveness (/) | Worldwide Governance Indicators |            |
| REQU                           | Regulatory quality (/) | Worldwide Governance Indicators |            |
| VOAC                           | Voice and accountability (/) | Worldwide Governance Indicators |            |
| POST                           | Political stability and absence of violence/terrorism (/) | Worldwide Governance Indicators |            |
| International politics (IPOL)  |            |        |            |
| OPEN                           | Openness (%) | Author statistics according to WTO data | Liu et al. (2017); Kang and Jiang (2012) |
| CDIS                           | Cultural distance (/) | Hofstede’s cultural distance |            |
| PREV                           | President’s visits, number (/) | Chinese Foreign Ministry |            |

### Appendix 2: Descriptive statistics of the variables

| Variable | Observations | Mean   | Median | Maximum | Minimum | SD    |
|----------|--------------|--------|--------|---------|---------|-------|
| OFDI     | 1716         | 3.564  | 4.021  | 6.700   | −3.000  | 1.919 |
| ECON     | 1716         | 0.000  | 0.036  | 2.313   | −5.547  | 1.000 |
| NVSO     | 1716         | 0.000  | −0.377 | 5.587   | −0.711  | 1.000 |
| VSOU     | 1716         | 0.000  | −0.343 | 5.446   | −0.834  | 1.000 |
| TSOU     | 1716         | 0.000  | −0.171 | 3.519   | −1.121  | 1.000 |
| INFQ     | 1716         | 0.000  | 0.105  | 2.825   | −1.704  | 1.000 |
| SATC     | 1716         | 0.000  | 0.161  | 3.137   | −2.630  | 1.000 |
| LATC     | 1716         | 0.000  | −0.144 | 2.428   | −3.581  | 1.000 |
| DPOL     | 1716         | 0.000  | −0.066 | 2.693   | −2.971  | 1.000 |
| IPOL     | 1716         | 0.000  | −0.117 | 3.501   | −3.878  | 1.000 |
Appendix 3: Correlation matrix

| Variable | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   |
|----------|------|------|------|------|------|------|------|------|------|------|
| OFDI     | 1.00 |      |      |      |      |      |      |      |      |      |
| ECON     | 0.38 | 1.00 |      |      |      |      |      |      |      |      |
| NVSO     | 0.12 | −0.03| 1.00 |      |      |      |      |      |      |      |
| VSOU     | 0.23 | 0.41 | 0.00 | 1.00 |      |      |      |      |      |      |
| TSOU     | 0.23 | 0.58 | 0.00 | 0.00 | 1.00 |      |      |      |      |      |
| INFQ     | 0.05 | 0.39 | 0.08 | 0.02 | 0.41 | 1.00 |      |      |      |      |
| SATC     | 0.23 | 0.43 | 0.01 | 0.12 | 0.41 | 0.00 | 1.00 |      |      |      |
| LATC     | 0.30 | 0.43 | −0.11| 0.19 | 0.28 | 0.00 | 0.00 | 1.00 |      |      |
| DPOL     | 0.08 | 0.24 | −0.07| −0.11| 0.37 | 0.35 | −0.02| 0.09 | 1.00 |      |
| IPOL     | 0.22 | 0.26 | 0.03 | 0.21 | 0.27 | 0.04 | 0.19 | 0.17 | 0.00 | 1.00 |

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