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Determinants of FDI from Visegrad countries in China and India: Long-term and short-term perspectives

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Abstract. This study investigates the determinants of Foreign Direct Investment (FDI) from the Visegrad Group (Poland, Czechia, Slovakia, and Hungary) in China and India. Using a panel autoregressive distributed lag (panel-ARDL) approach with stacked time-series data for 2006–2021, we identify both short- and long-run effects of host-country factors on outward FDI stocks. The results reveal that GDP per capita (market size) and trade openness (policy framework determinant) are significant and positive drivers of Visegrad FDI into China and India in the long run. In contrast, labour costs (efficiency-related determinant), inflation (policy framework), and R&D expenditures (strategic assets-related determinant) exert no significant long-term effects. Short-run dynamics, however, indicate that changes in labour costs, trade openness, and R&D expenditures are associated with higher outward FDI. Overall, the findings underscore the dominant influence of market size and openness in shaping the long-run investment patterns of Visegrad economies, while highlighting short-run sensitivities to cost and innovation-related factors.

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1. Introduction

In the pre-transition period and at the start of the transition in 1990, the foreign investment activity of companies from Visegrad countries (V4) was negligible. A significant increase in their FDI outward stocks occurred after they acceded to the European Union (EU) in 2004. During 2006-2021, its value grew at an average annual rate of 12.6%. At the end of 2021, the Czech Republic had the largest share in the group's overall FDI outward stocks (41.5%; U.S. Dollars 54.3 billion), followed by Hungary (32.5%; US Dollars 42.5 billion), Poland (21.7%; US Dollars 28.4 billion) and Slovakia (4.3%; US Dollars 5.7 billion) (OECD, 2024). The geographical spread of the outward investments of the V4 group shows a strong regional concentration, which, however, gradually decreases over time. At the end of 2006, 95.0% of their overall FDI outward stocks were located in Europe, while this share had fallen to 91.5% by the end of 2021. The highest investment concentration among European countries was in Slovakia and the Czech Republic (96.5% and 93.0%, respectively, at the end of 2021), while for Poland and Hungary, this percentage was much lower and amounted to 86.5% and 89.9%, respectively. Over time, Asian countries, particularly China and India, have begun to assume an important place on the Visegrad Group's FDI map. During 2006-2021, overall FDI inward stocks in Asian countries increased at an average annual rate of 14.7%, including 21.4% for India and 19.9% for China (OECD, 2024). The FDI outward stocks of the V4 countries in India and China increased significantly in 2018. They were mainly driven by the investment activity of Polish and Czech enterprises, while the investments of Slovakian and Hungarian firms in these countries continue to be marginal (Figure 1 and 2).

This is partly related to the early phases of internationalisation and the stage at which the analysed economies are located, according to the assumptions of Dunning's Investment Development Path (IDP) Theory (Dunning,

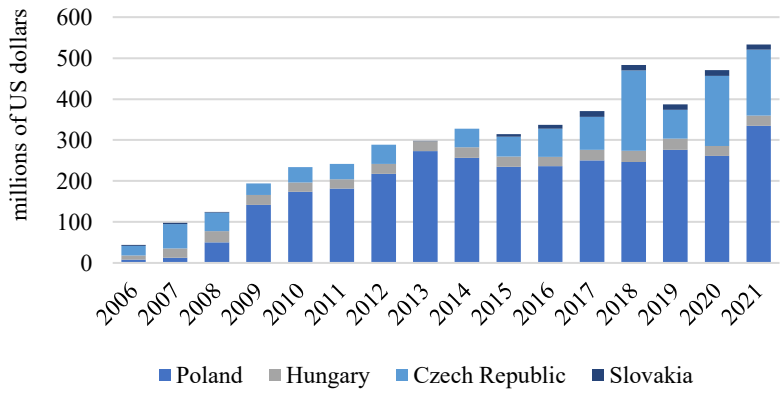

Fig. 1. Visegrad FDI outward stocks in India during 2006-2021 (millions of dollars)
Source: own preparation based on OECD (2024)

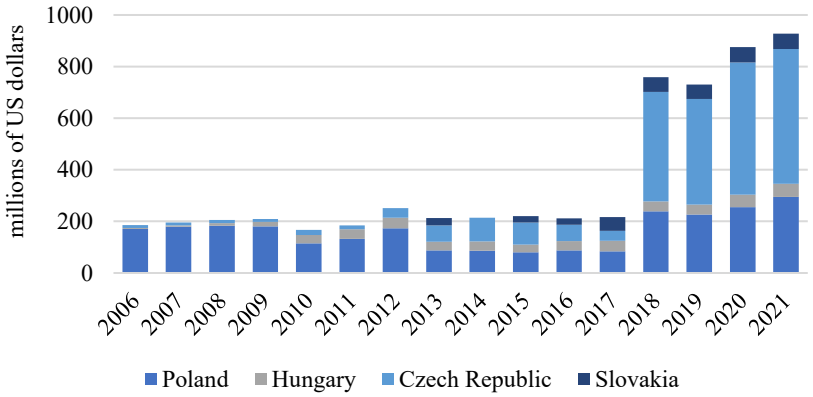

Fig. 2. Visegrad FDI outward stocks in China during 2006-2021 (millions of dollars)
Source: own preparation based on OECD (2024)

1981, 1986). According to this theory, the strategies of companies entering foreign markets in the early phases of the internationalisation process are dominated by geographically proximate locations. The Visegrad countries are in the third phase of the IDP, although it is at an early stage (Kuzel, 2017). It can be expected that as the analysed countries move along the investment path (transitioning from phase III to IV), investors will seek out geographically distant countries for their operations, which guarantee numerous locational advantages, with greater intensity. Entities from Central and Eastern Europe, including the Visegrad Group, are expected to increase their involvement in Asian countries, especially China and India, which are assessed as the most important drivers of the global economy. These countries are among the world's fastest-growing major economies (Kempt, 2023), inhabited by more than 35% of the world's population. Due to growing relevance of these destinations, this study focusses specifically on FDI in these countries undertaken by companies for V4 Group.

However, so far, the level of activity of Visegrad companies in this part of the world is still low despite the intensification of the phenomenon; this explains the research gap regarding the determinants of the FDI undertaken by the V4 in China and India. This prompts an important research question – what are the determinants of FDI conducted in China and India by V4 companies? This article addresses this question.

The paper is structured as follows. Section 2 presents a brief overview of the literature related to FDI determinants, the results of the research on the determinants of FDI undertaken by investors from Visegrad countries, and the FDI determinants of host country in China and India. The literature review covers available literature on the subject (particularly academic articles), published before January 2024. Selected academic databases (EBSCO, Emerald, Google Scholar, JSTOR, ScienceDirect, Scopus, Springer, Web of Science, and Wiley) were used to identify the relevant literature and research findings. Next, the methods used in the research are presented, followed by the research findings. Finally, the general conclusions are stated, along with some limitations that the researchers faced and valuable suggestions for future research.

2. Literature review

2.1. FDI determinants

The eclectic paradigm of international production (the so-called OLI paradigm) is the best-known theory that explains and identifies the FDI determinants. It provides a holistic approach that combines the achievements of preexisting FDI theories (the theory of monopolistic advantages, the location theory, and the internalisation theory) (Dunning, 1993; Dunning & Lundan, 2008). Dunning defines the three conditions that formulate the FDI determinants simultaneously, partly external and partly internal to companies. Ownership advantages (O) and internalisation advantages (I) – including marketing and management skills, trademarks and brand names, access to raw materials, economies of scale, access to capital, technology and patents – are firm-specific and represent endogenous factors. The location advantages (L) – including labour cost, tariff barriers, the presence of competitors or agglomerative economics – are country-specific and refer mainly to the host country factors exogenous to multinational enterprises (MNEs). All types of advantages play a crucial role in a firm's decision to expand abroad. Companies choose locations to make the most of ownership advantages. The locational factors shape the differences in the distribution of FDI inflows between countries and determine the attractiveness of a particular location.

The research findings presented in this article concern only the locational FDI determinants. The country-specific factors are directly related to the host country's location advantages, resulting from its favourable economic, infrastructural, political, legal and cultural conditions.

The list of factors that influence the choice of FDI location is long. Dunning has divided it into three groups: institutional and legal, economic, and business facilitation factors (Dunning, 2006; Dunning & Lundan, 2008). The first group of the host country FDI determinants, defined by Dunning as the policy framework factors, includes economic, political and social stability, rules regarding entry and operations, trade and tax policies, etc. (UNCTAD, 1999). The second group comprises the economic determinants of FDI and reflects the main motives of companies that invest abroad: resource-seeking (e.g., raw materials, skilled or unskilled workforce), market-seeking (e.g., market size, market growth perspective,

access to regional and global markets, structure of markets), efficiency-seeking (factors that reduce the cost of doing business) and strategic asset-seeking (e.g., related to access to modern technological or managerial solutions, physical infrastructure, etc.). Finally, the third group covers all factors dependent on host countries related to running a business (business facilitation), such as investment promotion, investment incentives and various forms of administrative support and facilities, attitudes of local communities, etc. (Dunning, 2006).

2.2. Determinants of FDI by investors from the Visegrad countries

The Visegrad countries, after the political transformation at the turn of the 1990s, have become an attractive destination for FDI. This has triggered research on the determinants of FDI in this part of the world, resulting in a rich literature on the subject (e.g. Bevan & Estrin, 2000; Bielik et al., 2006; Wojciechowski, 2013; Dorożyński & Kuna-Marszałek, 2016; Wach & Wojciechowski, 2016; Hintošová et al., 2018; Su et al., 2018; Wojciechowski & Makieła, 2019; Ľubomír et al., 2020; Gubik et al., 2020; Kemiveš & Barjaktarović, 2021). Unfortunately, vis-a-vis the lively research on foreign capital inflows into the Visegrad Group, the capital internationalisation of companies from this part of the world has not found much interest among researchers. There are only a few studies on FDI outflows from the V4 countries (Radlo & Sass, 2012; Wach & Wojciechowski, 2014; Kuznetsov & Nevskaya, 2017), while there are none on the FDI determinants of the Visegrad Group. In Table 1, we present articles with research results on the determinants of FDI from Poland, Czech Republic, Hungary, and Slovakia.

According to the research review, market-related factors dominated among the FDI determinants of the V4 countries, including access to foreign markets, insufficient domestic demand and low growth potential, competition in the home market (Czaplewski & Wiśniewska, 2007; Jaworek, 2008; Majoras, 2008; Mura & Gašparíková, 2010; Obłój & Wąsowska, 2012; Zemplinerová, 2012; Kowalewski & Radło, 2013; Kubíčková et al., 2014; Wojciechowski & Lubacha-Sember, 2014; Buczkowski & Kuna-Marszałek, 2015; Ciesielska, 2015; Dubravská et al., 2015; Gorynia et al., 2015; Jamroży, 2015; Salamaga, 2015, 2017; Ptaszyńska, 2016; Pavlak, 2018; Drabik, 2021; Kuczmarska, 2021; Jaworek et al., 2022). Some of these studies also indicated the significance of efficiency-related factors (Czaplewski & Wiśniewska, 2007; Majoras, 2008; Obłój & Wąsowska, 2012; Wojciechowski & Lubacha-Sember, 2014; Salamaga, 2015, 2017), policy framework determinants, including attractive financial and fiscal regulations (Gorynia et al., 2012; Kłysik-Uryszek, 2013; Jamroży, 2015; Salamaga, 2015) and factors dependent on the host countries related to running a business, including support for investors (Endrődi-Kovács & Goreczky, 2020), or a favourable business environment (Czakó & Sass, 2012; Zemplinerová, 2012; Toulová et al., 2015; Kuczmarska, 2021).

Table 1. Research on the determinants of FDI from the Visegrad Group countries

Country of V4	Articles
Poland	(Buczkowski et al., 2015; Buczkowski & Kuna-Marszałek, 2015; Ciesielska, 2014, 2015; Czaplewski & Wiśniewska, 2007; Dorożyński et al., 2017; Drabik, 2021; Gorynia et al., 2012, 2015; Jamroży, 2015; Jaworek, 2008; Jaworek et al., 2018, 2022; Karaszewski et al., 2009, 2014; Kłysik-Uryszek, 2013; Kowalewski & Radło, 2013; Kuczmarska, 2021; Obłój & Wąsowska, 2010; Ptaszyńska, 2016; Radlo, 2012; Salamaga, 2015, 2017; Witek-Hajduk, 2009; Wojciechowski & Lubacha-Sember, 2014)
Czech Republik	(Bohatá & Zemplinerová, 2004; Kubíčková et al., 2014; Sass & Vlčková, 2019; Toulová et al., 2015; Zemplinerová, 2012)
Hungary	(Czakó & Sass, 2012; Éltető & Antalóczy, 2002, 2019; Endrődi-Kovács & Goreczky, 2020; Majoras, 2008; Sass & Kalotay, 2010; Sass & Vlčková, 2019)
Slovakia	(Dubravská et al., 2015; Mura & Gašparíková, 2010; Pavlak, 2018)

Source: compiled by the authors based on selected academic databases (EBSCO, Emerald, Google Scholar, JSTOR, ScienceDirect, Scopus, Springer, Web of Science and Wiley)

Apart from the factors related to the host country, Obłój & Wąsowska (2010) pointed out that the company's internal resources were also important FDI determinants for companies from these countries.

However, the above research mainly concerns capital investments in Europe. There are no studies on the motives of investors from the Visegrad Group, which undertaking FDI in China and India, perhaps due to the still low investment activity of these countries, as indicated above.

2.3. FDI determinants in China and India – conceptual framework and hypothesis development

Before 1979, there was virtually no FDI in China. After that, the country implemented an 'open door' policy and became an important FDI destination (Luo et al., 2008). In the past 40 years, China has been a large recipient of FDI among Asian countries and worldwide. According to UNCTAD (2023) data, during 1990-2022, China absorbed an average of 8.2% of global FDI inflows annually, peaking in the last three years of this period (14% on average). Due to growing investor interest, at the end of 2022, China's FDI inward stocks reached more than 3.8 trillion dollars, accounting for 8.6% of global FDI, making China the world's second-largest recipient of FDI, just behind the United States.

Foreign capital interest in India started a little later. Although the Indian government embarked on industry deregulation in the 1980s, increased foreign capital interest began after 1991 with the economic liberalisation that followed the economic crisis (Dutta & Sarma, 2008; Nagaraj, 1997). Reversing the restrictive policy towards foreign investment, India has made efforts to garner a larger share of global FDI. Initiatives such as simplification of rules and regulations and improvement of infrastructure were expected to provide impetus to increase foreign capital inflows. While the government of India is firmly committed to creating a solid economic foundation and a proactive FDI policy regime, the country is far behind, compared to some developing countries like China (Dutta & Sarma, 2008; Zheng, 2009). By end-2022, India's FDI inward stocks reached 510.8 billion dollars, making the country the world's 20th largest recipient of FDI. This is a high score, but much smaller (by nearly 7.5 times), compared to China (UNCTAD, 2023).

Due to the locational advantages and reforms implemented by both governments, FDI grew significantly in China and India, which have been identified as the most attractive FDI destinations in the world. According to Kearney's 2023 FDI Confident Index, China is ranked 7th and India 16th. Considering only developing countries, China ranks 1st and India 2nd (Kearney, 2023). Despite the differences in FDI inflows, both destinations have become host and home countries for many MNEs. However, the countries considered were ranked low on the Index of Economic Freedom published annually by the Heritage Foundation. In 2024, China's economic freedom score was 48.5, ranking its economy 151st in the world, while India's score was 52.9, on the 126th position. For both countries, two index components, important for foreign investors – investment freedom and property rights – were rated very low. The Heritage Foundation indicated that the overall rule of law in both countries is weak, and there are restrictions on the flow of investment capital, especially in China, where the protectionist FDI approval system is still not transparent (Heritage Foundation, 2024).

The increased flows of foreign investment into this part of the world, observed for more than two decades, have influenced the interest of researchers. Their particular attention to China and India commenced at the beginning of the 21st century. Among the various research issues, the determinants of FDI in these countries have become a particularly intensely investigated topic. Most empirical research has focused on macro-level data to identify factors determining the level of FDI inflows (Table 2). Empirical studies of FDI locational factors in China and India investigate the role of variables such as market size, labour cost, infrastructure, political and economic stability, and openness in attracting FDI inflows. All of these studies have substantially contributed to a better understanding of locational factors in this part of the world. The broad spectrum of advantages offered by these countries makes them highly attractive destinations for foreign direct investment undertaken by MNEs from various countries and sectors, including those from the V4 Group.

However, the literature review presented in Table 2 includes only studies on the FDI determinants in China and India at the national level (without the provincial/state level). China and India are large countries with at diverse stages

Table 2. FDI locational factors in China and India

Counry level key factor	China	India
Market size/Market growth	(Ali & Guo, 2005; Dees, 1998; Du Pont, 2000; Hanh, 2020; Hong & Chen, 2001; F. Jiang et al., 2001; H. Jiang et al., 2017; Panigrahi & Panda, 2012; Saleem et al., 2018; Zhang, 2001; Zhao, 2003; Zheng, 2009)	(Azam & Lukman, 2010; Goel & Walia, 2017; Gupta, 2017; Kalirajan et al., 2012; Kaur & Sharma, 2013; Lokesha & Leelavathy, 2012; Murthy & Bhasin, 2015; Onyekwere & Otuyelu, 2021; Panigrahi & Panda, 2012; Pattayat, 2016; Sharma & Kumari, 2015; Singhania & Gupta, 2011; Zheng, 2009)
Labor cost	(Ali & Guo, 2005; Custorella, 2017; Dees, 1998; Du Pont, 2000; Hong & Chen, 2001; Liu et al., 1997; Saleem et al., 2018; Zheng, 2009)	(Lokesha & Leelavathy, 2012; Zheng, 2009)
Quality of labor/Human resources	(Custorella, 2017; OECD, 2000)	(Hasli et al., 2015; Kaur et al., 2016; Wagner & Delios, 2023)
Infrastructure/Physical infrastructure	(Gopalan et al., 2019; Li & Park, 2006; Zhang, 2001)	(Azam & Lukman, 2010; Gupta, 2017; Kaur et al., 2016; Lokesha & Leelavathy, 2012; R. P. Pradhan, 2012; Sharma & Kumari, 2015)
Political stability/ Government policies and incentives	(Du Pont, 2000; Li & Park, 2006; Zheng, 2009)	(Lokesha & Leelavathy, 2012; Zheng, 2009)
Country and political risk/Liberalization FDI regime/Country debt/External debt	(Panigrahi & Panda, 2012; Zhang, 2001; Zheng, 2009)	(Azam & Lukman, 2010; Gupta, 2017; Hasli et al., 2015; Kaur & Sharma, 2013; Lokesha & Leelavathy, 2012; Zheng, 2009)
Openness/Trade openness/Financial openness	(Custorella, 2017; Dees, 1998; Hanh, 2020; Saleem et al., 2018)	(Azam & Lukman, 2010; Goel & Walia, 2017; Gupta, 2017; Hasli et al., 2015; Jacob & Kattookaran, 2018; Kaur & Sharma, 2013; Panigrahi & Panda, 2012)
Export/Import	(Hanh, 2020; Liu et al., 1997; Panigrahi & Panda, 2012; Zheng, 2009)	(Jena et al., 2018; Kalirajan et al., 2012; Panigrahi & Panda, 2012; Zheng, 2009)
Exchange rate	(Banik, 2003; Hanh, 2020; Liu et al., 1997; Xing, 2006; Zhao, 2003)	(Jacob & Kattookaran, 2018; Jena et al., 2018; Kaur & Sharma, 2013; Lokesha & Leelavathy, 2012; Nayak & Sahoo, 2020)
Inflation rate	-	(Azam & Lukman, 2010; Goel & Walia, 2017; Gupta, 2017; Jena et al., 2018; Kaur & Sharma, 2013; A. K. Pradhan & Kelkar, 2014; Singhania & Gupta, 2011)
Domestic investment	(Banik, 2003; Panigrahi & Panda, 2012)	(Azam & Lukman, 2010; Panigrahi & Panda, 2012; A. K. Pradhan & Kelkar, 2014; R. P. Pradhan, 2012)
R&D (expenditures, patents)	(H. Jiang et al., 2017)	(Singhania & Gupta, 2011; Wagner & Delios, 2023)
Environmental regulations/ Environmental pollution	(Ullah et al., 2022)	(Hasli et al., 2015)

Source: compiled by the authors based on selected academic databases (EBSCO, Emerald, Google Scholar, JSTOR, ScienceDirect, Scopus, Springer, Web of Science and Wiley)

of economic development across provinces/states, with different government policies in particular parts of the countries. This contributes to varying investment attractiveness in different regions, which is, however, characteristic of almost all countries in the world.

Market size

Market size is regarded as the most significant determinant of market-seeking FDI. The presented research review (see Table 2) shows that market determinants are also the most important factors attracting FDI in China and India. This is because these countries have the world's largest populations, with a significant percentage of working-age people. Since 2000, the purchasing power of society, measured by GDP per capita, has also grown significantly, especially in China. It can be assumed that market-related factors are important determinants for investors from the V4 Group. Therefore, we hypothesise that:

Hypothesis 1: GDP per capita (as a representative of market-related determinants) in China and India significantly and positively impacts FDI from the Visegrad Group.

Labour cost

Labour cost, along with market size, is another major determinant of FDI inflows. According to the research review, this is also an important determinant of FDI in China and India. However, labour cost in India is much lower than in China today. According to the Reshoring Institute (2022), China is in the middle range of labour costs, while countries like India and Mexico are at the lower end. Moreover, labour costs in those countries have risen steadily from 2006 to 2023. There is an upward trend in minimum wages in both investment-receiving countries. However, China has experienced a more rapid increase in average monthly wages, which soared from US Dollars 80.27 in 2006 to US Dollars 302.30 in 2023. India also witnessed an increase in labour costs, albeit slower, rising from US Dollars 37.87 to US Dollars 65.00 over the same period. However, labour costs in both India and China are significantly lower than those in the Visegrad countries. Hence, we hypothesise that:

Hypothesis 2: Labour costs (as a representative of efficiency-related determinants) in China and India significantly and negatively impact FDI from the Visegrad Group.

Inflation

Multinational corporations consider many macroeconomic factors, including inflation, when deciding where to locate FDI. Inflation erodes companies' purchasing power, creating distortions in the net returns on investment and labour (Sayek, 2009). However, moderate levels of inflation can be beneficial to foreign direct investors and also can affect economic growth and stimulate FDI inflows. Studies to determine the impact of inflation on FDI have often yielded mixed and contradictory results, which is understandable, as the impact of inflation on FDI varies, depending on the nature of the host economy and the current level of inflation. Discrepancies can also be observed for the two analysed countries. This factor was a significant determinant of FDI in India (see Table 2), while it did not have a significant impact on FDI inflows into China (Panigrahi & Panda, 2012; Jacob et al., 2021). Therefore, we hypothesise that:

Hypothesis 3: Inflation (as a representative of policy framework determinants) in China and India significantly and negatively impacts FDI from the Visegrad Group.

Trade openness

One of the most important factors influencing the choice of FDI destination is trade openness. However, the impact of this factor depends on the type of investment. In the case of market-seeking investments, trade restrictions that create barriers to import products into a country can lead companies to enter that market through FDI. With a foreign subsidiary established there, the MNCs can supply goods to the local market. On the contrary, enterprises seeking localisation for export-oriented investment may prefer a more open economy because export restrictions generally imply higher transaction costs. Based on a literature review, Shenai et al. (2020) argue that although the relationship between trade openness and FDI inflows depends as much on the type of investment mentioned above as on the industry and the specifics of the host country, overall, the results show a positive relationship between these variables. Therefore, we hypothesise that:

Hypothesis 4: The trade openness of the economies of China and India (as a representative of policy framework determinants) has a significant and positive impact on the FDI from the Visegrad Group.

R&D expenditures

In recent years, factors related to the increasing innovativeness of the analysed economies, measured, among other things, by expenditure on R&D activities or quality of labour, have gained importance. The engagement of China and India in high technology sectors and cutting-edge technology development is transforming the global economy at an unprecedented pace (Dunning & Lundan, 2008). These countries, especially China, which has increased R&D

spending, are becoming even more attractive to foreign investors. Therefore, we hypothesise that: ***Hypothesis 5:*** R&D expenditures (as a representative of strategic assets-related determinants) in China and India significantly and positively impact FDI from Visegrad Group.

3. Methods and data sources

3.1. Data description

All variables used in research are expressed in natural logarithms. Individual variables are represented by several economic processes. The data from 2006 to 2021 are obtained from different databases (Table 3).

The description of the structure of individual variables shows them exhibiting differences in their means, variability, skewness, kurtosis and normality of residuals. Nevertheless, they tend to show similar features, including distributions relatively symmetrical to heavy tails, compared to a normal distribution. If a variable deviates from normality, it is more likely to be associated with kurtosis rather than skewness (see Table 4).

3.2. Methods

To examine the connectedness among economic determinants of FDI, icluding these from

Table 3. Description of determinants of FDI

Type of determinant	Variable	Description	Units	Source
Dependent variable				
-	FDI_OW	Foreign direct investment outwards of V4[1] countries in China and India	millions of US dollars	OECD
Macroeconomic determinants				
Market-related	GDPpc	Gross domestic product per capita	Purchasing power standard (PPS) per inhabitant in US dollars	World Bank
Efficiency-related	WAGE	Labor cost – Minimum wage in China and India	US dollars	World Bank
Policy framework	CPI	Consumer price index in China and India	(2010=100) Index	World Bank
Policy framework	OPEN	Trade openness of China and India economies	(%) share of export and import in GDP	World Bank
Strategic assets-related	RD	Research and development expenditures in China and India	(%) percent of GDP	World Bank

Source: Own author's draft
Notes: [1]Slovak FDI outward stock could not be included in the model due to the confidentiality of these data

Table 4. Descriptive statistics

Descriptive statistics	*ln_fdi_ow*	*ln_gdppc*	*ln_wage*	*ln_cpi*	*ln_open*	*ln_rd*
Mean	4.033	8.932	4.604	4.760	3.817	0.156
Std. Dev.	1.210	0.511	0.656	0.249	0.163	0.506
Skewness	-0.347	0.179	0.344	0.064	0.274	0.115
Kurtosis	3.176	1.907	1.592	2.531	2.227	1.263
Normality distribution test						
Jarque-Bera	2.049	5.290	9.819	0.945	3.589	12.277
Probability	0.359	0.071	0.007	0.625	0.166	0.002

Source: Own author's draft

Visegrad Group countries in China and India, panel methods were adopted. We consider the panel autoregressive distributive lag model (Panel ARDL(*q, p, p, …,p)*). The theoretical form of the model can be written as follows:

$$y_{it} = \alpha' + \sum_{j=1}^{q} \alpha_{ij} y_{i,t-j} + \sum_{j=1}^{p} \beta_{ij} x_{i,t-j} + \varepsilon_{i,t} \qquad (1)$$

where y_{it} represents the dependent variable; $x_{i,t-j}$ is a vector of explanatory variables (determinants of FDI); α_{ij}, β_{ij}, denotes the parameters of the model, i=1, 2, 3, …., N represents the individual countries and t = 1, 2, 3, …, T are the time periods; q, p denotes the lag order on the variables and $\varepsilon_{i,t}$, represents the white noise error terms.

In this study, based on a general model (1), a specific equation for FDI is formulated and takes the following forms :

$$\Delta FDI_{it} = c + \phi_1 [FDI_{i,t-1} - \vartheta'_{1,i} (GDPpc_{i,t-1} +$$

$$+ WAGE_{i,t-1} + CPI_{i,t-1} + OPEN_{i,t-1} + RD_{i,t-1})] +$$

$$\sum_{j=1}^{q-1} \beta_j \Delta FDI_{i,t-j} + \sum_{j=0}^{p-1} \alpha_j \Delta GDP_{i,t-j} +$$

$$\sum_{j=0}^{p-1} \gamma_j \Delta WAGE_{i,t-j} + \sum_{j=0}^{p-1} \delta_j \Delta CPI_{i,t-j} +$$

$$\sum_{j=0}^{p-1} \varphi_j \Delta OPEN_{i,t-j} \sum_{j=0}^{p-1} \psi_j \Delta RD_{i,t-j} + \varepsilon_{it} \qquad (2)$$

where c is constant, ε_{it} are the residuals, and all variables are defined as logarithmic levels and first differences of logarithmic variables. ϕ_1 is the error correction term. The expected value of the error correction parameter should range from (-1; 0), to show evidence of a long-run relationship. The value of the error correction term shows the speed of investors' adjustment to long-term changes in the economies of China and India. β_{ij}, α_{ij}, γ_{ij}, δ_{ij}, φ_{ij}, and ψ_{ij} are the short-run parameters presenting the short-term relationships in the model.

The pooled mean group (PMG) estimator, developed by Pesaran et al. (1999), was applied to estimate the parameters of the FDI equation. This method is increasingly used in panel data analysis, as it addresses common econometric challenges such as heteroscedasticity, autocorrelation within individuals, and dynamic dependence on past realizations. The PMG estimator combines pooling and averaging, allowing the intercepts, short-run coefficients, and error variances to vary across countries, while constraining the long-run relationships to be homogeneous. This assumption is consistent with the idea that economies share common technologies and are subject to similar long-term equilibrium conditions.

The estimator is well suited for panels with variables that are stationary or integrated of order one, and it can generate both short- and long-run estimates simultaneously. In this study, time dummies were also included to reduce the risk of cross-sectional correlation in idiosyncratic errors. Prior to estimation, the stationarity of variables was verified using Fisher-type panel unit root tests (Choi, 2001). For estimation, variables were transformed into first differences, $\Delta y_{i,t} = y_{i,t} - y_{i,t-1}$ and $\Delta x_{i,t} = x_{i,t} - x_{i,t-1}$ in line with unit root analysis requirements.

4. Research results and discussion

4.1. Panel unit root and cointegration analysis

We examined the impact of gross domestic product per capita (GDPpc), minimum wage (WAGE), consumer price index (CPI), trade openness (OPEN) and research and development expenditures (R&D) in China and India on the FDI of the Visegrad Group, by using the panel ARDL model.

The empirical study consisted of four stages. The first step of the research was to perform the unit root analysis (Table 5). We used two types of tests; the first group of tests assumed a common unit root process for all individuals (Levin, Lin, Chu test, and Breitung t-test), while the second group assumed an unit root process for all individuals (Im, Pesaran, Shin test, and Fisher-type tests). The outcomes of the unit root tests for all variables revealed that FDI in the Visegrad Group countries, along with all analysed determinants of FDI (GDPpc, labour cost, inflation, trade openness and R&D expenditures), exhibit stationarity in the first differences, yet demonstrate non-stationarity in levels (Table 5).

For GDPpc, CPI, OPEN and R&D the Levin, Lin, and Chu test showed no common unit root for all countries included in the research. This means that the mentioned processes are stationary at least in one country. However, the Breitung test showed that a common unit root exists for all variables, at least at the 5% significance level.

Table 5. Panel unit root test – summary of different tests

	ln_fdi_ow	*ln_rd*	*ln_gdppc*	*ln_wage*	*ln_cpi*	*ln_open*
Null: Unit root (assumes common unit root process)						
Levin, Lin & Chu (t*)	-0.177	-2.318 ***	-4.741 ***	-0.899	-2.622 ***	-1.873 **
Breitung t-stat	0.059	-1.478 *	0.872	0.973	0.069	0.047
Null: Unit root (assumes individual unit root process)						
Im, Pesaran and Shin (W-stat)	0.978	-0.954	-2.285 **	1.558	1.325	-0.254
ADF - Fisher[1] (χ^2)	0.305	17.95	22.43 **	5.452	5.353	10.28
PP - Fisher[1]	0.305	7.83	21.83 **	4.734	8.401 **	6.626

Source: Own author's draft

Notes: 1 Probability for Fisher tests is computed using an asymptotic Chi-square (χ2) distribution. All other tests assume asymptotic normality; ***, **, * the significance of test statistics with a p-value of 1%, 5% and 10%, respectively.

Table 6. Results of cointegration panel tests

Summary of various tests	**Statistic**	**Prob.**	**Statistic**	**Prob.**
Tests with common AR coeff.				
Panel v-Statistic	-3.032	0.999	-2.599	0.995
Panel rho-Statistic	2.062	0.980	2.150	0.984
Panel PP-Statistic	-19.75 ***	0.0001	-11.69 ***	0.0001
Panel ADF-Statistic	-6.83 ***	0.0001	-5.303 ***	0.0001
Tests with individual AR coefs. (between-dimension)				
	Statistic	Prob.		
Group rho-Statistic	3.263	0.999		
Group PP-Statistic	-13.33 ***	0.0001		
Group ADF-Statistic	-3.508 ***	0.0002		

Source: Own author's draft,

Notes: ***, **, * The significance of test statistics with p-values of 1%, 5%, and 10% respectively

Then, we used the unit root tests (IPS test and Fisher type test), which assumed an individual unit root, where we rejected the null hypothesis only for GDPpc. However, the PP-Fisher test rejected the null of individual unit root for GDPpcit and CPIit.

Due to the construction of the alternative hypothesis, the rejection of the null hypothesis does not mean that there is no unit root in the panel, but that the null hypothesis has been rejected for some individuals. Hence, based on the results of Im, Pesaran, Shin test and ADF Fisher-type test, we found that the CPIit and other variables were non-stationary in levels and stationary in first differences. In a further study, we used the first differences of all the variables (Table 5).

The second step was to check whether the is long-term relationship between FDI and the analysed determinants of FDI from Visegrad Group. The results of panel cointegration tests are presented in Table 6. Four out of the seven-panel cointegration tests indicated the existence of a long-run relationship. First of all, the Panel-PP, Panel-ADF, Group-PP, as well as Group-ADF tests indicated the rejection of the null hypothesis of no cointegration. Therefore, the use of the ARDL mode with long-run adjustment to equilibrium was justified (Table 6).

Table 7. The results of Dumitrescu-Hurlin Panel Causality test between FDI and several determinants

Cause	Effect	W-Stat.	$\bar{Z}$-Stat.	*p*-value	Significance
R&D ≠> FDI		4,949	1,688	0,091	*
FDI ≠> R&D		10,75	5,807	<0,01	***
GDP ≠> FDI		5,321	1,953	0,051	*
FDI ≠> GDP		1,640	-0,661	0,509	
WAGE ≠> FDI		4,313	1,236	0,216	
FDI ≠> WAGE		6,633	2,884	0,004	***
CPI ≠> FDI		4,538	1,396	0,163	
FDI ≠> CPI		2,047	-0,373	0,709	
OPEN ≠> FDI		6,434	2,743	0,006	***
FDI ≠> OPEN		3,322	0,533	0,594	

Source: Own author's draft

4.2. Causality analysis between FDI and its determinants

The third step is to analyse the causality relationships between variables. Taking into account the Granger causality results the significant relationship is confirmed at least running from factors (GDPpc, WAGE, CPI and OPEN) to FDI. The objective of Granger causality analysis is to ascertain whether there is a potential predictive power for one indicator based on the past values of another indicator. However, it is essential to note that causality analysis cannot determine the intensity and sign of the impact. Therefore, the results of this analysis will be supplemented with appropriate econometric models.

The Dumitrescu HurlinPanel Causality test was used to assess causality between the analysed variables (see more Dumitrescu, Hurlin (2012)). The testing results are presented in Table 7 and then transformed into a causality diagram (see Figure 3).

The results of the causality tests conclude that there is unidirectional causality running from GDP to FDI and OPEN to FDI. This implies an important influence of market determinants and policy frameworks on investors' decision-making from the V4 to invest capital in China and India. In the case of the relationship between FDI and R&D, there is a bidirectional causal relationship (R&D ↔ FDI), which means this determinant is an important factor in shaping the volume of FDI from Visegrad countries targeting China and India (Fig. 3). Also, FDI is an essential factor for the growth of R&D expenditures in the host country. High levels of technology, innovation, and research in the host economy significantly attract investors.

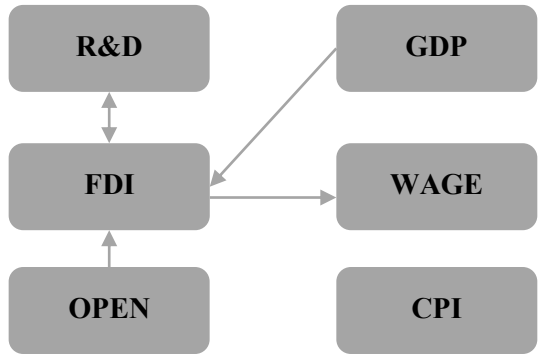

Fig. 3. Causality connectedness between FDI and its determinants
Notes: ↔ bidirectional causal relationship; → unidirectional causal relationship
Source: Own author's draft

The fourth step of the research is to build the panel ARDL model and analyse the impact of the determinants on Visegrad FDI in China and India.

4.3. Autoregressive distributed lag model for FDI

Based on the annual data on the FDI from V4 countries in China and India, and the respective determinants of investment decisions, the parameters of the panel ARDL model were estimated. The estimator we used is a popular method for estimating dynamic panels, with different short-run coefficients, error variances

across individuals, and the common long-term structure of relationships. The long-term equation is as follows:

$$\ln\_fdi_{it} = \beta_1 \ln\_gdppc_{it} + \beta_2 \ln\_wage_{it} + \\ + \beta_3 \ln\_cpi_{it} + \beta_4 \ln\_open_{it} + \beta_5 \ln\_rd_{it} + \varepsilon_{it} \quad (3)$$

where: β_1 ,…, β_5 are the long-term parameters and ε_{it} are the residuals.
In contrast, the error correction equation with long-run adjustment to equilibrium is:

$$\Delta\ln\_fdi_{it} = \gamma_0 + \gamma_1 EC_{i,t-1} + \gamma_2 \Delta\ln\_gdppc_{it} + \\ + \gamma_3 \Delta\ln\_wage_{it} + \gamma_4 \Delta\ln\_cpi_{it} + \gamma_5 \Delta\ln\_open_{it} + \\ + \gamma_6 \Delta\ln\_rd_{it} + \mu_{it} \quad (4)$$

where γ_1 is the error correction coefficient, $EC_{i,t-1}$ is a lagged error correction component, γ_2 ,…,γ_6 are the short-term parameters and μ_{it} is the residual of the short-term equation with correction mechanism.

The panel ARDL model and the PMG estimator are appropriate, whether the underlying regressors exhibit $I(0)$ or $I(1)$ and both N (number of individuals) and T (time span) are relatively small (Pesaran et al., 1999). To identify the important determinants of the companies' investment decisions from Visegrad countries which have invested in China and India, we estimated parameters of the model and verified the significance of parameters based on the Student t-test. Results are presented in Table 8 and Table A1 (in appendix).

The point estimates of long-run parameters in the selected equations align with economic theory. Primarily, the long-run coefficients indicate significant interdependencies between variables over the long term. Referring to the equation for FDI, it is evident that GDP per capita and the trade openness of the host economy contribute to the increase in FDI inward stocks in China and India in the long term. Specifically, a 1% increase in GDPpc leads to a 1.019% rise in FDI, while a similar increase in trade openness results in a 0.375% increase in FDI (see Table 8). The studies presented in Table 2 confirmed a statistically significant relationship between market size/market growth and FDI in China and India. A similar relationship has been indicated for trade openness and FDI in these countries .

The remaining determinants considered in the study, such as labour costs, inflation and R&D expenditure, exhibit directional influences consistent with economic theory. Specifically, high labour costs and high inflation are identified as negative factors, while R&D expenditure positively affects FDI outward stocks from the Visegrad Group countries. Nevertheless, these factors included in the empirical model were

Table 8. Panel ARDL model of Visegrad foreign direct investment determinantsin China and India

Variable	Coefficient	Standard error	t-Statistic
Long Run Equation			
l_gdppcit	1.019 ***	0.251	4.067
l_wageit	-0.224	0.149	-1.499
l_cpiit	-0.446	0.408	-1.093
l_openit	0.375 ***	0.139	2.685
l_rdit	0.172	0.807	0.213
Short Run Equation			
ECi,t-1	-0.611 ***	0.148	-4.138
Δl_gdppcit	0.762	1.739	0.438
Δl_wageit	-1.355 ***	0.486	-2.787
Δl_cpiit	-4.220	4.647	-0.908
Δl_openit	1.990 **	0.749	2.654
Δl_rdit	3.550 ***	0.829	4.283
c	-1.698 ***	0.536	-3.166

Source: Own author's draft
Notes: ***, **, * The significance of test statistics with p-values of 1%, 5%, and 10% respectively

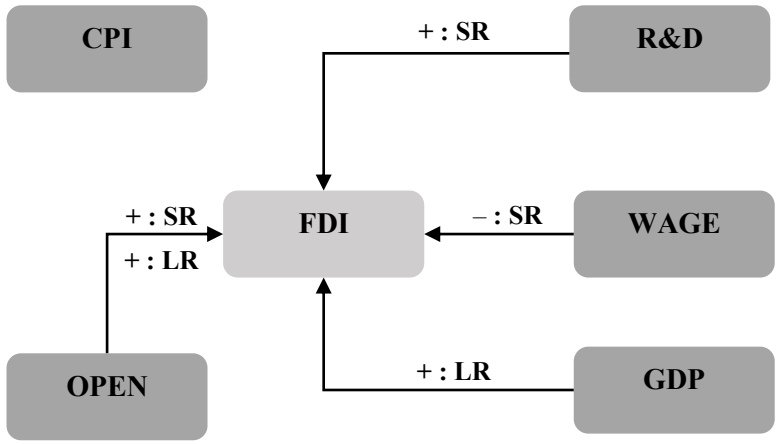

Fig. 4. Diagram of determinants' impact in case of Visegrad FDI in China and India
Notes: SR – short-run, LR - long-run, + - positive impact; – - negative impact
Source: Own author's draft

determined to be statistically insignificant. Despite the increase in labour costs in China and India, their respective levels remain comparatively low, compared to those in V4 countries. Consequently, even with their increment, the impact on FDI reduction is not substantial. In contrast, the results of earlier studies for China and India confirmed a statistically significant relationship between the indicated factors and FDI outwards inflows to these countries for labour cost, inflation and R&D expenditure (Table 2).

The panel ARDL model can be used to account for long-run and short-run relationships, as well as the speed of adjustment to the long-run equilibrium (the error correction term). The error correction coefficient has a significant and negative sign, which implies that the model converges to a long-run equilibrium. In the FDI equation, the average point estimate of error correction (γ_i=-0.611) shows that about 61.1% of the deviation from FDI equilibrium in China and India will be corrected in the next year. The parameter shows the reaction of companies from Visegrad Group countries investing in China and India in adjustment to the long-term path of equilibrium, where the total time to return to long-term equilibrium takes about one year and five months.

The empirical results confirm that R&D expenses and trade openness of China and India have positive elasticities for FDI from V4 countries, while labour cost has negative elasticity. That means, in the short run, a 1% increase in wages tends to lead to a 1.355% decrease in analysed FDI. Similarly, a 1% increase in trade openness and R&D expenditure in the short run tends to result in a 1.99% and 3.55% increase in FDI, respectively. A negative and significant short-run relationship, identified between wages and FDI, suggests that wages can reduce the FDI from the Visegrad Group countries in the short term. Further, a positive and significant short-run relationship running from trade openness and R&D expenditure to FDI, suggests that those two determinants can increase the Visegrad FDI in China and India in the short term (Fig. 4). The short-run coefficient analysis shows also that wages, trade openness and R&D expenditure bear the burden of short-run adjustment to restore long-run equilibrium after a shock to the system.

5. Concluding remarks

Over the past two decades, there has been a notable increase in the global dispersion of investment capital, driven by the search for optimal investment locations. Foreign direct investment has become a tool for raising the competitiveness of companies and increasing their value, which is true not only to those from the developed countries but also from developing ones, including those from the Visegrad Group. The foreign expansion of companies from V4 countries is becoming a factor in building their international competitiveness using globally dispersed resources. Asian countries, including China and India, are becoming more and more popular as the FDI destination due to their significant locational advantages, which we confirmed by the results presented in this article.

All hypotheses were verified based on causality analysis and parameter analysis of the econometric model (Table 9). The first hypothesis, which suggests that GDP per capita, representing market-related determinants, exerts a significant and positive influence on FDI outward stocks from the Visegrad Group into China and India, and the fourth hypothesis, that trade openness of China and India has a significant and positive impact on FDI, are supported in a long-term perspective. This relationship is posited to persist over a long-term horizon, indicating that higher GDP per capita levels and trade openness correspond to increased FDI from the Visegrad countries into China and India. However, despite the overall support for the hypothesis, the analysis also revealed that short-term fluctuations of GDP per capita had less impact on investment decisions. The fourth hypothesis is also supported in the case of short-run relationships and by the results of causality analysis. From a short-term perspective, the empirical results support the second hypothesis, which suggests that labour costs harm FDI. Only in the case of the third hypothesis did there be a lack of supporting results from short-term and long-term perspectives and causality analysis.

The fifth hypothesis, related to strategic assets determinants, shows that research and development expenditures positively impact FDI from the V4 group to China and India. The hypothesis is supported by results from the causality analysis and the econometric model's short-term elasticities. The results indicates that the host country's advanced technological and scientific capabilities are significant factors in attracting foreign capital. The bidirectional causal relationship also substantiates the notion of a notable correlation between foreign direct investment and R&D expenditure.

The study's findings need to be considered in light of several limitations. This study has some limitations, typical of quantitative research. First, the sample used was relatively small because of the low scale of FDI in Asian countries from the Visegrad Group, despite more than thirty years of capital internationalisation by companies of this region.

Future research on determinants of FDI from the Visegrad Group may broaden the range of

Table 9. Verification of the hypotheses

Hypothesis	Long-term perspective	Short-term perspective	Causality analysis
H1. GDP per capita (as a representative of market-related determinants) in China and India significantly and positively impacts FDI from the Visegrad Group.	Supported	Rejected	$GDP \rightarrow FDI$
H2. Labour costs (as a representative of efficiency-related determinants) in China and India significantly and negatively impact FDI from the Visegrad Group.	Rejected	Supported	$WAGE \leftarrow FDI$
H3. Inflation (as a representative of policy framework determinants) in China and India significantly and negatively impacts FDI from the Visegrad Group.	Rejected	Rejected	$CPI \nleftrightarrow FDI$
H4. The trade openness of China's and India's economies (as a representative of policy framework determinants) significantly and positively impacts FDI from the Visegrad Group.	Supported	Supported	$OPEN \rightarrow FDI$
H5. R&D expenditures (as a representative of technology and strategic assets-related determinants) in China and India significantly and positively impact FDI from the Visegrad Group.	Rejected	Supported	$RD \leftrightarrow FDI$

Note: supported by the results of empirical research; rejected based on the results of empirical research; ↔ bidirectional causality; → unidirectional causality; ↮ lack of causality.
Source: Own author's draft

factors. Beyond macroeconomic fundamentals, host-country policy uncertainty, and geopolitical tensions can alter the timing, scale, and sectoral allocation of FDI. Future research directions will involve analysing dynamic dependencies using various econometric methods.

Based on our study, it can be concluded that China and India are attractive locations for Visegrad investors in terms of market advantages. Both countries have the largest populations in the world, whose purchasing power is steadily increasing. Despite rising labour costs, they remain attractive for foreign investment targeting production efficiency. According to the study, rising wages do not reduce FDI from the Visegrad Group in the long term. Still, low labour costs and trade openness create an attractive location for export-oriented MNCs from the V4. Investors from these countries are looking for locations that guarantee low production costs for finished/semi-finished products for export to other parts of the world.

This may reflect the fact that, despite the efforts of China and India to rebuild their economies innovatively, linked to increased R&D spending and creating the einvironment for innovative FDI, they are still primarily seen by V4 investors as low-cost, large-market locations rather than innovation-driven destinations.

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Appendix

Table A1. Cross-section short-run coefficient

Variable	POL_CHN	POL_IND	HUN_CHN	HUN_IND	CZ_CHN	CZ_IND
c	-3.137	-0.552***	-1.628	-4.597*	-0.146	-1.375
$EC_{i,t-1}$	-0.857***	-0.181**	-0.418***	-0.889***	-0.279***	-1.039***
Δl_gdppc_{it}	9.021	1.264	-2.58	-0.097	-1.492	-1.545
Δl_wage_{it}	-2.719*	-0.519	-0.591	0.176 ***	-2.095	-2.384
Δl_cpi_{it}	2.456	6.752	0.359	-0.08	-10.43	-24.38
Δl_open_{it}	1.274	0.281	2.67**	-0.246***	4.132	3.831
Δl_rd_{it}	5.059	5.017	5.526*	1.943**	0.446	3.31

Notes: ***, **, * The significance of test statistics with p-values of 1%, 5%, and 10% respectively.
Source: Own author's draft