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THE EFFECT OF FOREIGN DIRECT INVESTMENT ON PRODUCTIVITY:
NEW EVIDENCE FROM CEEs

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Abstract

The primary objective of this thesis focuses on examining the relationship between foreign direct investment (FDI) and total factor productivity in CEE economies since FDI has played a crucial role in the transition economies of Central and Eastern Europe. To analyse the relationship, 21-year panel data starting from 1999 to 2019, fixed effects regression and the feasible generalised least squares (FGLS) model are adopted. The thesis finds a significant direct positive FDI-productivity relationship in CEEs. Moreover, inflation (as a proxy of macroeconomic instability) exerts a significantly negative influence on domestic productivity, whereas the trade openness, human capital and institution quality of a country also exert significant impact on productivity.

Keywords

FDI; Productivity; Central and Eastern European countries; Panel data; Fixed effects

1. Introduction

Over the past decades, countries over the world have been opening up to globalisation. It is emphasized that the globalisation process is particularly crucial for transition economies (Gurgul & Lach, 2014), and the public were left with a belief that foreign direct investment (FDI) plays a crucial role in facilitating economic growth or efficiency enhancement. Therefore, it is not to our surprise that the increasing focus on the effect of FDI in the economic development of Central and Eastern European countries (CEEs) in transition has attracted remarkable attention over the past years. This paper aims to study the direct effect of foreign direct investment on country-level total factor productivity in CEEs.

There are a few reasons for this research topic: firstly, the effect of FDI on domestic productivity has not been thoroughly examined, and the evidence on this matter came to diverse conclusions. Some scholars find the relationship positive (Tiwari

& Mutascu, 2011; Fillat and Woerz, 2009), whilst others find it insignificant or negative (Fons-Rosen, Kalemli-Ozcan & Sorensen, 2017; Potterie & Lichtenberg, 2001). Secondly, most literature at the macro level study the relationship between FDI and growth, and at the micro level study FDI and firm productivity. In cross-country research, it could matter if the dependent variable is TFP growth or GDP growth (Baltabaev, 2014). The significance of this thesis lies in its consideration of the productivity implications, rather than the output implications, of foreign direct investment. This is based on the premise, as discussed in the literature on economic growth, that TFP (Total Factor Productivity) growth contributes more to enhancing economic growth than capital accumulation (Li & Tanna, 2019). Additionally, the data on this subject is highly available for empirical study. In addition, the results of this empirical analysis could provide a reference for generating practical policy implications that boost domestic productivity.

Moreover, Central and Eastern European countries are selected to be the study object mainly because of two aspects: after the collapse of the Communism, CEEs had their transition starting from the 1990s and FDI is assumed to be of great importance in these economies upgrading their infrastructure to assist the economic transitions. The existing literature focuses mainly on the FDI-productivity relationship in developing countries, and examining the relationship in CEEs will establish more support for transition economies. Moreover, the literature hasn't been providing sufficient evidence and policy implications for Central and Eastern European economies.

Thus, this paper will combine two literatures and use macro-level data to investigate the FDI-productivity relationship in CEEs. This study employs a panel data set covering 21 years (1999-2019) across 11 CEE countries to investigate the relationship. Total factor productivity (TFP) serves as the dependent variable, with FDI, institution quality, inflation (a proxy for macroeconomic instability), human capital, and trade openness as explanatory variables. The TFP data is sourced from the Penn World Table 10.01, while other variables are gathered from the World Bank and ICRG databases. To analyse the relationship, pooled OLS, fixed effects (FE), and random effects (RE) models are used for comparison, with model specification testing Chow F-

test and the Hausman test to ensure model accuracy. Additionally, a feasible generalized least squares (FGLS) model is employed for robustness analysis, accounting for heteroscedasticity, autocorrelation, and cross-sectional dependence.

The empirical analysis finds a positive and significant relationship between FDI and TFP in CEE economies, suggesting that foreign direct investment positively influences productivity growth in these transition economies. Inflation, as a measure of macroeconomic instability, negatively impacts productivity, while trade openness positively influences productivity. In contrast, no significant evidence is found regarding the effect of human capital on productivity. The robustness of the FDI-productivity nexus is supported by FGLS modelling results, indicating that attracting FDI and promoting trade openness could yield productivity enhancements for CEE countries. The findings stress the importance of macroeconomic stability and open trade policies in realizing productivity gains from FDI.

This paper adds new contributions to the literature related to FDI and total factor productivity (TFP), offering new evidence on the positive impact of foreign direct investment on productivity growth in Central and Eastern European (CEE) economies. This thesis supports that there is direct FDI-productivity effect (Li & Tanna, 2019; Tuan et al., 2009; Woo, 2009; Girma et al., 2015). By focusing on the post-Soviet transition period, this study expands the existing body of work on FDI-TFP nexus in these economies and provides insights into the effects of institutional quality, macroeconomic instability, and trade openness on productivity. Moreover, this paper addresses the existing gap in the literature regarding the FDI-productivity relationship in post-Soviet Union countries, providing valuable policy implications and enriching our understanding of how macroeconomic stability and trade openness can influence the extent to which FDI translates into productivity gains in these unique economic contexts.

The rest parts of this thesis are structured as follow: section 2 reviews the outstanding literature on related topic; section 3 introduces the research methodology; section 4 summarizes the descriptive statistics; section 5 performs the empirical analysis and discusses the implications; section 6 discloses limitations of this thesis and

draw takeaway conclusions.

2. Literature review

2.1. The FDI-productivity nexus

In theory, the FDI-economic growth nexus or FDI-productivity growth nexus is generally positive, while in the existing empirical analyses, the relationship is ambiguous and inconclusive.

At the micro or firm level, some studies imply a positive impact of FDI for the recipient countries. Djankov and Hoekman (2000) adopt methods of ordinary least squares (OLS), fixed effects and random effects and find that cross-border investment exerts a positive effect on total factor productivity (TFP) increase for the recipient enterprises in the Czech Republic. Kimura and Kiyota (2006) report a positive impact on Japanese firms. Tuan, Ng and Zhao (2009) report that China, the world's largest share of FDI receivers among various developing economies, shows a significantly positive FDI-productivity relationship; Zhao & Zhang (2010) suggest a positively direct and indirect impact on Chinese productivity enhancement and the interaction factor human capital strengthens the relationship. Keller and Yeaple (2003) in the US, Harris and Moffat (2013) in the UK, Yasar and Paul (2009) in Turkey, as well as Javorcik and Li (2014) in Romania argue for positive FDI-productivity growth spillover effects. Moreover, Blomstrom and Sjöholm (1999), as well as Chuang and Lin (1999) provide empirical evidence on a positive relationship for Indonesia and Taiwan, respectively.

By contrast, other firm-level studies argue there are negative, insignificant or mixed effects in this matter. Aitken and Harrison (1999) provide evidence of negative influence in Venezuela. Potterie and Lichtenberg (2001) as well as Nachum, Dunning and Jones (2000) argue for a potentially negative effect on FDI inflow to the host countries. Gorg & Greenaway (2004) believe that the effects are mostly negative, and although there is some proof of a positive relationship for some countries, disagreement still appears in particular circumstances. Haddad and Harrison (1993) report

insignificant externalities in Morocco. Fons-Rosen, Kalemli-Ozcan and Sorensen (2017) study 25 developed economies and do not conclude the effect significant. Vahter and Masso (2006) use firm-level population data to provide insights that the spillovers of FDI vary for different model specifications, variables or sectors, and there is a prominent self-selection bias for FDI receivers or initiators that enterprises with high productivity would be more likely to have FDI inflow. Girma et al. (2015) present that FDI in China exerts a direct positive impact on productivity for international business while exerts an indirect negative impact on local enterprises.

A meta-analysis reviews 69 empirical investigations in 31 less developed economies from 1986 to 2013 and finds that merely 32% of empirical studies provide support for a positive and significant result, around half of the research suggests the estimations are not significant, and 17% negative and significant effect (Demena & van Bergeijk, 2017). Moreover, the finding of this meta-analysis suggests that the spillovers are subject to publication bias, specification models and other factors.

As for the macro-level, the support for direct FDI on growth or productivity in the country level data is mixed. Li and Tanna (2019) provide evidence that FDI's direct effect on TFP enhancement or efficiency gain is weakly positive, and the relationship is robust after considering contingencies of human capital and institution conditions. Fillat and Woerz (2009) find the relationship significantly positive for fairly developed economies, and the impact is more powerful for developing countries. Tiwari and Mutascu (2011) examine more than twenty Asian countries from 1986 to 2008 using pooled OLS, panel random and panel fixed effects methods and find a positive relation. Joo & Shawl (2021) perform a case study on BRICS (Brazil, Russia, India, China and South Africa) using the feasible generalised least squares (FGLS) model and conclude there is significantly positive FDI effect on economic growth. Some studies are supportive to the view that a positive association between FDI and growth was found irrespective of other conditions (Herzer and Klasen, 2008; Hansen and Rand, 2006). Some researches present evidence on the effect under certain conditions. Trade openness (Balasubramanyam, Salisu & Sapsford, 1996), institution quality (Slesman, Baharumshah & Wohar, 2015), financial development (Alfaro, Kalemli-Ozcan &

Sayek, 2009), domestic policy environment (Mallick and Moore, 2008), and host country technology absorptive capacity (Woo, 2009), could have effect on the FDI and growth relationship.

On the other perspective, some studies argue that FDI does not exert a robust positive effect on growth. Demir and Duan (2018) performed OLS, 2SLS (two-stage least squares method) and the GMM model on more than two hundred countries and find no significant effects between bilateral cross-border investment flow and productivity on the recipients and senders. Lipsey (2002) reports no consistent association between outstanding or inflow FDI and growth. Alfaro, Kalemli and Sayek (2004) explore more than 49 countries and imply that FDI solely may not play a important role in economic development, while economies with well-developed financial market are found to have a remarkably positive FDI-aggregate productivity effect, and less developed financial market development would restrict the economy taking the advantage of foreign investment. Carkovic and Levine (2002) suggest that FDI does not have a robust and positive effect on growth. Herzer and Donaubauer (2018) argue for a long-term negative effect on total factor productivity, and this causality only validates from one direction, FDI to productivity.

In summary, the effect of FDI on productivity is inconclusive in the literature, and most literature at the macro level study the relationship between FDI and growth, and at the micro level study FDI and firm productivity. Thus, this paper aims to study the impact of foreign direct investment on aggregate productivity using macro-level data.

2.2. Summary of FDI-productivity mechanism

According to Bruno and Cipollina (2018), foreign direct investment could offer immediate funding for the purchase of new facilities and machinery (long-term asset), and serve as a significant driver for economic reorganisation. Additionally, it could directly transmit “embedded” technology to overseas subsidiaries, and technology may also indirectly disseminate or “spillover” into domestic economies. In micro level, the

effect can be either direct, affecting the international branches that receive the investment, or indirect, affecting local enterprises that are influenced by the foreign firms. In the second scenario, the indirect impact might occur either horizontally (within the same sector), or vertically (between different sectors). Ultimately, the vertical impact may be categorised into two types: forward linkages, which refer to the connections with domestic clients downstream, and backward linkages, which refer to the connections with domestic suppliers upstream. While FDI has the capacity to exert the influences mentioned above, it does not suggest that these effects occur unconditionally. The effect of cross-border investment on the recipient nation depends on various factors, including the type of FDI and the motivations behind multinational corporations making these investments (such as markets, resources, efficiency, or strategic assets looking for FDI). It also depends on the characteristics and capabilities of the recipient economy (referring to absorptive capacities), the method of entry (such as greenfield projects, takeovers, or mergers and acquisitions), and the scale of entry (multinational firms acquire how much percentage of shares in domestic enterprises).

Regarding the direct effect of cross-border investment on economic/productivity growth in the micro level, especially when FDI brings in capital to the recipient nation, there is some agreement that it has a beneficial influence on the host countries, and this conclusion is supported by evidence in the literature (Blomström, & Kokko, 1998; Navaretti & Venables, 2004; Girma et al, 2015). In the macro level, when looking at statistics from different nations, the evidence about the direct effect of foreign direct investment on economic or productivity growth is inconclusive, despite that there is strong demonstration suggesting the effect of FDI on growth is not a simple linear relationship, but rather depending on the ability of the recipient economies to absorb and benefit from the investment (Li & Tanna, 2019).

2.3.Productivity

The relationship between FDI and productivity growth has significant welfare

implications, particularly considering the recent empirical studies underlining productivity growth as the major motivator of economic development in the long run. Despite the fact that previous empirical literature believes factor accumulation is the crucial determinative factor for growth, an agreement is built that factor accumulation is much less significant than productivity growth for economic expansion. (Kose, Prasad & Terrones, 2009). Lipsey (2000) summarized that the economic historical scholars recognized technology change as the primary determinant of long-run economic growth across the ages.

The conventional wisdom holds the view that the change of aggregate productivity is the measurement of technical change rate, and famous economists have given interpretations to TFP. Law explained that “total factor productivity of an economy only increases if people ‘work smarter’ and learn to obtain more output from a given supply of inputs. Improvements in technology – the invention of the internal combustion engine, the introduction of electricity, of semiconductors clearly increase total factor productivity.” The quote interprets TFP as a measurement of all technological enhancements. Another prominent economist, Statscan, regarded TFP accesses the impact of technology change and enhancements in efficiency over the long run: “Technological progress or the growth of total factor productivity is estimated as a residual from the production function... Total factor productivity is thus the best expression of the efficiency of economic production and the prospects for longer term increases in output.” (Lipsey, 2000)

In a panel discussion consisting of members from the European Bank of Reconstruction and Development, the Federal Reserve Bank of Philadelphia and BEROC, Kyiv School of Economics, SITE, and IMF, economists highlighted the necessity for sustained reform in diverse fields to assure inclusive and lasting economic growth, and the key role of focusing on improving productivity to achieve economic success for transition economies. Speakers in the discussion first observed that transition economies generally have been narrowing the economic gap with wealthier EU members over the past two decades. This economic growth on various occasions

has been driven by FDI and productivity enhancement. (Becker et al., 2018)

2.4. Foreign direct investment (FDI)

According to Kerner (2014), the definition of FDI could be diverse: FDI, as defined by Oatley, refers to “A form of cross-border investment in which a resident or corporation based in one country owns a productive asset located in a second country. Such investments are made by multinational corporations. FDI can involve the construction of a new, or the purchase of an existing, plant or factory.” While Sobel describes FDI as “Investment in control of productive facilities overseas—usually defined by an investment that amounts to control of 10% or more of a company's equity.” The definitions exhibit minor yet crucial distinctions. Oatley's argument suggests that FDI requires a foreign source of capital, whereas Sobel's description allows for locally raised capital to be considered FDI provided that it is controlled by a foreign-based multinational firms. Although there is a small difference in the way these concepts are expressed, the practical difference in terms of real-world impact is significant, resulting in the capital of trillions of dollars allocated in a non-random manner on a worldwide scale. Both definitions prioritise "productive" assets and activities, necessitating the inclusion of a clear definition of the term "productive" and factual understanding of how the foreign affiliate utilises capital.

Direct investment, according to the definitions provided by the IMF and OECD, is when a resident entity in one nation (the direct investor) intends to acquire a long run ownership interest in a business based in a different country (referred to as the direct investment enterprise). The term "lasting interest" denotes a resilient and continuous connection between the investor and the investment enterprise, marked by a significant degree of influence on the management of the company. Direct investment refers to the initial transaction that establishes a relationship between an investor and a company. It also includes any following capital transactions between them and related companies, regardless of whether they are incorporated or unincorporated. It is crucial to emphasise

that capital transactions that do not lead to any settlement, such as the swapping of shares between affiliated firms, must also be recorded in the Balance of Payments and the International Investment Position. (Duce and España, 2003)

In recent decades, FDI has become a hot topic for investigation, and there are several reasons and motivations according to Moosa (2002): One reason is the exponential enhancement in foreign direct investment and the subsequent shift in its distribution, notably during the 1980s. During the 1990s, foreign direct investment constituted around 25% of global capital outflows, experiencing a relative increase compared to other types of cross-border investments since the 1970s. The exponential increase in cross-border investment can be attributed to intense global rivalry and the inclination to liberalise financial, goods, and factor markets. FDI flows have been observed to persistently increase despite a slowdown in global commerce. For instance, if trade obstacles hinder the growth of trade, corporations may resort to Foreign Direct Investment (FDI) as a means to bypass these hurdles. Another instance is that despite the decline in diversified investments in Asian countries during the 1990s crisis, there was no substantial impact on foreign direct investment flows. According to Lipsey (1999), foreign direct investment has been the most stable kind of international investment for host countries. The second reason driving attention to FDI is the worry it generates regarding the origins and outcomes of foreign ownership. The perspectives on this matter are highly varied, ranging from considering FDI as a representation of new colonialism or imperialism, to perceiving it as an indispensable factor for the survival of the recipient nation. Many countries exhibit a contradictory or uncertain stance towards FDI. It is claimed that incoming FDI has adverse impacts on employment, hinders domestic technical advancement, and exacerbates the trade deficit. A significant level of foreign ownership frequently raises alarm regarding the possibility of losing sovereignty and compromising of national security. Outward foreign direct investment is occasionally criticised for causing job exports and granting foreigners the opportunity to acquire native technologies. One further justification for examining FDI is its potential to provide resources to developing nations. According to this assertion, foreign direct investment is increasingly becoming a significant source

of cash, especially when alternative methods of financing are becoming scarce. This is particularly evident after the global debt crisis that occurred in the beginning of the 1980s. According to Lipsey (1999), cross-border investment has consistently been the most reliable form of foreign investments for less developed economies. Furthermore, foreign direct investment is significant not merely because it involves the transfer of capital, but also because it typically would involve the technology transferring, managerial skills, technical knowledge, and marketing expertise. However, it is important to stress that FDI does not always need the transfer of capital financially, since investors might choose to contract a loan from local financial institutions. Furthermore, the additional advantages of FDI may not come into existence, or they may come into existence at a giant expense to the recipient economies. FDI is regarded to exert a possibly crucial influence on the transition of the former Communist economies. It enhances internal savings and increases the overall investment in the recipient country. Furthermore, FDI is advantageous due to its ability to introduce cutting-edge technology, enhance managerial expertise, and provide opportunities for accessing global export markets. As mentioned before, these favourable benefits may not occur, or they may occur at the same time as certain negative effects.

FDI can be categorised based on the viewpoint of the investor (the country providing the investment) and the viewpoint of the host country receiving the investment (Moosa, 2002): Caves (1971) classified foreign direct investment from an investor's viewpoint into mainly three kinds: horizontal, vertical, and conglomerate FDI. Horizontal foreign direct investment is carried out with the aim of expanding horizontally by producing identical or similar items in the recipient economy as in the recipient nation. Therefore, product differentiation plays a crucial role in determining the market layout for horizontal FDI. In a broader sense, horizontal one is carried out to fully utilise specific advantages of monopoly or oligopoly, for instance, patents and differentiated goods. This is especially true if expanding domestically would result in a violation of antitrust laws. Vertical foreign direct investment, in contrast, is carried out with the intention of leveraging raw materials or establishing proximity to customers by acquiring distribution outlets. Conglomerate FDI is the third type of

foreign direct investment that encompasses horizontal and vertical ones. In the globe, horizontal, vertical, and conglomerate mergers and acquisitions made up 71%, 2%, and 27% of the total amount of merger and acquisition in 1999, respectively (Moosa, 2002).

From the recipient nation's viewpoint, FDI could be categorized as three types: import-substituting, export-enhancing, and government-initiated FDI (Moosa, 2002). Import-substituting FDI refers to the domestic production of products that were formerly imported, leading to a decline in both the recipient nation's imports and the investing nation's exports. This category of FDI is typically affected by the market size of the recipient nation, transportation cost, and trade barrier. In contrast, export-enhancing FDI is driven by the need to find fresh sources of inputs, for example, raw materials and intermediate products. This form of FDI increases the recipient nation's exports of these inputs to the investing country and other nations where the multinational corporation's subsidiaries are based. Government-initiated FDI occurs when the regime provides motives for foreign investors to address a deficit in the balance of payments. Kojima (1985) offers a rather similar classification of FDI related to trade. Based on Kojima's categorization, FDI can be classified as either trade-oriented FDI, which leads to a surplus market demand for imports and a surplus of market exports under the initial conditions of trade, or be classified as anti-trade-oriented FDI, which negatively impacts trade.

FDI data could also be classified into FDI flows and stock. FDI flows denote "the net value of financial transactions between MNCs and their foreign affiliates over a period of time, usually a year". Aggregate flow statistics include equity, intercompany loans, and reinvested profits. Central banks would collect FDI flow statistics to display the balance of payments, and these statistics are commonly known to be the "balance of payments data." (Kerner, 2014)

2.5. Factors that could influence FDI-Productivity relationship

While the evidence on FDI as a motivator for economic expansion is mixed, the

literature supporting FDI-growth indicates that the growth-promoting effect of FDI inflow generally relies on countries absorptive capacities to take the largest advantage of technology transfer and productivity spillovers related to this capital inflow. The major effort of micro level studies examined the FDI effect on productivity and the types of industrial linkages, including the vertical and horizontal one that facilitate the transfer of these influences. However, these impacts are examined in majority irrespective of the host economy's absorptive capacities. Demena and van Bergeijk (2017) in their meta-analysis argue that merely one-fifth of the research have effective control over host economy's situation. It was concluded that the firm-level studies primarily accounts for the impact of absorptive capacity in a limited view, stressing on the effect of research and development, technological disparity, and labour's educated level as representations. By comparison, at macro level literature, the effects of absorptive capacity are proxied by economic wide indicators, including human capital, trade openness, institution conditions, and macroeconomics stability, in spite that major studies stress mainly in examining the effect on growth instead of total factor productivity enhancement. (Li & Tanna, 2019)

2.5.1. Institution

Some researchers propose that cross-border investment itself does not have an isolated impact on growth or productivity, instead, the relationship relies on the host economy's characteristics (Carkovic & Levine, 2002; Borensztein, Gregorio & Lee, 1998). In the existing literature, there is sufficient evidence considering the importance of institution quality in the enhancement of domestic productivity. Prufer and Tondl in 2008 conclude a deep relationship regarding foreign direct investment and productivity growth in the Latin America area relies on a well-functioning legal structure. Slesman, Baharumshah and Wohar (2015) report strong evidence that foreign capital inflow has a positive effect on growth for the recipient nation with high institution quality, and the effect is insignificant or negative for the host country with low institution quality. Bekaert, Harvey and Lundblad (2011) also stress the significance of institution quality in creating high productivity growth. Moreover, Li and Tanna (2019) suggest a weak

FDI-TFP growth effect, and the relationship becomes robust after accounting for institutions as contingencies. They also conclude that promoting institution quality is important for less developed economies to realise productivity growth from FDI.

In addition, Becker et al. (2018) mentioned that to foster comprehensive and enduring economic expansion, it is necessary to implement changes across different fields. Considering that enhancing productivity is crucial for achieving economic growth, governments should prioritise establishing the policies for investment and innovation. This emphasize that related institutions should be able to provide the structure for functioning market. Therefore, the significance of rule of law, corruption controlling, and other relevant areas should be stressed since transition economies usually found to be incomplete in these areas.

2.5.2. Macroeconomic instability (Inflation)

Macroeconomic stability is also widely acknowledged to be a factor of economic growth or efficiency improvement (Joo & Shawl, 2021). Inflation as a representation of macroeconomic instability is found to exert a negative influence on growth (Bleaney, 1996). Mechic, Silajdzic and Babic-Hodovic (2013) find empirical evidence that economic stability is a significant motivator of growth in European economies. Jallab, Gbakou, and Sandretto (2008) report a positive and significant effect of cross-border investment on GDP growth in the case of economic stability in North African countries. Prufer and Tondl (2008) suggest a strong correlation for FDI-productivity growth when the economy has stability. Abdelmalki et al. (2012) investigate the effect of macroeconomic stability on the relationship and find a positive influence only when inflation is controlled at a certain level.

2.5.3. Human capital

Other researchers also reveal that education is relevant to productivity or GDP growth. Alfaro and Charlton (2007) suggest that FDI may not exert a direct positive effect on growth, but the relationship is found when human capital is available and financial development is in place. Borensztein, Gregorio and Lee (1998) analyse the

effect of human capital on the FDI-economic growth connection and reveal that FDI is beneficial to GDP enhancement when a specific level of human capital in the recipient nation is satisfied. Liu, Agbola and Dzator (2016) using industry-level data prove that a high quality of human capital creates a strong spillover impact on productivity improvement in China. In addition, Li and Tanna (2019) suggest a robust FDI-aggregate productivity enhancement relationship taking the account of human capital and suggest that under certain circumstances the human capital effect could diminish. Contessi and Weinberger (2009) conclude that many studies find that the more an economy equipped with human capital, the more foreign direct investment contributes to increased economic development.

2.5.4. Trade openness

Economists have increasingly focused on the influence of globalisation on economic expansion in recent decades. Typically, past research typically emphasises the beneficial impacts of globalisation on promoting economic growth. A significant body of literature describes globalisation as a state of openness, particularly in terms of trade. Nevertheless, scholars have varying interpretations and definitions of trade openness. Consistent with this understanding of globalisation, Dollar (1992) discovered that an economy's focus on external markets, along with a high level of exports and the ability to sustain imported commodities and machinery, contribute to economic growth. Greenaway et al. (1998) provided evidence through cross-country regressions that trade protection exerts a negative influence on growth rates. Generally, past studies focusing on time series or panel datasets have consistently highlighted that some economic features of globalisation have had a key role in driving growth in Central and Eastern European economies during their transition period. The academics typically emphasise the favourable influence of FDI and trade openness on economic growth in Central and Eastern European transition economies. (Gurgul & Lach, 2014)

Trade openness is a key factor in promoting productivity growth (Yang and Mallick, 2014). Cooray, Dutta and Mallick (2017) believe that high openness of trade could expand the goods trading sector and enhance economic activity, thus bringing

about economic growth. They also find that human capital contributes to the trade openness effect on the economics growth (Cooray, Mallick & Dutta, 2014). Trade openness has an essential influence in boosting productivity growth by promoting the "learning-by-exporting" theory (Yang and Mallick, 2014). Moreover, Li and Tanna (2018) argue that vast amount of FDI funds are commonly related to a high level of trade openness. Contessi and Weinberger (2009) conclude that many studies find that the more an economy is opened to trade, the more foreign direct investment contributes to increased economic development.

2.6. Economic transitions in CEEs

Transition economic has been one of the most controversial issues in literature in Europe and the US. Conferences are arranged, special issues are published in reputable journals, and investigating institutes are established to comprehend the characteristics of transition process and to acquire its fundamental insights. Thus, the post-Soviet Union period and economies should attract more exploration. Previously Central-planning economies consists of 26 countries in total that facilitated reforms economically and politically, and these economies could be categorized mainly in two groups: The first category comprises nations located in Central and Eastern Europe, and the nations of the former Soviet Union comprise the other category. The two categories attained varying degrees of economic advancement. (Khitakhunov, 2020)

The characteristics of the initial transition period were outlined by scholars. The beginning of transition process was implemented first by Poland, where initiated a comprehensive stabilisation and reform programme starting from 1989 and was put into effect on January 1, 1990. The action plans executed by transition countries include the measures to achieve macroeconomic stability, fiscal policy reform, merchandise trades and social policy. In the meantime, establishing institutional and legal structures was of great importance. From 1989 to 1994, the overall output of all transition economies decreased by 40.8%, and the figure for CEEs is 32.6% compared to the 1989 level. In addition, the inflation rates have reached an exceptionally high level, and 22 out of 26

economies encountered annual inflation rates that were at least three times the initial value. (Khitakhunov, 2020; Fischer et al., 1996)

The performances of formally central planning economies in the first decade starting from the transition were summarized. The evidence suggests that the mean level of output decreases in CEEs ranges from 28% to 43%, which is lower than the 54% fall observed in former Soviet Union countries. By 1998, the majority of nations had successfully reduced inflation rates to single digit. It was mentioned that the fiscal balance had plummeted. For example, in the majority of Central and Eastern European nations, the mean fiscal deficit deteriorated to 4-5%, and in the Baltic countries, fiscal surplus of over 5% decreased to nearly zero. The conventional tax structures and the institutional framework for revenue collection had completely failed, resulting in a significant fall in revenues, even though there were still substantial demands for expenditures. It was concluded that those countries that were closer to Western Europe had comparatively shorter duration of communist society and were more advanced in economic development when controlled by former Soviet Union have better performance. (Fischer & Sahay, 2000)

Becker et al. (2018) examined the economic development of CEEs during a period of 25 years following the fall of the Communism. Their conclusions highlight the difficulties and obstacles faced by these countries: the CEEs should enhance the efficiency and effectiveness of their investments, and increasing productivity is crucial for achieving future economic development. This may be accomplished by investing in both human capital and physical resources, while also enhancing the basic institutions that facilitate and encourage these investments for all key parties involved. It should be noticed that the process of change is challenging, while the alternatives are far less favourable for the majority of individuals in these economies. Therefore, to attain better growth rates and long-term development, it is crucial to facilitate a comprehensive range of reforms, including in the economic and political aspects, and pursue a strategy that seeks to enhance the institutional development of nations. (Khitakhunov, 2020)

3. Methodology

3.1. Variable description

In order to test the association between aggregate productivity and foreign investment, the model will consider the effect of FDI on aggregate productivity, and control for institutions, inflation, human capital, and trade openness (Li & Tannas, 2019).

TFP, the dependent variable of the study, refers to the productivity of the domestic economy. The comparative productivity levels data drawn from the Penn World Table version 10.01 is selected to measure the country's total factor productivity level according to Fernald, Inklaar and Ruzic (2023). TFP is measured at constant national prices (2017=1).

FDI is the independent variable of the study. The FDI data taken from the Penn World Table is the net inflow of foreign direct investment as a percentage of GDP (Joo & Shawl, 2021).

Institution is a control variable referring to the institution's quality. The institution index is extracted from the ICRG database, which presents aggregate indicators of diverse measurements of institution and government risk. By summing up three indicators from ICRG: corruption, law and order, as well as democratic accountability, an institutional index is constructed (Li & Tanna, 2019). Given that these three indicators' scales are from 0 to 6, the total index value range is between 0 and 18. The higher the indicator point, the lower the institution risk and the better the institution quality.

Inflation is a control variable as a proxy for macroeconomic instability (Joo & Shawl, 2021; Bleaney, 1996). The data is extracted from the World Bank Open Data. Inflation, according to the World Bank, is "measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly; the Laspeyres formula is generally used".

Human capital is also a control variable for this study. It is the index of human

capital per capita, based on years of schooling and returns to education, and its data is drawn from Penn World Table 10.01 database (Mallick & Zhang, 2022).

Trade openness is measured by the merchandise trade as a share of GDP taken from the World Bank database (Li & Tanna, 2019). It is calculated by “the sum of merchandise exports and imports divided by the value of GDP, all in current U.S. dollars” according to the database.

3.2. Econometrics model

The thesis will employ the pooled model, fixed effect model and random effect model (Woo, 2009; Herzer & Donaubauer, 2018) for assessment. Firstly, an ordinary least square (OLS) would be performed. Since there may be a potential association between productivity and independent variables, OLS could cause biased and inconsistent results (Djankov & Hoekman, 2000). F-tests will be applied to decide whether or not pooled OLS model is appropriate for the measurement, and if pooled OLS is inappropriate, panel models including fixed effects (FE) and random effects (RE) models will be employed. One of the advantages of adopting panel data model is that it could control for unobserved variables like cultural factors or differences in business practices across regions at certain level. Another benefit is that it could control for variables that change over time but not across countries, or vary over time but not across countries. Before implementing panel data analysis, the Levin-Liu-Chu (LLC) unit root test will be used to determine if the data is stationary. Then F-tests will check the joint significance of each model and specification. Breusch-Pagan Lagrange multiplier (LM) test will be performed for choosing between pooled OLS regression and random effects regression, and the Hausman test for choosing models between fixed and random effects. The results find that fixed effects are more appropriate for our analysis. In addition, the Wooldridge test (Drukker, 2003), Modified Wald test, and Pesaran's test will account for FE model's serial correlation, heteroscedasticity, and cross-sectional dependence.

The linear regression econometrics model of combined entity and time fixed

effects is presented as follows:

$$TFP_{it} = \beta_1 FDI_{it} + \beta_2 Institution_{it} + \beta_3 Inflation_{it} + \beta_4 Humancap_{it} + \beta_5 Tradeopen_{it} + \alpha_i + \lambda_t + \mu_{it}$$

Where i denotes the country (from number 1 to 11), and t denotes time period (from 1999 to 2019). β_0 is the common intercept, and β_1 , β_2 , β_3 , β_4 as well as β_5 are the parameters to be estimated. In addition, α_i stands for countries fixed effect, λ_t for the time fixed effects, and μ_{it} for the error term.

4. Data description

The study uses second data collected from databases World Bank Open Data and Penn World Table 10.01 (PWT 10.01), World Bank Open data, and International Country Risk Guide (ICRG) data related to CEEs. These countries consist of Bulgaria, Czechia, Estonia, Croatia, Hungary, Lithuania, Latvia, Poland, Romania, Slovak Republic, Slovenia, and Bulgaria. There are 12 CEE countries, however, Albania, one of the CEEs, was excluded from the thesis study since its productivity data is unavailable. Moreover, the study period of this thesis ranges from 1999 to 2019, because 2019 is the most updated year for PWT 10.01 database, and there are plenty of data missing issues before 1999. Therefore, the data includes 21 years (T), 11 target countries (N), and total observation 231.

Variables for the study consist of three types: identifiers, dependent variables, and independent variables. Identifiers, including country name, country number, country code and year, are used to distinguish each country and year from others. The dependent variable is total factor productivity (TFP), since its rise is regarded as a crucial indicator of a nation's economic growth in the long run (Easterly & Levine, 2001). The independent variables will include foreign direct investment (FDI), since our primary objective is to test for the relationship between productivity and FDI. The control variables include institutional index (Institution), inflation (Inflation), human capital (Humancap), and trade openness (Tradeopen), which are regarded to be influential to the TFP gains.

Table 1

Variable definitions and data sources

Variable name	Definition	Expected sign	Source
Identifier			
CountryName	Country name		
Country	Country number assigned by author		
Code	Country composed by 3 letters		
Year	Year		
Dependent Variable			
TFP	TFP at constant national prices (2017=1)		Penn World Table 10.01
Independent Variable			
FDI	Foreign direct investment, net inflows (% of GDP)	+	World Bank
Institution	Index constructed by adding up the values of institutional indicators: control of corruption, law and order, and democracy. The index ranges from 0 to 18.	+	ICRG
Inflation	Annual change rate of Consumer Price Index (CPI)	-	World Bank
Humancap	Index of human capital per person, based on years of schooling and returns to education	+	Penn World Table 10.01
Tradeopen	Index of trade openness, based on merchandise trade (% of GDP)	+	World Bank

Source: author's calculations

The summary statistics reported in table 2 shows the total observations number, average value, standard deviation, minimum and maximum value of variables. For each variable, the observations are 231 and thus there is no missing data. Therefore, the data is strongly balanced and builds a solid ground for panel analysis. The aggregate productivity seemed to be rather stable throughout the 21-year period in 11 countries since the standard deviation is small. Some variables seem more likely to have larger variability or extreme value, for example, the mean trade openness is 104% of GDP with a standard deviation of 33%. The values range from 43% to 176%, indicating

diverse levels of integration into global trade. Moreover, foreign direct investment inflows change seem to fluctuate remarkably among countries or across time. Particular countries in specific years may experience significant variations macroeconomic instability and its inflation reach 45% annual change rate of Consumer Price Index (CPI). The large variations may imply the data is considerably heterogenous.

Table 2

Descriptive Statistics

Variable	Obs	Mean	Std. dev.	Min	Max
Year	231	2009	6.068	1999	2019
Country	231	6	3.169	1	11
TFP	231	0.940	0.090	0.677	1.105
FDI	231	5.201	8.325	-40.086	60.041
Institution	231	12.555	0.916	10	17
Inflation	231	3.959	5.494	-1.545	45.804
Humancap	231	3.267	0.243	2.808	3.849
Tradeopen	231	104.024	33.159	43.076	175.552

Source: author's calculation using Stata

Line graphs in Figure 1 show changes in the total factor productivity for 11 countries from 1999 to 2019. As can be seen in the graphs, most countries have upward trend of aggregate productivity growth over the decades with some fluctuation, while Bulgaria (BGR) and Croatia (HRV) are rather stable or slightly decline. When combining all the line graphs together, we could see a clear pattern that productivity dropped from 2007 to 2009, and gradually bounced back starting from 2009. This sudden decline could be subject to the 2007-2008 global financial crisis. This visual analysis suggests that these countries have potential non-stationary mean with upward trend.

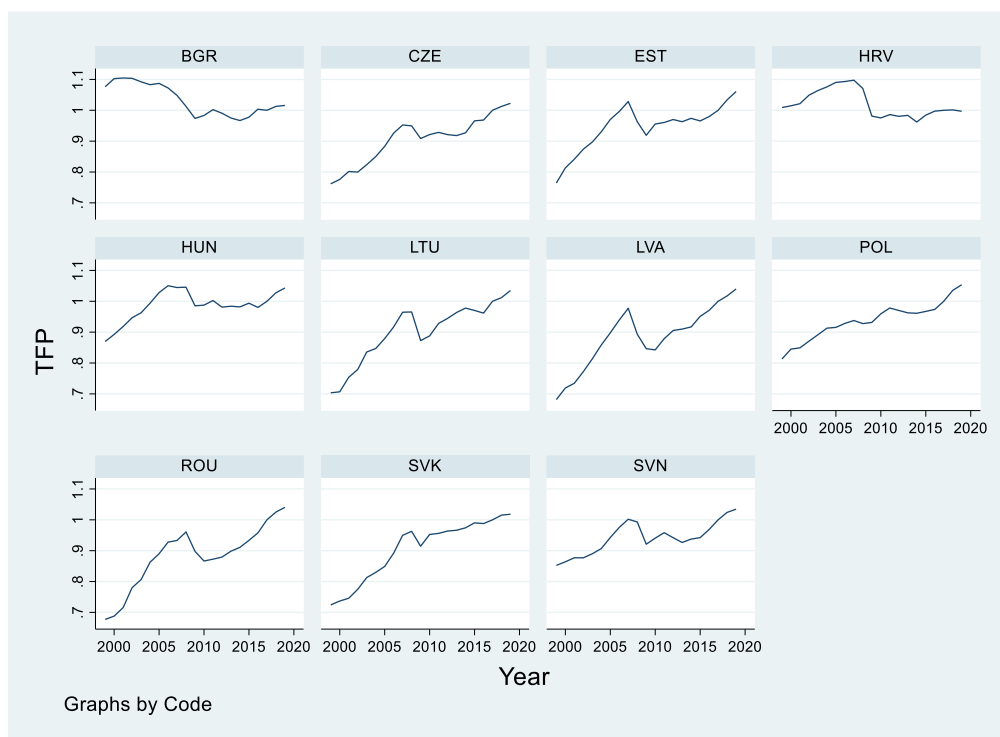


Figure 1. Line graph of total factor productivity by country

Source: author’s calculations using Stata

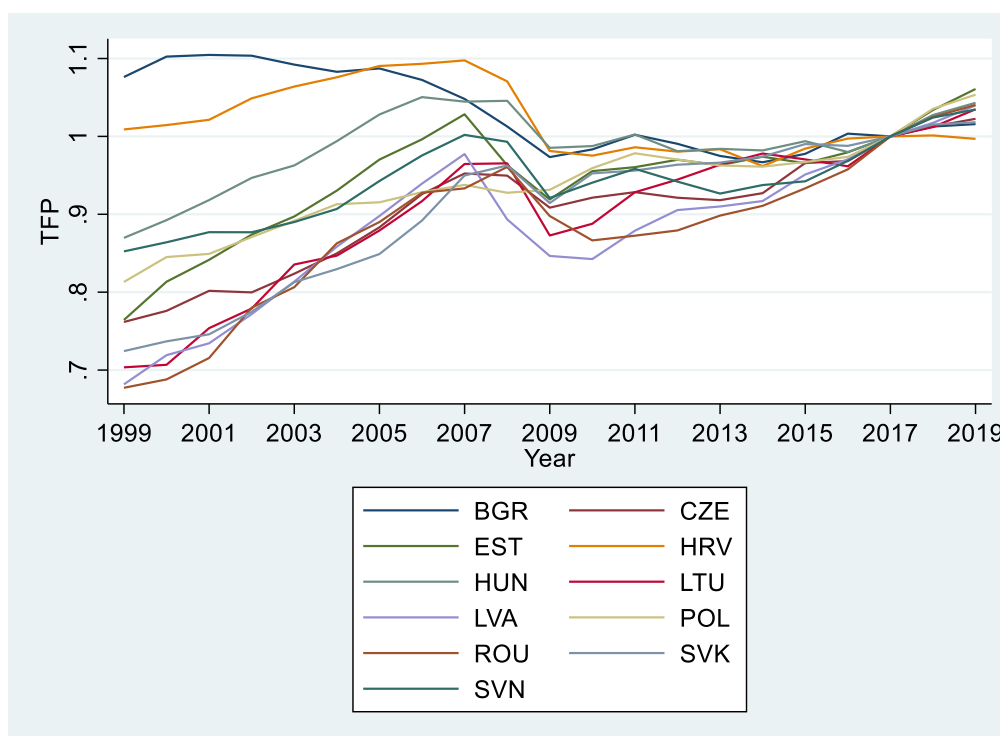


Figure 2. Line graph of total factor productivity, overlay

Source: author’s calculations using Stata

5. Empirical Process, outcomes and discussion

5.1. Pooled OLS model

Firstly, OLS model that does not account for panel structure is performed in Appendix 1 A1. The FDI-Productivity relationship is showed to be positive and significant at 5% level as expected, but the adjusted R-squared is unsurprisingly low (at 0.19). The model does not show a good fit for the data and may need some improvement by accounting for the panel structure.

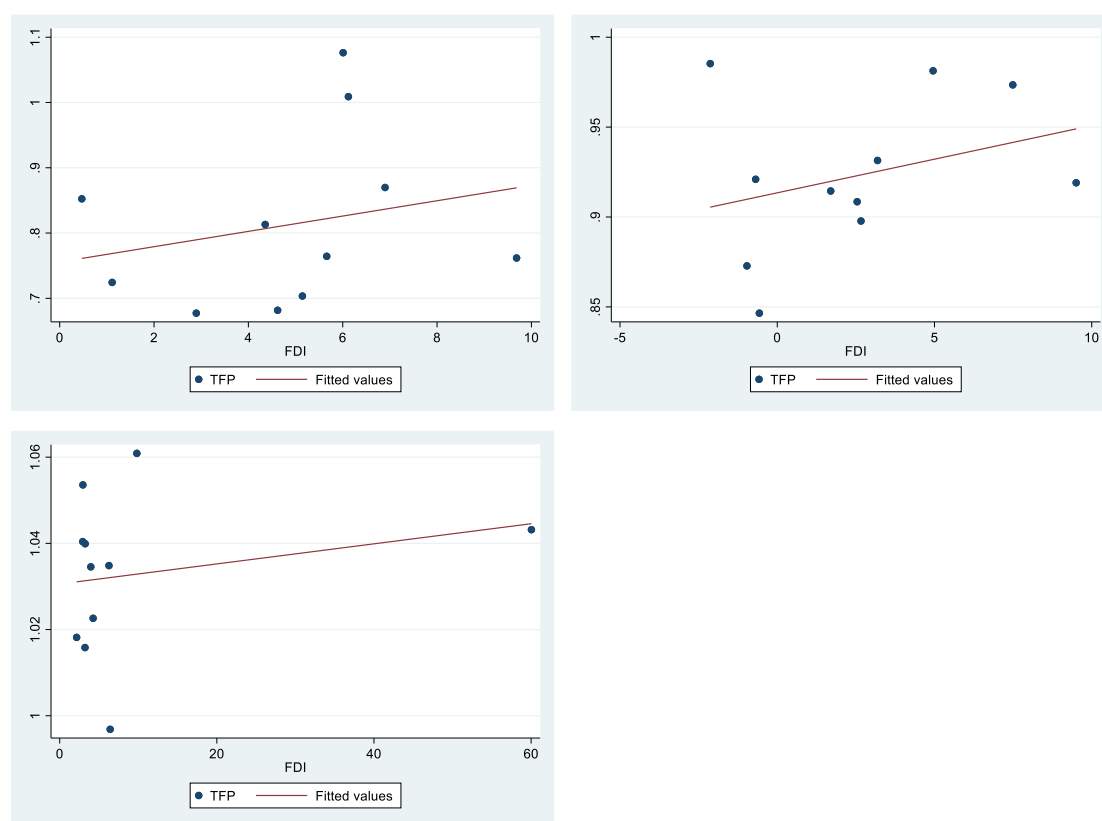


Figure 3. Scatter graphs between TFP and FDI in 1999, 2009, and 2019 respectively

Source: author's calculation using Stata

Figure 3 shows the scatter plots for 1999, 2009, and 2019, respectively. It seems that data in 2019 show strong heteroskedasticity, while data in 1999 and 2009 barely have such issue. To further analyse the situation, a scatter graph for the pooled data is constructed, and it presents strong heteroskedasticity: as FDI increases, the variance in aggregate productivity reduces drastically. In addition to the visual analysis, a formal

test, the Breusch-Pagan/Cook-Weisberg heteroskedasticity test, also suggests the similar result: the p-value is small, so the null hypothesis of homoscedasticity is rejected at 5% significance level. Having heteroscedasticity could lead to bias for t-statistics and F-statistics, thus rendering hypothesis testing incorrect.

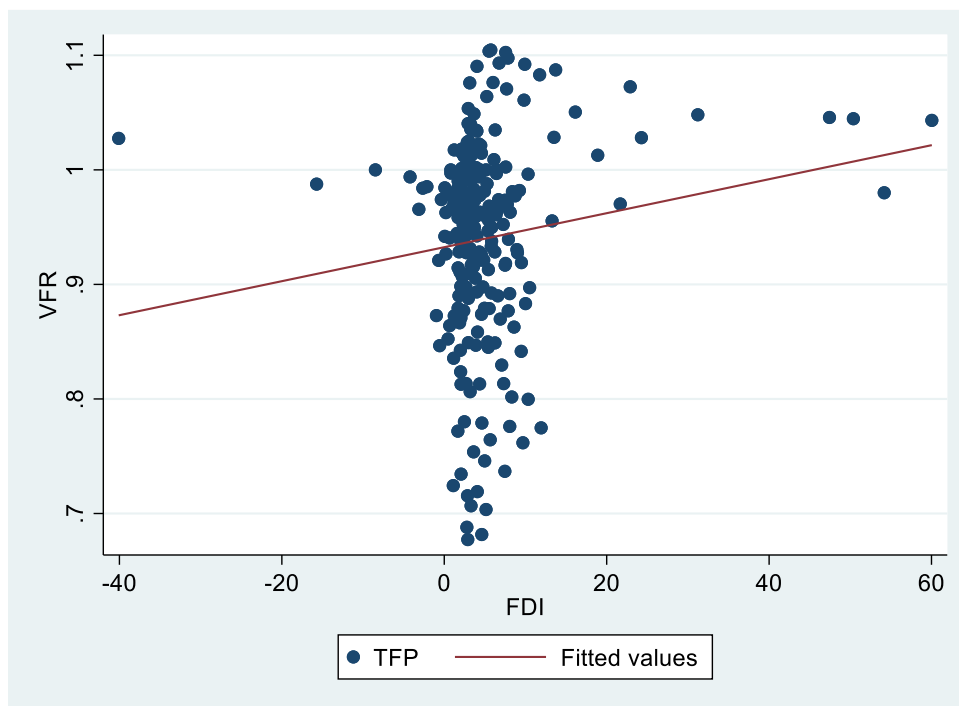


Figure 4. Scatter graph for pooled data

Source: author's calculation using Stata

5.2. Stationarity test

Since this thesis adopts panel data for analysis, the preliminary phase of handling this type of data is to check its characteristics, especially for stationarity. Stationarity is a key requirement for external validity for cross section time series data, otherwise nonstationary data may lead to spurious relationship. One of the most widely used tests for panel data analysis to test for unit roots is the Levin, Lin, and Chu test (Li & Liu, 2005). To check for the stationarity of TFP, formal test Levin-Lin-Chu (LLC) for is performed, and the result suggests stationarity. In this unit root test for TFP, the p-value is 0.0006 and therefore we reject the null hypotheses and state that TFP data is

stationary at 5% significance level. I apply the same LLC test to examine other explanatory variables including FDI, institutional index, inflation, human capital, and trade openness. At statistical 5% significance level, the null hypothesis of each variable's data has unit root is rejected and therefore state that all the mentioned variables are stationary.

5.3. Panel Fixed Effects (FE) and comparison with pooled OLS

In this section, FE model will be performed, tested, and reformulated, and then we will decide whether pooled OLS or FE is more suitable for the dataset.

The provisional analysis finds certain level of heterogeneity in the statistics, so panel data analysis could be applied for further research. An entity fixed effects estimation is given on Appendix 1 A2, and an equivalent method of estimation, least squares dummy variable (LSDV) estimator is also given on Appendix 1 A3 for re-testing. To confirm if this country fixed effects are needed, a joint test (Chow F-test) examines if the dummy variables for all nations are equal to 0. At a significance level of 5%, we reject the null hypothesis that the coefficients of all counties are collectively equal to zero, and state country effects are jointly significant. Thus, country fixed effects model is necessary instead of pooled model.

Figure 5 and 6 plots the heterogeneity visual analysis. Figure 5 calculates the mean and show how different the countries are, and there seem to be certain level of heterogeneity across countries in terms of TFP, which is consistent with our F-test result that country individual effect is significant. Figure 6 presents each country's aggregate productivity and all countries average productivity in every year. The conditional mean varies over the years and suggest there is also heterogeneity. This heterogeneity may be caused by time, therefore another FE model across time unit is introduced.

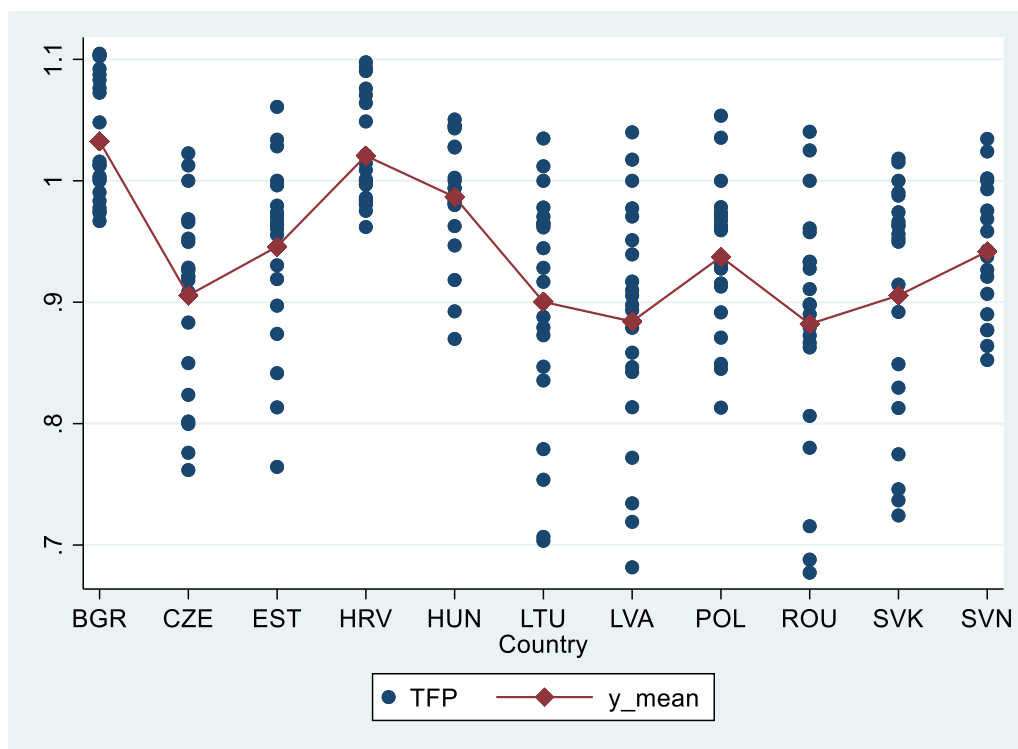


Figure 5. Analysis of heterogeneity across countries/ entities

Source: author’s calculations using Stata

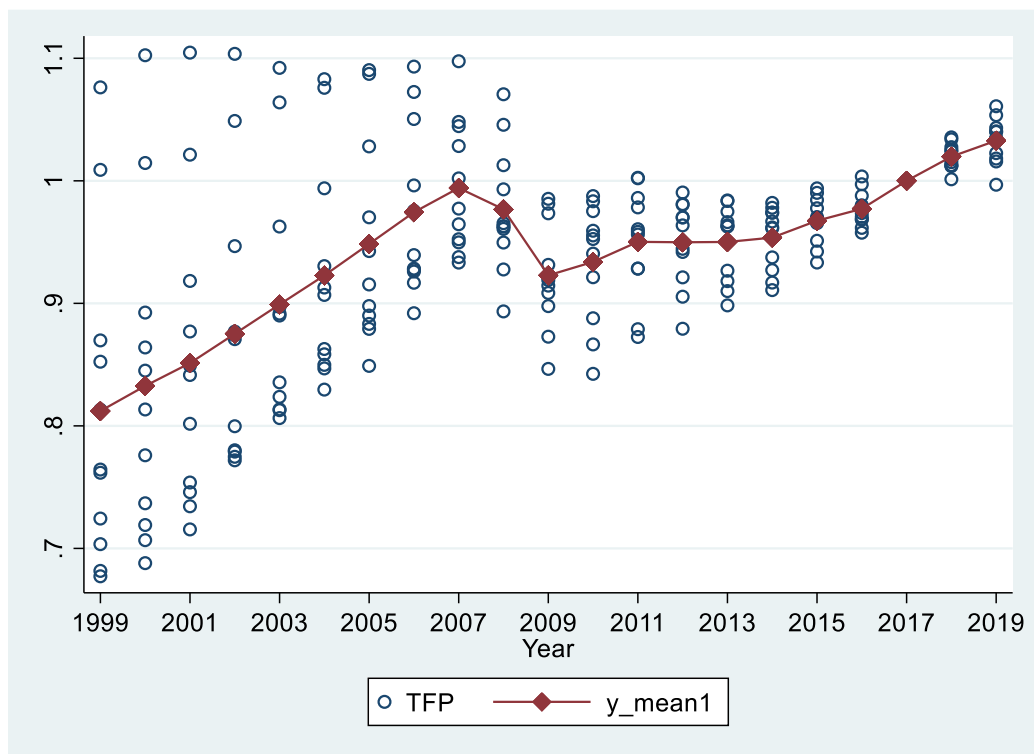


Figure 6. Analysis of heterogeneity across time

Source: author’s calculations using Stata

So far, we had introduced the individual effects for countries, but now the fixed time effect will be introduced and tested if significant. Appendix 1 A4 gives the estimation of time fixed effect through Within estimator, and Appendix 1 A5 re-tests the estimation through LSDV estimator. Then, the F-test (Appendix 1 A4) for joint insignificant of time fixed effect is performed for entity demeaned estimation. The p-value > 0.05 , null hypothesis that time fixed effects is insignificant is rejected, and it states that at least one year's effect is significantly different from others. Therefore, time effects should also be considered to improve the FE modelling.

It could be concluded that entity effect and time effect is both significant, so combined country and time fixed effect model is run, and the estimator is presented in Appendix 1 A7. Again, for re-testing, LSDV estimator for equivalent model is given in Appendix 1 A8.

5.4. Panel random effects (RE)

Besides fixed effects model, another way of analysing panel data is by adopting random effects model. A benefit of using RE model is that it could consider time invariant variables, and RE model will give a more efficient estimator and better p-value than FE model, so it is reasonable to run RE if it is statistically justifiable to do so. Thus, RE is run and given in Appendix 1 A9. However, RE may not be the most efficient model to run, since it has stricter assumptions, especially that u_i and regressors should not be correlated. When the assumptions do not hold, the coefficients of RE could be strongly biased. Generally, RE could be appropriate for data with small T and large N (often for micro-level panel study), which is different from our dataset. So, it's of great importance to choose carefully which model to adopt.

The formal and generally accepted way of comparing and choosing between pooled model and FE model is running the Hausman test (in Appendix 2). Since the p-value given in the test result is very small, we reject the null hypothesis at statistical 5% level and conclude that FE model is more appropriate for our analysis.

Table 3 presents these five models with statistical significance level. The

baseline module (column 1) is pooled OLS regression estimator; the second column is the within estimator taking the fixed effect of country differences; the third column accounts for fixed time effects; the fourth column considers both country and time fixed effects in the regression; the last column reports estimator of random effects.

Table 3

FDI and productivity models

Variables	(1)	(2)	(3)	(4)	(5)
FDI	0.001 ** (0.001)	0.001 ** (0.001)	0.001 * (0.001)	0.0001 (0.0004)	0.001 * (0.0005)
Institution	-0.021 *** (0.006)	-0.0003 (0.006)	-0.001 (0.006)	0.013 ** (0.006)	-0.006 (0.006)
Inflation	-0.005 *** (0.001)	-0.003 *** (0.001)	-0.003 *** (0.001)	-0.002 *** (0.001)	-0.003 *** (0.001)
Humancap	0.030 (0.032)	0.133 *** (0.040)	-0.076 ** (0.030)	-0.177 *** (0.062)	0.098 *** (0.038)
Tradeopen	0.0004 * (0.0002)	0.002 *** (0.0003)	0.0003 (0.0002)	0.001 *** (0.0003)	0.001 *** (0.0003)
Constant	1.075 *** (0.097)	0.352 ** (0.141)	1.186 *** (0.087)	1.32 *** (0.206)	0.562 *** (0.133)
N	231	231	231	231	231

Prob > F = 0.000 for all regressions

Notes. Dependent variable is TFP. Independent variables include FDI, and control variables are institution, inflation, human capital, and trade openness. Correlation is statistically significant at 0.01 level ***, at 0.05 level **, at 0.1 level *.

Source: author's calculation using Sata

5.5. Regression analysis and robustness

To better examining FDI's effect on productivity for these group of economies, Croatia is excluded from the regression analysis in table 4 column 1, and there are reasons for doing such, according to Harrold & Hahm (2012): Croatia's development lags behind that of other countries. Most of the CEE nations joined the European Union (EU) in 2004, while Croatia entered EU in 2013. When Croatia prepared to the entry,

its mean income level in 2013 is the same as the income level of two small and developing countries, Czechia and Slovakia in 2004. Moreover, Croatia had a poorer environment for private firms, which led to smaller size and less productive enterprises compared to earlier EU entrants. In addition, Croatia was suggested of having significant gap in its support for research and development, and in “innovation, technological readiness, institutions, and business sophistication”. Finally, the labour market of Croatia was less modernized. Its unemployment rates were among the highest and labour force participation rate were in the lowest level in EU, meanwhile Croatia particularly was lagging in the capability of increasing labour productivity.

As could be concluded in the previous test, the fixed effects model is suggested to be more appropriate for our analysis. However, there are potential post regression issues need to be addressed to verify the accuracy of this FE model, and there are 3 diagnostic tests could be used. To obtain a robust estimation, autocorrelation should be taken into account. Wooldridge’s method (Drukker, 2003) uses the residual from a regression in the first difference to test for serial correlation. The null hypothesis of the test is presented in Appendix 2. In this test, we reject the null hypothesis of no first-order autocorrelation since its p-value is very small. The thesis conducts the second diagnostic test, the Modified Wald test, to measure groupwise heteroscedasticity. The null hypothesis is stated in the appendix 1. P-value = 0.000 indicates the presence of groupwise heteroscedasticity issue. The last diagnostic test is Pesaran CD test for cross-sectional dependence detection. Cross-sectional dependence is a greater concern in most macro panel data with over 20 years period than in micro panel data, and therefore very likely to occur in our situation. The purpose of the Pesaran CD test is to check whether the residuals are correlated across countries. In appendix 2, the test outcome returns $Pr = 0.000$, so the null hypothesis of no is rejected. Hence, the model has cross-sectional dependence problem. These diagnostic tests detected serial correlation, heteroskedasticity, and cross-sectional dependence issues. To address these issues and reduce potential bias, feasible generalised least squares (FGLS) regression could be implemented (Joo & Shawl, 2021; Reed & Ye, 2011), and the result is given in Table 4 column (4) after taking account for heteroscedasticity, cross-sectional dependence, and

autocorrelation.

It should be noted that many existing studies did not account for the potential endogeneity issue, according to Baltabaev (2014). These studies include those done by Wang and Blomström (1992), Woo (2009), as well as Alfaro, Kalemli, and Sayek (2009) who draw different conclusions on the relationship. The deficiency of agreement in the research may be due to endogeneity in FDI and growth relationship (Choe, 2003). The possible endogeneity that FDI is impacted by growth or productivity instead of the reverse effect, could lead to failure in accounting for cross-border investment on economic growth. Li and Liu (2005) suggest that endogeneity is significant in FDI and output growth. Another research done by Choe (2003) uses the Granger causality test to conclude that the impact is more significant from economic growth to FDI instead of from FDI to economic growth. These results unequivocally show that endogeneity needs to be considered. Regression analysis using independent variables lagged by 1 period is one of the methods for resolving this endogeneity issue (Baltabaev, 2014; Fillat & Woerz, 2011), and it is presented in table 4 column 5.

The regression analysis between FDI and aggregate productivity is considered in table 4. The first model (presented in column 1) examines the FDI, institution, macroeconomic stability, human capital, and trade openness effect on total factor productivity, excluding Croatia. To check for robustness, based on the first model (column 1), column 2 controls for the ICRG measure of corruption individually (an indicator included in the institutional index), and the result is generally similar to that in column 1 with lower-level significance for some variables. The third model (column 3) considers the effect after countries join the European Union based on the first model, as their productivity has improved after entering. Column 4 accounts for serial correlation, heteroskedasticity, and cross-sectional dependence issues, and optimizes the empirical model using FGLS regression. In order to address potential reverse causality problem, the last model performs an analysis with all independent variables lagged by 1 period. All these regression models fit the dataset at statistical 1% level.

Table 4

FDI and productivity models: result and robustness

Variables	(1)	(2)	(3)	(4)	(5)
FDI	0.0002 (0.0004)	0.00005 (0.0004)	0.0003 (0.0003)	0.0003 *** (0.0001)	
Institution	0.026 *** (0.006)		0.008 (0.006)	-0.006 *** (0.002)	
Corruption		0.005 (0.012)			
Inflation	-0.002 *** (0.001)	-0.002 ** (0.001)	0.002 (0.002)	-0.0006 * (0.0003)	
Humancap	0.157 ** (0.078)	0.115 (0.081)	0.040 (0.088)	-0.016 (0.020)	
Tradeopen	0.001 *** (0.000)	0.001 ** (0.000)	0.001 *** (0.000)	0.001 *** (0.0001)	
lag1_FDI					0.001 * (0.000)
lag1_Institution					0.005 (0.006)
lag1_Inflation					-0.003 *** (0.001)
lag1_Humancap					0.284 *** (0.050)
lag1_Tradeopen					0.001 *** (0.000)
Constant	0.206 (0.254)	0.607 ** (0.245)	0.694 ** (0.288)	0.945 *** (0.065)	-0.121 (0.167)
N	210	210	150	231	200

Prob > F = 0.000 for all regressions

Notes. The dependent variable is TFP, independent variables are FDI, institution, inflation, human capital, trade openness and their first lags. Correlation is statistically significant at 0.01 level ***, at 0.05 level **, at 0.1 level *.

Source: author's calculation using Sata

5.6. Result and discussion

The regression outcomes of columns 4 and 5 (in table 4) suggest that FDI has a direct positive impact on productivity enhancement, and they are statistically

significant at 0.01 and 0.1 levels respectively, supporting the literature that FDI exerts a positive direct impact on productivity (Joo & Shawl, 2021; Girma et al., 2015; Tiwari & Mutascu, 2011; Tuan, Ng & Zhao 2009; Woo, 2009). In the FGLS model (column 4), TFP is expected to be enhanced by 0.0003 when FDI increases by one unit, and the figure is expected to be 0.001 for the lagged model (column 4). However, the effect is not significant for every model: from columns 1 to 3, FDI's direct effect on productivity is positive but not statistically significant. This positive direct effect but not significant robustly is consistent with Li and Tanna's (2019) work result.

As for the control variables, institution in column 1 suggests a significant positive association with productivity, and columns 2 as well as 3 show positive but not significant result. It was noticed that institutional index in column 4 is shown to have a negative relationship with productivity, which seems not in line with the expectation. This seemingly negative impact only occurs in model 4, and it is likely caused by endogeneity since the in column 5 suggests a positive effect after taking account for endogeneity, which agrees with the expectation (Li & Tanna, 2019). Moreover, the influence of macroeconomic instability, proxied by inflation, on aggregate productivity is in line with our anticipation and former study results (Li & Tanna, 2019; Prufer & Tondl, 2008) at different significance level and confirms that economic stability is beneficial to realize the productivity gains. In general, human capital exerts a positive impact on aggregate productivity, which is consistent to the previous theoretical expectation (Li & Tanna, 2019). In addition, trade openness is found exerts a positive impact on productivity for all 4 models in table 4 in surprisingly similar magnitude and at the same level (1%) of significance. This suggests that the beneficial impact of merchandise trade is robust, and the positive effect is in accordance with the empirical literature (Yang & Mallick, 2014; Li & Tanna, 2018; Gurgul & Lach, 2014).

In terms of the policy implications, CEE countries should make efforts on attracting cross-border investment and formulate regulations that could promote international trade to achieve productivity growth and economic efficiency. Moreover, the coefficient of trade openness is higher than the coefficient of FDI, therefore improving trade openness could be more important than enhancing FDI inflows for

CEE countries to acquire productivity growth. Additionally, maintaining a stable macroeconomic condition by controlling the inflation in a certain range is important to facilitate TFP enhancement.

In summary, this empirical result is in favour of positive FDI-Productivity nexus, and it provides support to for other factors, including institutional quality, macroeconomic instability, human capital, and trade openness, that are considered to have an impact on domestic productivity for CEE countries in the literature. Nevertheless, there could be some limitations that may undermine the accuracy of the analysis. Firstly, this study includes a small sample of data consisting of 231 observations in maximum and fewer for some models. In addressing this potential issue to improve measurement accuracy, quarterly or semi-annually data could be adopted in estimation for future studies if available. Secondly, although the empirical process has accounted for reverse causality issue, other endogeneity problems may potentially appear, and using instrumental variables could assist in resolving the issue in future studies.

6. Conclusion

Over the past decades, the increase in FDI has outnumbered that of output or trade, and policymakers in transition and less developed economies have focused on attracting foreign investment, hoping that it could bring out technology updates and productivity growth on the domestic economy (Driffield, Mickiewicz & Temouri, 2013). FDI has played a crucial role in the transition economies of Central and Eastern Europe. Although there is abundant empirical evidence related to the impact of FDI on total output growth, the influence of FDI on productivity and efficiency in the macro level is paid less attention, and the evidence on FDI-output or productivity is mixed.

This thesis examines the effect of FDI on aggregate productivity in CEE economies, using a 21-year panel dataset covering 11 countries and employing fixed effects and Feasible Generalized Least Squares (FGLS) models for analysis. The outcomes indicate a positive and significant direct effect of FDI on productivity in these

host economies. Specifically, the findings suggest that FDI directly contributes to productivity growth and emphasize the importance of maintaining a stable macroeconomic environment, improving institutional quality, and enhancing human capital to maximize the productivity: Firstly and most importantly, the analysis shows a significant positive direct relationship between FDI and total factor productivity, indicating that foreign investment contributes to productivity improvements in CEE countries. Secondly, institution with high quality is related to better productivity. Higher democratic accountability, more effective legal system, and better control of corruption could be the factors for productivity growth. Thirdly, stable macroeconomic condition, represented by the inflation rates controlled in a stable and reasonable range, may play a crucial role in facilitating productivity enhancement. This negative relationship between inflation and productivity stresses the importance of maintaining economic stability. In addition, human capital could be beneficial in enhancing productivity. Investment in education and expertise development may contribute to raising the aggregate productivity. Finally, openness to merchandise trade is strongly and positively related to productivity, indicating that policies promoting trade may boost productivity.

Therefore, the policy implications for CEE countries and other transition economies that seek to maximize the benefits of productivity growth would be as follows: Firstly, concomitant efforts ought to be put in place to attract FDI, embedded with advanced technology and managerial know-how. Secondly, improving institutional frameworks by improving the rule of law, controlling corruption, and ensuring democratic accountability could create an environment conducive for aggregate productivity enhancement. Thirdly, ensure the instilling of macroeconomic stability through sound fiscal and monetary policies because controlled inflation and a stable economic environment would create fertile grounds for productivity growth. Fourthly, education and skill development should be the priority areas. A highly skilled labour force should be in a position to further enhance long-run productivity growth. Lastly, policies encouraging international trade open up the countries to international trade, since trade openness could significantly enhance productivity directly.

In summary, this paper supports the literature by giving new evidence that FDI has a positive direct effect on productivity growth in CEE economies. It pinpoints the quality of institutions, macroeconomic stability, human capital, and openness to trade are of great importance in granting insight to policymakers towards the effective tool for sustainable economic growth. Results are in favour of a positive FDI-productivity relationship, but it is also important to call for further research in the spirit of comprehending the subtle impacts of FDI due to potential endogeneity issues and increasing the dataset by using more frequent data for better analysis of the effects. This study suggests that diverse dimensional influence on productivity should call for a comprehensive approach to the design of policy, taking into account a range of economic, institutional, and human capital factors to optimize productivity in the countries of transition.

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Appendix 1 Regressions

A1. Pooled OLS estimator

TFP	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
FDI	.001 **	.0007	2.22	0.027	.0002	.003
Institution	-.021 ***	.006	-3.30	0.001	-.033	-.008
Inflation	-.005 ***	.001	-4.33	0.000	-.007	-.002
Humancap	.030	.032	0.95	0.344	-.032	.092
Tradeopen	.0004 *	.0002	1.77	0.078	-.00004	.0008
Constant	1.075 ***	.097	11.07	0.000	.883	1.266
Number of obs	= 231		R-squared		= 0.206	
F(5, 225)	= 11.64		Adj R-squared		= 0.188	
Prob > F	= 0.000					

Notes. Dependent variable is TFP, and independent variable is FDI, and control variables are institution, inflation, human capital, and trade openness. Correlation is statistically significant at 0.01 level ***, at 0.05 level **, at 0.1 level *.

Source: author's calculation with Sata

A2. Panel data characteristics

Panel variable:	Country (strongly balanced)
Time variable:	Year, 1999 to 2019
Delta:	1 year

Source: author's calculation with Sata

A3. Within estimator of entity fixed effects

TFP	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
FDI	.001 **	.0005	2.18	0.030	.0001	.002
Institution	-.0003	.006	-0.06	0.955	-.012	.011
Inflation	-.003 ***	.0009	-3.07	0.002	-.004	-.0009
Humancap	.133 ***	.040	3.32	0.001	.054	.212
Tradeopen	.002 ***	.0003	5.92	0.000	.001	.002
Constant	.352 **	.141	2.49	0.013	.073	.631
Number of obs	= 231		R-squared:			
No. of categories	= 11		Within		= 0.448	
Obs per group:			Between		= 0.005	
min	= 21		Overall		= 0.092	
avg	= 21.0					
max	= 21					

H0: all dummies are equal to 0

H1: not all dummies are identically equal to 0

F test that all $u_i=0$: $F(10, 215) = 23.64$ Prob > F = 0.000

Note. Dependent variable is TFP, and independent variables are FDI, institution, inflation, human capital, and trade openness. Correlation is statistically significant at 0.01 level ***, at 0.05 level **, at 0.1 level *.

Source: author's calculation with Sata

A4. LSDV estimator of entity fixed effects

TFP	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
FDI	.001 **	.0005	2.18	0.030	.0001	.002
Institution	-.0003	.006	-0.06	0.955	-.012	.011
Inflation	-.003 ***	.0009	-3.07	0.002	-.004	-.0009
Humancap	.133 ***	.040	3.32	0.001	.054	.212
Tradeopen	.002 ***	.0003	5.92	0.000	.001	.002
Constant	.352 **	.141	2.49	0.013	.074	.631
Number of obs		= 231		Prob > F		= 0.000
No. of categories		= 11		R-squared		= 0.622
F(5, 215)		= 34.91		Adj R-squared		= 0.595
F test of absorbed indicators:		F(10, 215) = 23.639		Prob > F = 0.000		

Note. Dependent variable is TFP, and independent variables are FDI, institution, inflation, human capital, and trade openness. Correlation is statistically significant at 0.01 level ***, at 0.05 level **, at 0.1 level *.

Source: author's calculation with Sata

A5. Within estimator of time fixed effects

TFP	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
FDI	.001 *	.0006	1.90	0.059	-.00004	.002
Institution	-.001	.006	-0.22	0.825	-.0137	.011
Inflation	-.003 ***	.001	-3.34	0.001	-.005	-.001
Humancap	-.076 **	.010	-2.54	0.012	-.135	-.017
Tradeopen	.0003	.0002	1.33	0.185	-.0001	.0006
Constant	1.186 ***	.087	13.67	0.000	1.015	1.357
Number of obs		= 231		R-squared:		
No. of categories		= 21		Within		= 0.100
Obs per group:				Between		= 0.072
min		= 11		Overall		= 0.079
avg		= 11.0				
max		= 11				

H0: all u_i are equal to 0 ($u_1 = u_2 = \dots = 0$);

H1: not all u_i are identically equal to 0.

F test that all $u_i = 0$: F(20, 205) = 5.08 Prob > F = 0.000

Note. Dependent variable is TFP, and independent variables are FDI, institution, inflation, human capital, and trade openness. Correlation is statistically significant at 0.01 level ***, at 0.05 level **, at 0.1 level *.

Source: author's calculation with Sata

A6. LSDV estimator of time fixed effects

TFP	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
FDI	.001 *	.0006	1.90	0.059	-.00004	.002
Institution	-.001	.006	-0.22	0.825	-.014	.011
Inflation	-.003 ***	.001	-3.34	0.001	-.005	-.001
Humancap	-.076 **	.030	-2.54	0.012	-.135	-.017
Tradeopen	.0003	.0002	1.33	0.185	-.0001	.0006
Year_2000	.024	.030	0.81	0.420	-.034	.082
Year_2001	.037	.030	1.24	0.216	-.022	.096
Year_2002	.051 *	.031	1.65	0.100	-.010	.112
Year_2003	.074 **	.031	2.37	0.019	.012	.135
Year_2004	.100 ***	.031	3.22	0.001	.039	.161
Year_2005	.119 ***	.031	3.83	0.000	.058	.181
Year_2006	.146 ***	.031	4.67	0.000	.084	.207
Year_2007	.166 ***	.032	5.24	0.000	.103	.228
Year_2008	.163 ***	.031	5.18	0.000	.101	.225
Year_2009	.106 ***	.032	3.29	0.001	.042	.169
Year_2010	.112 ***	.032	3.50	0.001	.049	.176
Year_2011	.130 ***	.032	4.04	0.000	.067	.194
Year_2012	.130 ***	.032	4.01	0.000	.066	.194
Year_2013	.128 ***	.033	3.89	0.000	.063	.193
Year_2014	.126 ***	.033	3.80	0.000	.060	.191
Year_2015	.143 ***	.033	4.40	0.000	.079	.207
Year_2016	.148 ***	.032	4.56	0.000	.084	.212
Year_2017	.185 ***	.032	5.71	0.000	.121	.249
Year_2018	.212 ***	.033	6.40	0.000	.146	.277
Year_2019	.214 ***	.033	6.46	0.000	.149	.279
Constant	1.066 ***	.091	11.76	0.000	.887	1.245
Number of observations	= 231			R-squared	= 0.469	
F (25, 205)	= 7.24			Adjusted R-squared	= 0.404	
Prob > F	= 0.000					

Notes. Dummy variable Year_1999 is excluded to avoid the dummy variable trap. Dependent variable is TFP, and independent variables are FDI, institution, inflation, human capital, trade openness and year dummies. Correlation is statistically significant at 0.01 level ***, at 0.05 level **, at 0.1 level *.

Source: author's calculation with Sata

A7. Within estimator of combined entity and time fixed effects

TFP	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
FDI	.0001	.0004	0.23	0.820	-.0008	.0001

Institution	.013 **	.006	2.31	0.022	.002	.025
Inflation	-.002 ***	.0008	-3.00	0.003	-.004	-.001
Humancap	-.177 ***	.062	-2.84	0.005	-.300	-.054
Tradeopen	.001 ***	.0003	4.76	0.000	.0007	.002
Country_2	-.094 **	.043	-2.20	0.029	-.178	-.010
Country_3	-.078**	.033	-2.36	0.019	-.144	-.013
Country_4	.034	.023	1.50	0.136	-.011	.079
Country_5	-.090 ***	.024	-3.72	0.000	-.138	-.042
Country_6	-.156 ***	.017	-9.06	0.000	-.190	-.122
Country_7	-.161 ***	.017	-9.41	0.000	-.195	-.128
Country_8	-.061 ***	.023	-2.69	0.008	-.105	-.016
Country_9	-.108 ***	.019	-5.72	0.000	-.145	-.071
Country_10	-.106 ***	.039	-2.69	0.008	-.184	-.028
Country_11	-.089 ***	.030	-3.01	0.003	-.148	-.031
Constant	1.316 ***	.206	6.39	0.000	.910	1.723
Number of obs	= 231		R-squared:			
Number of groups	= 21		Within		= 0.615	
Obs per group:			Between		= 0.063	
min	= 11		Overall		= 0.327	
avg	= 11.0					
max	= 11					
F test that all u _i =0:	F(20, 195) = 6.47			Prob > F = 0.000		

Note. Dummy variable Country_1 is excluded to avoid the dummy variable trap. Dependent variable is TFP, and independent variables are FDI, institution, inflation, human capital, trade openness and country dummies. Correlation is statistically significant at 0.01 level ***, at 0.05 level **, at 0.1 level *.

Source: author's calculation using Stata

A8. LSDV estimator of entity and time fixed effects

TFP	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
FDI	.0001	.0004	0.23	0.820	-.0008	.001
Institution	.013 **	.006	2.31	0.022	.002	.025
Inflation	-.002 ***	.0008	-3.00	0.003	-.004	-.001
Humancap	-.177 ***	.062	-2.84	0.005	-.300	-.054
Tradeopen	.001 ***	.0003	4.76	0.000	.0007	.002
Country_2	-.094 **	.043	-2.20	0.029	-.178	-.001
Country_3	-.078 **	.033	-2.36	0.019	-.144	-.013
Country_4	.034	.023	1.50	0.136	-.011	.079
Country_5	-.090 ***	.024	-3.72	0.000	-.138	-.042
Country_6	-.156 ***	.017	-9.06	0.000	-.190	-.122
Country_7	-.161 ***	.017	-9.41	0.000	-.195	-.128
Country_8	-.061 ***	.023	-2.69	0.008	-.105	-.016

Country_9	-.108 ***	.019	-5.72	0.000	-.145	-.071
Country_10	-.106 ***	.039	-2.69	0.008	-.184	-.028
Country_11	-.089 ***	.030	-3.01	0.003	-.148	-.031
Year_2000	.014	.020	0.71	0.480	-.026	.054
Year_2001	.036 *	.020	1.78	0.076	-.004	.077
Year_2002	.070 ***	.022	3.24	0.001	.028	.113
Year_2003	.093 ***	.022	4.18	0.000	.049	.137
Year_2004	.117 ***	.023	5.18	0.000	.072	.161
Year_2005	.139 ***	.023	5.96	0.000	.093	.185
Year_2006	.158 ***	.024	6.52	0.000	.110	.206
Year_2007	.185 ***	.025	7.44	0.000	.136	.234
Year_2008	.178 ***	.025	7.06	0.000	.128	.227
Year_2009	.136 ***	.026	5.34	0.000	.086	.187
Year_2010	.129 ***	.027	4.75	0.000	.075	.183
Year_2011	.137 ***	.029	4.76	0.000	.080	.193
Year_2012	.134 ***	.030	4.52	0.000	.076	.193
Year_2013	.134 ***	.031	4.35	0.000	.073	.195
Year_2014	.137 ***	.032	4.33	0.000	.075	.200
Year_2015	.149 ***	.032	4.63	0.000	.086	.213
Year_2016	.163 ***	.033	4.97	0.000	.098	.228
Year_2017	.192 ***	.034	5.68	0.000	.125	.258
Year_2018	.218 ***	.035	6.25	0.000	.149	.286
Year_2019	.239 ***	.035	6.76	0.000	.169	.309
Constant	1.185 ***	.195	6.08	0.000	.801	1.569

Number of obs = 231

R-squared = 0.77

Adj R-squared = 0.73

Notes. Dummy variable Country_1 and Year_1999 are excluded to avoid the dummy variable trap. Dependent variable is TFP, and independent variables are FDI, institution, inflation, human capital, trade openness country dummies and year dummies. Correlation is statistically significant at 0.01 level ***, at 0.05 level **, at 0.1 level *.

Source: author's calculation with Sata

A9. Random effects

TFP	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
FDI	.001 *	.0005	1.93	0.053	-.00001	.002
Institution	-.006	.006	-1.01	0.313	-.018	.006
Inflation	-.003 ***	.001	-3.37	0.001	-.005	-.001
Humancap	.098 ***	.038	2.56	0.010	.023	.173
Tradeopen	.001***	.0003	5.24	0.000	.0008	.002
Constant	.562 ***	.133	4.22	0.000	.301	.823

Number of obs	= 231	R-squared:	
Number of groups	= 11	Within	= 0.442
Obs per group:		Between	= 0.001
min	= 21	Overall	= 0.112
avg	= 21.0	Wald chi2(5)	= 138.13
max	= 21	Prob > chi2	= 0.000

Note. Dependent variable is TFP, and independent variables are FDI, institution, inflation, human capital, and trade openness. Correlation is significant at 0.01 level ***, at 0.05 level **, at 0.1 level *.

Source: author's calculation with Stata

A10. (Table 4 column 1) Fixed effects excluding Croatia

TFP	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
FDI	0.0002	0.0004	0.393	0.695	-0.001	0.001
Institution	0.026 ***	0.006	4.062	0.000	0.013	0.038
Inflation	-0.002 ***	0.001	-2.682	0.008	-0.003	-0.001
Humancap	0.157 **	0.078	2.009	0.046	0.003	0.312
Tradeopen	0.001 ***	0.000	2.877	0.005	0.0002	0.001
Country_2	-0.301 ***	0.051	-5.951	0.000	-0.400	-0.201
Country_3	-0.226 ***	0.038	-5.922	0.000	-0.301	-0.151
Country_5	-0.154 ***	0.025	-6.111	0.000	-0.204	-0.104
Country_6	-0.186 ***	0.017	-10.934	0.000	-0.219	-0.152
Country_7	-0.171 ***	0.017	-10.195	0.000	-0.204	-0.138
Country_8	-0.155 ***	0.025	-6.108	0.000	-0.205	-0.105
Country_9	-0.154 ***	0.019	-8.085	0.000	-0.192	-0.117
Country_10	-0.289 ***	0.046	-6.272	0.000	-0.379	-0.198
Country_11	-0.216 ***	0.034	-6.406	0.000	-0.282	-0.149
Constant	0.206	0.254	0.809	0.420	-0.297	0.708
Number of obs	= 210			R-squared:		
Number of groups	= 21			Within	= 0.598	
Obs per group:				Between	= 0.579	
min	= 10			Overall	= 0.565	
avg	= 10.0					
max	= 10					
F test that all u _i =0:	F(20, 175) = 5.58			Prob > F = 0.000		

Notes. Dummy variable Country_1 is excluded to avoid the dummy variable trap. Dependent variable is TFP, and independent variables are FDI, institution, inflation, human capital, trade openness and country dummies. Correlation is statistically significant at 0.01 level ***, at 0.05 level **, at 0.1 level *.

Source: author's calculation using Stata

A11. (Table 4 column 2) Fixed effects excluding Croatia, regression with corruption

TFP	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
FDI	0.00006	0.0004	0.132	0.895	-0.001	0.001
Corruption	0.005	0.012	0.442	0.659	-0.018	0.028
Inflation	-0.002 **	0.001	-2.132	0.034	-0.003	-0.000
Humancap	0.115	0.081	1.420	0.157	-0.045	0.275
Tradeopen	0.001 **	0.000	2.566	0.011	0.000	0.001
Country_2	-0.218 ***	0.048	-4.511	0.000	-0.314	-0.123
Country_3	-0.161 ***	0.038	-4.236	0.000	-0.237	-0.086
Country_5	-0.093 ***	0.023	-4.116	0.000	-0.138	-0.048
Country_6	-0.154 ***	0.016	-9.719	0.000	-0.185	-0.122
Country_7	-0.135 ***	0.015	-9.092	0.000	-0.164	-0.106
Country_8	-0.098 ***	0.022	-4.417	0.000	-0.142	-0.054
Country_9	-0.122 ***	0.018	-6.734	0.000	-0.158	-0.086
Country_10	-0.214 ***	0.044	-4.847	0.000	-0.302	-0.127
Country_11	-0.152 ***	0.032	-4.696	0.000	-0.216	-0.088
Constant	0.607 **	0.245	2.475	0.014	0.123	1.091
sigma_u	0.043					
sigma_e	0.045					
rho	0.475	(fraction of variance due to u_i)				
Number of obs	= 210		R-squared:			
Number of groups	= 21		Within		= 0.561	
Obs per group:			Between		= 0.739	
min	= 10		Overall		= 0.582	
avg	= 10.0					
max	= 10					
F test that all u_i=0:	F(20, 175) = 3.82			Prob > F = 0.0000		

Notes. Dummy variable Country_1 is excluded to avoid the dummy variable trap.

Dependent variable is TFP, and independent variables are FDI, corruption, inflation, human capital, trade openness and country dummies. Correlation is statistically significant at 0.01 level ***, at 0.05 level **, at 0.1 level *.

Source: author's calculation using Stata

A12. (Table 4 column 3) FE, excluding Croatia, after joining EU

TFP	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
FDI	0.0003	.0003	1.135	0.259	-0.0002	0.001
Institution	0.008	0.006	1.411	0.161	-0.003	0.020
Inflation	0.002	0.002	0.950	0.344	-0.002	0.005
Humancap	0.040	0.088	0.450	0.653	-0.134	0.213
Tradeopen	0.001 ***	0.000	3.327	0.001	0.0003	0.001
Country_2	-0.131 **	0.054	-2.417	0.017	-0.238	-0.024
Country_3	-0.078 *	0.042	-1.857	0.066	-0.162	0.005
Country_5	-0.061 **	0.027	-2.269	0.025	-0.115	-0.008

Country_6	-0.087 ***	0.017	-5.119	0.000	-0.120	-0.053
Country_7	-0.077 ***	0.015	-5.197	0.000	-0.107	-0.048
Country_8	-0.040	0.025	-1.560	0.121	-0.090	0.011
Country_9	-0.056 ***	0.017	-3.362	0.001	-0.088	-0.023
Country_10	-0.130 **	0.056	-2.313	0.022	-0.241	-0.019
Country_11	-0.096 ***	0.037	-2.619	0.010	-0.169	-0.023
Constant	0.694 **	0.288	2.407	0.018	0.123	1.264
sigma_u	0.027					
sigma_e	0.028					
rho	0.481	(fraction of variance due to u_i)				
Number of obs	= 150			R-squared:		
Number of groups	= 15			Within		= 0.554
Obs per group:				Between		= 0.465
min	= 10			Overall		= 0.481
avg	= 10.0					
max	= 10					
F test that all u_i=0:	F(14, 121) = 5.83					Prob > F = 0.000

Notes. Dummy variable Country_1 is excluded to avoid the dummy variable trap. Dependent variable is TFP, and independent variables are FDI, institution, inflation, human capital, and trade openness. Correlation is statistically significant at 0.01 level ***, at 0.05 level **, at 0.1 level *.

Source: author's calculation using Stata

A13. (Table 4 column 4) Robustness check: Feasible Generalized Least Squares Model (Cross-sectional time-series FGLS)

Cross-sectional time-series FGLS regression						
Coefficients:	generalized least squares					
Panels:	heteroskedastic with cross-sectional correlation					
Correlation:	panel-specific AR (1)					
TFP	Coefficient	Std. err.	z	P> z	[95% conf. interval]	
FDI	.0003 ***	.0001	3.24	0.001	.0001	.0005
Institution	-.006 ***	.002	-3.85	0.000	-.010	-.003
Inflation	-.0006 *	.0003	-1.95	0.051	-.001	2.14e-06
Humancap	-.016	.020	-0.79	0.428	-.056	.024
Tradeopen	.001 ***	.0001	10.47	0.000	.001	.001
Constant	.942 ***	.065	14.55	0.000	.815	1.068
Estimated covariances	= 66			Number of obs		= 231
Estimated autocorrelations	= 11			Number of groups		= 11
Estimated coefficients	= 6			Time periods		= 21
				Wald chi2(5)		= 178.70
				Prob > chi2		= 0.000

Notes. Dependent variable is TFP, and independent variables are FDI, institution, inflation, human capital, and trade openness. Correlation is significant at 0.01 level ***, at 0.05 level **, at 0.1 level *.

Source: author's calculation using Stata

A14. Robustness check: lag 1 year for all independent variables, FE

TFP	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
lag1_FDI	.0007	.0005	1.48	0.141	-.0002	.002
lag1_Institution	.003	.006	0.56	0.578	-.008	.014
lag1_Inflation	-.004 ***	.0008	-4.65	0.000	-.005	-.002
lag1_Humancap	.080 **	.040	1.98	0.049	.0004	.160
lag1_Tradeopen	.002	.0003	6.06	0.000	.001	.002
Constant	.500	.141	3.55	0.000	.222	.778
sigma_u	.080					
sigma_e	.052					
rho	.697	(fraction of variance due to u_i)				
Number of obs		= 220		R-squared:		
Number of groups		= 11		Within		= 0.445
Obs per group:				Between		= 0.002
min		= 20		Overall		= 0.101
avg		= 20.0		corr(u_i, Xb)		= -0.621
max		= 20				
F test that all u_i=0:	F(10, 204) = 22.19			Prob > F = 0.000		

Notes. Dependent variable is TFP, and independent variables are lagged 1 period of FDI, institution, inflation, human capital, and trade openness. Correlation is significant at 0.01 level ***, at 0.05 level **, at 0.1 level *.

Source: author's calculation with Sata

A15. (Table 4 column 5) Robustness check: lag 1 year for all independent variables, FE (exclude Croatia)

TFP	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
lag1_FDI	0.001 *	0.000	1.961	0.051	-0.000	0.002
lag1_Institution	0.005	0.006	0.825	0.410	-0.006	0.016
lag1_Inflation	-0.003 ***	0.001	-3.461	0.001	-0.004	-0.001
lag1_Humancap	0.284 ***	0.050	5.734	0.000	0.186	0.382
lag1_Tradeopen	0.001 ***	0.000	2.910	0.004	0.000	0.001
Constant	-0.121	0.167	-0.727	0.468	-0.451	0.208
sigma_u	0.095					
sigma_e	0.049					
rho	0.790	(fraction of variance due to u_i)				
Number of obs		= 200		R-squared:		
Number of groups		= 10		Within		= 0.539

Obs per group:		Between	= 0.0004
min	= 20	Overall	= 0.1104
avg	= 20.0	corr(u_i, Xb)	= -0.743
max	= 20		
F test that all u_i=0:		F(9, 185) = 20.79	Prob > F = 0.000

Notes. Dependent variable is TFP, and independent variables are lagged 1 period of FDI, institution, inflation, human capital, and trade openness. Correlation is significant at 0.01 level ***, at 0.05 level **, at 0.1 level *.

Source: author’s calculation with Sata

Appendix 2 Tests

A1. Heteroskedasticity test

Breusch–Pagan/Cook–Weisberg test for heteroskedasticity

Assumption: Normal error terms

Variable: Fitted values of TFP

H0: Constant variance

H1: Non-constant variance

$$\chi^2(1) = 5.05$$

$$\text{Prob} > \chi^2 = 0.025$$

Source: author’s calculation using Stata

A2. Levin–Lin–Chu unit-root test for TFP

H0: Panels contain unit roots

H1: Panels are stationary

Number of panels = 11

Number of periods = 21

	Statistic	p-value
Unadjusted t	-5.309	
Adjusted t*	-2.625	0.004

Source: author’s calculations using Stata

A3. The Hausman test

	FE coefficients (b)	RE coefficients (B)	Difference (b-B)	sqrt(diag(V_b- V_B)) Std. err.
FDI	.001	.001	.00007	.
Institution	-.0003	-.006	.006	.
Inflation	-.005	-.003	.0004	.
Humancap	.133	.098	.035	.012
Tradeopen	.002	.001	.0002	.00006

b = Consistent under H0 and Ha; obtained from xtreg.

B = Inconsistent under H_a , efficient under H_0 ; obtained from xtreg.

Test of H_0 : Difference in coefficients not systematic

$$\begin{aligned}\chi^2(5) &= (b-B)'[(V_b-V_B)^{-1}](b-B) \\ &= 53.60\end{aligned}$$

Prob > χ^2 = 0.000

(V_b-V_B is not positive definite)

Note. For Hausman test: H_0 : RE model is appropriate specification; H_1 : FE is appropriate specification. P-value is 0.000, thus reject the null hypothesis and state that FE is more appropriate specification.

Source: author's calculation using Stata

A4. Testing for serial correlation, FE model: Wooldridge test

Wooldridge test for autocorrelation in panel data

H_0 : no first-order autocorrelation

H_1 : There is first-order autocorrelation

$$\begin{aligned}F(1, 10) &= 520.863 \\ \text{Prob} > F &= 0.000\end{aligned}$$

Source: author's calculation using Stata

A5. Testing for heteroscedasticity, FE model: Modified Wald test

Modified Wald test for groupwise heteroskedasticity in fixed effect regression model

H_0 : $\sigma^2(i) = \sigma^2$ for all i

$$\begin{aligned}\chi^2(11) &= 695.75 \\ \text{Prob} > \chi^2 &= 0.000\end{aligned}$$

Source: author's calculation using Stata

A6. Testing for contemporaneous correlation, FE model: Pesaran CD test

H_0 : The residuals are not correlated across countries.

H_1 : The residuals are correlated across countries.

Pesaran's test of cross sectional independence = 9.817, Pr = 0.000

Average absolute value of the off-diagonal elements = 0.516

Source: author's calculation using Stata

Appendix 3 Data

A1. Supplementary regression data

Country Name	Country	Code	Year	TFP	Human Capital	FDI	Trade openness	Inflation	Institution
Bulgaria	1	BGR	1999	1.076	2.886	6.008	69.397	2.573	13.00
Bulgaria	1	BGR	2000	1.103	2.902	7.561	86.034	10.316	12.25
Bulgaria	1	BGR	2001	1.105	2.919	5.732	87.405	7.361	11.00
Bulgaria	1	BGR	2002	1.104	2.937	5.515	83.442	5.810	11.00

Bulgaria	1	BGR	2003	1.092	2.955	9.916	87.085	2.349	11.00
Bulgaria	1	BGR	2004	1.083	2.973	11.746	93.223	6.147	11.00
Bulgaria	1	BGR	2005	1.087	2.991	13.720	100.112	5.039	11.25
Bulgaria	1	BGR	2006	1.073	3.009	22.904	111.499	7.262	11.13
Bulgaria	1	BGR	2007	1.048	3.027	31.228	109.106	8.403	10.00
Bulgaria	1	BGR	2008	1.013	3.046	18.900	108.791	12.349	10.00
Bulgaria	1	BGR	2009	0.973	3.064	7.490	76.613	2.753	10.00
Bulgaria	1	BGR	2010	0.983	3.083	3.631	90.915	2.439	10.00
Bulgaria	1	BGR	2011	1.002	3.094	3.644	105.290	4.220	10.00
Bulgaria	1	BGR	2012	0.990	3.105	3.294	109.405	2.955	10.00
Bulgaria	1	BGR	2013	0.975	3.117	3.562	114.393	0.890	10.00
Bulgaria	1	BGR	2014	0.967	3.128	1.913	111.785	-1.418	10.04
Bulgaria	1	BGR	2015	0.978	3.140	4.370	107.374	-0.105	10.67
Bulgaria	1	BGR	2016	1.004	3.151	2.757	102.811	-0.799	11.25
Bulgaria	1	BGR	2017	1.000	3.163	3.383	110.581	2.062	11.50
Bulgaria	1	BGR	2018	1.013	3.174	2.726	107.641	2.815	11.50
Bulgaria	1	BGR	2019	1.016	3.186	3.223	103.034	3.104	11.50
Czechia	2	CZE	1999	0.762	3.533	9.686	84.420	2.135	14.00
Czechia	2	CZE	2000	0.776	3.574	8.067	98.778	3.775	14.00
Czechia	2	CZE	2001	0.802	3.582	8.319	102.673	4.663	13.83
Czechia	2	CZE	2002	0.800	3.590	10.337	96.292	1.903	12.88
Czechia	2	CZE	2003	0.824	3.599	2.019	100.339	0.119	12.50
Czechia	2	CZE	2004	0.850	3.607	5.361	115.973	2.760	12.75
Czechia	2	CZE	2005	0.883	3.616	10.012	112.745	1.857	13.00
Czechia	2	CZE	2006	0.926	3.620	4.564	120.386	2.534	13.00
Czechia	2	CZE	2007	0.952	3.624	7.264	126.544	2.853	13.00
Czechia	2	CZE	2008	0.950	3.628	3.722	121.966	6.359	13.00
Czechia	2	CZE	2009	0.908	3.632	2.541	105.095	1.019	13.00
Czechia	2	CZE	2010	0.921	3.636	4.863	124.185	1.473	13.00
Czechia	2	CZE	2011	0.928	3.641	1.825	137.245	1.917	13.00
Czechia	2	CZE	2012	0.921	3.645	4.517	142.898	3.288	13.00
Czechia	2	CZE	2013	0.918	3.649	3.476	144.806	1.438	13.00
Czechia	2	CZE	2014	0.927	3.653	3.864	157.270	0.344	13.04
Czechia	2	CZE	2015	0.966	3.657	0.904	159.143	0.309	13.50
Czechia	2	CZE	2016	0.968	3.662	5.528	155.769	0.684	13.50
Czechia	2	CZE	2017	1.000	3.666	5.139	158.028	2.451	13.04
Czechia	2	CZE	2018	1.013	3.670	3.343	155.380	2.149	13.00
Czechia	2	CZE	2019	1.023	3.674	4.257	149.741	2.848	12.83
Estonia	3	EST	1999	0.764	3.246	5.661	123.782	3.296	14.00
Estonia	3	EST	2000	0.813	3.302	7.319	156.192	4.018	14.00
Estonia	3	EST	2001	0.842	3.317	9.479	147.810	5.748	13.42

Estonia	3	EST	2002	0.874	3.332	4.591	138.423	3.572	12.00
Estonia	3	EST	2003	0.897	3.347	10.515	137.624	1.335	12.00
Estonia	3	EST	2004	0.930	3.362	8.949	117.472	3.048	12.00
Estonia	3	EST	2005	0.970	3.377	21.674	127.272	4.080	12.00
Estonia	3	EST	2006	0.996	3.396	10.328	135.941	4.438	12.00
Estonia	3	EST	2007	1.028	3.415	13.511	118.878	6.601	12.38
Estonia	3	EST	2008	0.963	3.434	8.123	117.017	10.362	12.50
Estonia	3	EST	2009	0.919	3.453	9.506	97.733	-0.078	12.50
Estonia	3	EST	2010	0.955	3.473	13.278	122.304	2.972	12.50
Estonia	3	EST	2011	0.961	3.492	4.821	147.187	4.982	12.50
Estonia	3	EST	2012	0.970	3.512	7.765	148.450	3.933	12.83
Estonia	3	EST	2013	0.963	3.533	4.372	138.495	2.781	13.00
Estonia	3	EST	2014	0.974	3.553	6.689	128.925	-0.106	13.04
Estonia	3	EST	2015	0.966	3.574	-3.126	119.511	-0.492	13.50
Estonia	3	EST	2016	0.980	3.595	3.846	116.854	0.149	13.50
Estonia	3	EST	2017	1.000	3.616	6.447	116.003	3.417	13.50
Estonia	3	EST	2018	1.034	3.638	4.024	118.065	3.436	13.50
Estonia	3	EST	2019	1.061	3.659	9.822	109.794	2.277	13.50
Croatia	4	HRV	1999	1.009	2.887	6.120	50.913	4.019	10.00
Croatia	4	HRV	2000	1.015	2.910	4.587	55.670	4.611	12.67
Croatia	4	HRV	2001	1.021	2.938	4.495	59.892	3.777	13.83
Croatia	4	HRV	2002	1.049	2.966	3.665	58.365	1.672	13.00
Croatia	4	HRV	2003	1.064	2.994	5.237	57.853	1.767	13.00
Croatia	4	HRV	2004	1.076	3.022	3.140	58.870	2.055	13.13
Croatia	4	HRV	2005	1.090	3.051	4.030	60.841	3.317	13.00
Croatia	4	HRV	2006	1.093	3.086	6.756	64.277	3.190	13.00
Croatia	4	HRV	2007	1.098	3.121	7.851	64.146	2.899	13.00
Croatia	4	HRV	2008	1.071	3.157	7.681	65.611	6.077	12.92
Croatia	4	HRV	2009	0.981	3.193	4.956	50.896	2.379	12.50
Croatia	4	HRV	2010	0.975	3.229	2.632	54.304	1.031	12.92
Croatia	4	HRV	2011	0.986	3.268	1.995	57.510	2.273	13.00
Croatia	4	HRV	2012	0.980	3.308	2.560	58.015	3.412	12.33
Croatia	4	HRV	2013	0.984	3.349	1.627	58.422	2.217	12.00
Croatia	4	HRV	2014	0.962	3.391	5.370	61.884	-0.215	12.08
Croatia	4	HRV	2015	0.984	3.434	0.069	66.012	-0.464	13.00
Croatia	4	HRV	2016	0.997	3.478	0.809	68.172	-1.125	13.00
Croatia	4	HRV	2017	1.000	3.524	0.807	73.114	1.129	13.00
Croatia	4	HRV	2018	1.001	3.571	2.144	74.359	1.500	13.00
Croatia	4	HRV	2019	0.997	3.619	6.426	73.929	0.772	13.00
Hungary	5	HUN	1999	0.870	2.946	6.898	108.097	9.998	17.00
Hungary	5	HUN	2000	0.893	2.962	5.819	127.840	9.804	15.25

Hungary	5	HUN	2001	0.918	2.992	7.551	119.168	9.117	13.17
Hungary	5	HUN	2002	0.947	3.022	5.389	106.897	5.265	13.00
Hungary	5	HUN	2003	0.963	3.053	4.875	106.586	4.661	13.00
Hungary	5	HUN	2004	0.994	3.083	4.358	111.510	6.744	13.00
Hungary	5	HUN	2005	1.028	3.114	24.282	114.377	3.562	13.00
Hungary	5	HUN	2006	1.050	3.146	16.142	132.667	3.930	13.00
Hungary	5	HUN	2007	1.045	3.178	50.384	136.222	7.959	13.00
Hungary	5	HUN	2008	1.046	3.210	47.439	137.340	6.043	13.00
Hungary	5	HUN	2009	0.985	3.242	-2.130	122.660	4.212	13.00
Hungary	5	HUN	2010	0.988	3.275	-15.714	138.953	4.856	12.92
Hungary	5	HUN	2011	1.002	3.290	7.567	151.295	3.930	12.50
Hungary	5	HUN	2012	0.981	3.306	8.397	154.289	5.652	12.50
Hungary	5	HUN	2013	0.984	3.321	-2.643	153.013	1.733	12.50
Hungary	5	HUN	2014	0.982	3.337	9.260	152.814	-0.228	12.50
Hungary	5	HUN	2015	0.994	3.353	-4.207	152.186	-0.062	12.50
Hungary	5	HUN	2016	0.980	3.369	54.180	152.243	0.395	12.50
Hungary	5	HUN	2017	1.000	3.385	-8.478	154.651	2.348	12.50
Hungary	5	HUN	2018	1.027	3.401	-40.086	152.863	2.850	12.46
Hungary	5	HUN	2019	1.043	3.417	60.041	148.997	3.339	12.00
Lithuania	6	LTU	1999	0.703	2.872	5.145	71.448	0.728	12.00
Lithuania	6	LTU	2000	0.707	2.905	3.300	80.409	0.982	12.00
Lithuania	6	LTU	2001	0.754	2.938	3.615	89.365	1.367	11.92
Lithuania	6	LTU	2002	0.779	2.971	4.634	92.456	0.282	11.50
Lithuania	6	LTU	2003	0.836	3.005	1.158	90.327	-1.134	12.00
Lithuania	6	LTU	2004	0.847	3.040	3.887	95.852	1.164	12.00
Lithuania	6	LTU	2005	0.879	3.074	4.953	104.818	2.658	12.00
Lithuania	6	LTU	2006	0.917	3.089	7.485	111.037	3.739	11.71
Lithuania	6	LTU	2007	0.965	3.104	6.553	104.681	5.737	11.50
Lithuania	6	LTU	2008	0.965	3.119	3.614	114.535	10.926	11.50
Lithuania	6	LTU	2009	0.873	3.134	-0.963	92.965	4.453	11.50
Lithuania	6	LTU	2010	0.888	3.150	2.970	118.913	1.319	11.50
Lithuania	6	LTU	2011	0.928	3.165	4.320	137.413	4.130	11.50
Lithuania	6	LTU	2012	0.945	3.181	1.578	143.442	3.090	11.83
Lithuania	6	LTU	2013	0.964	3.197	1.652	144.882	1.047	12.00
Lithuania	6	LTU	2014	0.978	3.213	0.736	137.385	0.104	12.08
Lithuania	6	LTU	2015	0.970	3.229	2.503	129.227	-0.884	13.00
Lithuania	6	LTU	2016	0.962	3.246	2.735	121.694	0.906	13.00
Lithuania	6	LTU	2017	1.000	3.263	2.897	130.152	3.723	12.92
Lithuania	6	LTU	2018	1.012	3.280	2.418	129.930	2.698	12.50
Lithuania	6	LTU	2019	1.035	3.297	6.271	125.839	2.335	12.50
Latvia	7	LVA	1999	0.682	2.808	4.621	62.080	2.365	12.25

Latvia	7	LVA	2000	0.719	2.830	4.073	63.703	2.654	13.00
Latvia	7	LVA	2001	0.734	2.856	2.075	65.854	2.487	12.83
Latvia	7	LVA	2002	0.772	2.883	1.675	66.244	1.939	12.00
Latvia	7	LVA	2003	0.814	2.910	2.690	69.037	2.943	12.00
Latvia	7	LVA	2004	0.858	2.937	4.098	76.927	6.192	12.00
Latvia	7	LVA	2005	0.898	2.964	4.763	81.501	6.748	12.00
Latvia	7	LVA	2006	0.939	2.977	7.908	82.040	6.536	12.00
Latvia	7	LVA	2007	0.977	2.990	8.738	76.092	10.093	12.00
Latvia	7	LVA	2008	0.893	3.003	4.000	73.316	15.402	12.00
Latvia	7	LVA	2009	0.847	3.016	-0.568	66.310	3.534	12.00
Latvia	7	LVA	2010	0.842	3.029	1.983	88.591	-1.085	12.00
Latvia	7	LVA	2011	0.879	3.043	5.531	107.082	4.371	12.00
Latvia	7	LVA	2012	0.905	3.057	3.837	111.250	2.258	12.33
Latvia	7	LVA	2013	0.910	3.070	3.275	107.043	-0.029	12.50
Latvia	7	LVA	2014	0.917	3.084	3.330	104.117	0.620	12.54
Latvia	7	LVA	2015	0.951	3.098	2.981	99.053	0.174	13.00
Latvia	7	LVA	2016	0.971	3.113	1.194	95.173	0.141	13.00
Latvia	7	LVA	2017	1.000	3.127	3.904	102.215	2.930	13.33
Latvia	7	LVA	2018	1.017	3.142	1.232	104.119	2.534	12.79
Latvia	7	LVA	2019	1.040	3.156	3.245	100.932	2.811	12.50
Poland	8	POL	1999	0.813	2.994	4.356	43.076	7.154	14.25
Poland	8	POL	2000	0.845	3.019	5.420	46.903	9.900	13.00
Poland	8	POL	2001	0.849	3.038	2.974	45.144	5.408	12.75
Poland	8	POL	2002	0.871	3.058	2.055	48.441	1.905	12.00
Poland	8	POL	2003	0.892	3.078	2.466	56.023	0.683	12.00
Poland	8	POL	2004	0.913	3.098	5.436	64.578	3.383	12.00
Poland	8	POL	2005	0.915	3.118	3.606	62.413	2.184	12.38
Poland	8	POL	2006	0.928	3.140	6.231	68.993	1.285	13.00
Poland	8	POL	2007	0.938	3.163	5.834	71.292	2.459	13.00
Poland	8	POL	2008	0.928	3.185	2.731	71.076	4.165	13.00
Poland	8	POL	2009	0.931	3.208	3.189	65.031	3.795	13.00
Poland	8	POL	2010	0.959	3.230	3.898	71.006	2.581	13.00
Poland	8	POL	2011	0.978	3.254	3.492	76.147	4.239	13.00
Poland	8	POL	2012	0.970	3.278	1.450	77.627	3.560	13.33
Poland	8	POL	2013	0.963	3.302	0.200	79.996	0.992	13.50
Poland	8	POL	2014	0.961	3.327	3.794	82.290	0.054	13.54
Poland	8	POL	2015	0.967	3.352	3.269	82.915	-0.874	14.00
Poland	8	POL	2016	0.974	3.378	3.776	85.809	-0.665	14.00
Poland	8	POL	2017	1.000	3.404	2.287	89.237	2.076	12.83
Poland	8	POL	2018	1.035	3.431	3.262	90.446	1.813	12.42
Poland	8	POL	2019	1.054	3.458	2.956	89.232	2.227	11.67

Romania	9	ROU	1999	0.677	2.921	2.895	52.666	45.804	13.08
Romania	9	ROU	2000	0.688	2.937	2.784	63.242	45.667	13.00
Romania	9	ROU	2001	0.716	2.951	2.864	66.746	34.477	12.83
Romania	9	ROU	2002	0.780	2.964	2.483	68.882	22.540	12.00
Romania	9	ROU	2003	0.806	2.977	3.190	72.042	15.273	12.29
Romania	9	ROU	2004	0.863	2.990	8.594	75.018	11.874	12.50
Romania	9	ROU	2005	0.890	3.004	6.601	69.277	9.015	12.50
Romania	9	ROU	2006	0.928	3.023	9.020	68.526	6.559	12.50
Romania	9	ROU	2007	0.933	3.042	5.787	63.465	4.837	12.50
Romania	9	ROU	2008	0.961	3.061	6.377	62.332	7.851	12.50
Romania	9	ROU	2009	0.898	3.080	2.664	54.503	5.587	12.50
Romania	9	ROU	2010	0.866	3.100	1.890	65.687	6.091	12.50
Romania	9	ROU	2011	0.873	3.118	1.230	72.433	5.789	12.50
Romania	9	ROU	2012	0.879	3.137	1.701	71.482	3.335	11.92
Romania	9	ROU	2013	0.898	3.156	2.031	73.406	3.985	11.50
Romania	9	ROU	2014	0.911	3.176	1.937	73.842	1.068	11.54
Romania	9	ROU	2015	0.933	3.195	2.427	73.317	-0.594	12.00
Romania	9	ROU	2016	0.958	3.214	3.374	74.530	-1.545	12.00
Romania	9	ROU	2017	1.000	3.234	2.833	74.351	1.339	11.88
Romania	9	ROU	2018	1.025	3.253	3.018	72.912	4.625	11.50
Romania	9	ROU	2019	1.040	3.273	2.934	69.085	3.828	11.54
Slovak Republic	10	SVK	1999	0.724	3.247	1.112	70.671	10.570	15.00
Slovak Republic	10	SVK	2000	0.737	3.252	7.466	84.097	12.036	14.58
Slovak Republic	10	SVK	2001	0.746	3.299	4.979	88.876	7.330	13.75
Slovak Republic	10	SVK	2002	0.775	3.347	11.934	87.736	3.127	12.50
Slovak Republic	10	SVK	2003	0.813	3.395	2.066	94.544	8.554	12.50
Slovak Republic	10	SVK	2004	0.830	3.444	7.075	100.295	7.549	12.50
Slovak Republic	10	SVK	2005	0.849	3.494	6.247	105.600	2.709	12.50
Slovak Republic	10	SVK	2006	0.892	3.518	8.057	123.036	4.483	12.50
Slovak Republic	10	SVK	2007	0.950	3.541	5.843	138.050	2.757	12.50
Slovak Republic	10	SVK	2008	0.963	3.565	4.600	143.954	4.598	12.50

Slovak Republic	10	SVK	2009	0.914	3.589	1.701	125.301	1.615	12.50
Slovak Republic	10	SVK	2010	0.953	3.613	2.321	145.423	0.957	12.50
Slovak Republic	10	SVK	2011	0.956	3.638	5.436	160.047	3.919	12.50
Slovak Republic	10	SVK	2012	0.964	3.663	1.878	167.150	3.606	12.50
Slovak Republic	10	SVK	2013	0.966	3.688	1.015	169.420	1.400	12.50
Slovak Republic	10	SVK	2014	0.974	3.714	-0.358	165.399	-0.076	12.54
Slovak Republic	10	SVK	2015	0.990	3.740	1.710	166.458	-0.325	13.00
Slovak Republic	10	SVK	2016	0.988	3.767	5.273	168.689	-0.520	13.00
Slovak Republic	10	SVK	2017	1.000	3.794	4.418	172.536	1.312	13.00
Slovak Republic	10	SVK	2018	1.015	3.821	2.121	175.552	2.514	13.25
Slovak Republic	10	SVK	2019	1.018	3.849	2.157	169.814	2.665	13.50
Slovenia	11	SVN	1999	0.852	3.249	0.469	82.170	6.156	14.00
Slovenia	11	SVN	2000	0.864	3.264	0.669	93.235	8.912	14.00
Slovenia	11	SVN	2001	0.877	3.271	2.401	93.058	8.380	13.83
Slovenia	11	SVN	2002	0.877	3.278	7.875	90.720	7.481	12.75
Slovenia	11	SVN	2003	0.890	3.284	1.807	89.797	5.544	12.50
Slovenia	11	SVN	2004	0.907	3.291	2.217	99.143	3.593	12.50
Slovenia	11	SVN	2005	0.943	3.298	2.681	109.332	2.452	12.50
Slovenia	11	SVN	2006	0.975	3.316	1.753	119.984	2.458	12.83
Slovenia	11	SVN	2007	1.002	3.335	3.921	128.280	3.657	12.75
Slovenia	11	SVN	2008	0.993	3.353	1.938	127.578	5.647	12.50
Slovenia	11	SVN	2009	0.921	3.372	-0.686	104.185	0.839	12.50
Slovenia	11	SVN	2010	0.941	3.391	0.662	122.996	1.801	12.50
Slovenia	11	SVN	2011	0.958	3.410	1.698	136.114	1.803	12.50
Slovenia	11	SVN	2012	0.942	3.430	0.072	137.830	2.597	12.83
Slovenia	11	SVN	2013	0.927	3.450	0.215	139.195	1.769	13.00
Slovenia	11	SVN	2014	0.938	3.470	2.039	139.788	0.199	13.00
Slovenia	11	SVN	2015	0.942	3.491	4.014	143.233	-0.526	13.00
Slovenia	11	SVN	2016	0.969	3.511	3.231	141.744	-0.055	13.00
Slovenia	11	SVN	2017	1.000	3.532	2.462	153.370	1.429	13.00
Slovenia	11	SVN	2018	1.024	3.553	2.839	159.598	1.739	13.00

Slovenia	11	SVN	2019	1.035	3.575	3.960	163.717	1.631	13.00
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Source: Penn World Table 10.01, World Bank, ICRG

A2. Supplementary institution data

	BGR	HRV	CZE	EST	HUN	LVA	LTU	POL	ROU	SVK	SVN
Control of Corruption											
1999	4.00	2.00	4.00	5.00	5.00	3.00	3.00	3.67	3.00	4.00	4.00
2000	3.25	2.67	4.00	5.00	4.92	3.00	3.00	3.00	3.00	4.00	4.00
2001	2.00	3.83	3.83	4.42	3.17	2.83	2.92	2.75	2.83	3.75	3.83
2002	2.00	3.00	2.88	3.00	3.00	2.00	2.50	2.00	2.00	2.50	3.00
2003	2.00	3.00	2.50	3.00	3.00	2.00	2.50	2.00	2.29	2.50	3.00
2004	2.00	3.00	2.50	3.00	3.00	2.00	2.50	2.00	2.50	2.50	3.00
2005	2.00	2.50	2.50	3.00	3.00	2.00	2.50	2.13	2.50	2.50	3.00
2006	2.00	2.50	2.50	3.00	3.00	2.00	2.21	2.50	2.50	2.50	3.00
2007	2.00	2.50	2.50	3.00	3.00	2.00	2.00	2.50	2.50	2.50	3.00
2008	2.00	2.50	2.50	3.00	3.00	2.00	2.00	2.50	2.50	2.50	3.00
2009	2.00	2.50	2.50	3.00	3.00	2.00	2.00	2.50	2.50	2.50	3.00
2010	2.00	2.92	2.50	3.00	3.00	2.00	2.00	2.50	2.50	2.50	3.00
2011	2.00	3.00	2.50	3.00	3.00	2.00	2.00	2.50	2.50	2.50	3.00
2012	2.00	2.33	2.50	3.33	3.00	2.33	2.33	2.83	2.17	2.50	3.33
2013	2.00	2.00	2.50	3.50	3.00	2.50	2.50	3.00	2.00	2.50	3.50
2014	2.04	2.08	2.54	3.54	3.00	2.54	2.58	3.04	2.04	2.54	3.50
2015	2.50	3.00	3.00	4.00	3.00	3.00	3.50	3.50	2.50	3.00	3.50
2016	2.75	3.00	3.00	4.00	3.00	3.00	3.50	3.50	2.50	3.00	3.50
2017	3.00	3.00	3.00	4.00	3.00	3.33	3.42	3.33	2.50	3.00	3.50
2018	3.00	3.00	3.00	4.00	3.00	2.79	3.00	3.42	2.50	3.25	3.50
2019	3.00	3.00	2.83	4.00	3.00	2.50	3.00	3.00	2.50	3.50	3.50
Law and Order											
1999	4.00	5.00	5.00	4.00	6.00	4.25	4.00	4.58	4.08	5.00	5.00
2000	4.00	5.00	5.00	4.00	4.33	5.00	4.00	4.00	4.00	4.58	5.00
2001	4.00	5.00	5.00	4.00	4.00	5.00	4.00	4.00	4.00	4.00	5.00
2002	4.00	5.00	5.00	4.00	4.00	5.00	4.00	4.00	4.00	4.00	4.75
2003	4.00	5.00	5.00	4.00	4.00	5.00	4.00	4.00	4.00	4.00	4.50
2004	4.00	5.00	5.00	4.00	4.00	5.00	4.00	4.00	4.00	4.00	4.50
2005	4.00	5.00	5.00	4.00	4.00	5.00	4.00	4.25	4.00	4.00	4.50
2006	3.63	5.00	5.00	4.00	4.00	5.00	4.00	4.50	4.00	4.00	4.50
2007	2.50	5.00	5.00	4.00	4.00	5.00	4.00	4.50	4.00	4.00	4.50
2008	2.50	4.92	5.00	4.00	4.00	5.00	4.00	4.50	4.00	4.00	4.50
2009	2.50	4.50	5.00	4.00	4.00	5.00	4.00	4.50	4.00	4.00	4.50
2010	2.50	4.50	5.00	4.00	4.00	5.00	4.00	4.50	4.00	4.00	4.50
2011	2.50	4.50	5.00	4.00	4.00	5.00	4.00	4.50	4.00	4.00	4.50

2012	2.50	4.50	5.00	4.00	4.00	5.00	4.00	4.50	3.75	4.00	4.50
2013	2.50	4.50	5.00	4.00	4.00	5.00	4.00	4.50	3.50	4.00	4.50
2014	2.50	4.50	5.00	4.00	4.00	5.00	4.00	4.50	3.50	4.00	4.50
2015	2.67	4.50	5.00	4.00	4.00	5.00	4.00	4.50	3.50	4.00	4.50
2016	3.00	4.50	5.00	4.00	4.00	5.00	4.00	4.50	3.50	4.00	4.50
2017	3.00	4.50	5.00	4.00	4.00	5.00	4.00	3.96	3.38	4.00	4.50
2018	3.00	4.50	5.00	4.00	4.00	5.00	4.00	3.50	3.00	4.00	4.50
2019	3.00	4.50	5.00	4.00	4.00	5.00	4.00	3.50	3.04	4.00	4.50
Democratic Accountability											
1999	5.00	3.00	5.00	5.00	6.00	5.00	5.00	6.00	6.00	6.00	5.00
2000	5.00	5.00	5.00	5.00	6.00	5.00	5.00	6.00	6.00	6.00	5.00
2001	5.00	5.00	5.00	5.00	6.00	5.00	5.00	6.00	6.00	6.00	5.00
2002	5.00	5.00	5.00	5.00	6.00	5.00	5.00	6.00	6.00	6.00	5.00
2003	5.00	5.00	5.00	5.00	6.00	5.00	5.50	6.00	6.00	6.00	5.00
2004	5.00	5.13	5.25	5.00	6.00	5.00	5.50	6.00	6.00	6.00	5.00
2005	5.25	5.50	5.50	5.00	6.00	5.00	5.50	6.00	6.00	6.00	5.00
2006	5.50	5.50	5.50	5.00	6.00	5.00	5.50	6.00	6.00	6.00	5.33
2007	5.50	5.50	5.50	5.38	6.00	5.00	5.50	6.00	6.00	6.00	5.25
2008	5.50	5.50	5.50	5.50	6.00	5.00	5.50	6.00	6.00	6.00	5.00
2009	5.50	5.50	5.50	5.50	6.00	5.00	5.50	6.00	6.00	6.00	5.00
2010	5.50	5.50	5.50	5.50	5.92	5.00	5.50	6.00	6.00	6.00	5.00
2011	5.50	5.50	5.50	5.50	5.50	5.00	5.50	6.00	6.00	6.00	5.00
2012	5.50	5.50	5.50	5.50	5.50	5.00	5.50	6.00	6.00	6.00	5.00
2013	5.50	5.50	5.50	5.50	5.50	5.00	5.50	6.00	6.00	6.00	5.00
2014	5.50	5.50	5.50	5.50	5.50	5.00	5.50	6.00	6.00	6.00	5.00
2015	5.50	5.50	5.50	5.50	5.50	5.00	5.50	6.00	6.00	6.00	5.00
2016	5.50	5.50	5.50	5.50	5.50	5.00	5.50	6.00	6.00	6.00	5.00
2017	5.50	5.50	5.04	5.50	5.50	5.00	5.50	5.54	6.00	6.00	5.00
2018	5.50	5.50	5.00	5.50	5.46	5.00	5.50	5.50	6.00	6.00	5.00
2019	5.50	5.50	5.00	5.50	5.00	5.00	5.50	5.17	6.00	6.00	5.00
Total											
1999	13.00	10.00	14.00	14.00	17.00	12.25	12.00	14.25	13.08	15.00	14.00
2000	12.25	12.67	14.00	14.00	15.25	13.00	12.00	13.00	13.00	14.58	14.00
2001	11.00	13.83	13.83	13.42	13.17	12.83	11.92	12.75	12.83	13.75	13.83
2002	11.00	13.00	12.88	12.00	13.00	12.00	11.50	12.00	12.00	12.50	12.75
2003	11.00	13.00	12.50	12.00	13.00	12.00	12.00	12.00	12.29	12.50	12.50
2004	11.00	13.13	12.75	12.00	13.00	12.00	12.00	12.00	12.50	12.50	12.50
2005	11.25	13.00	13.00	12.00	13.00	12.00	12.00	12.38	12.50	12.50	12.50
2006	11.13	13.00	13.00	12.00	13.00	12.00	11.71	13.00	12.50	12.50	12.83
2007	10.00	13.00	13.00	12.38	13.00	12.00	11.50	13.00	12.50	12.50	12.75
2008	10.00	12.92	13.00	12.50	13.00	12.00	11.50	13.00	12.50	12.50	12.50

2009	10.00	12.50	13.00	12.50	13.00	12.00	11.50	13.00	12.50	12.50	12.50
2010	10.00	12.92	13.00	12.50	12.92	12.00	11.50	13.00	12.50	12.50	12.50
2011	10.00	13.00	13.00	12.50	12.50	12.00	11.50	13.00	12.50	12.50	12.50
2012	10.00	12.33	13.00	12.83	12.50	12.33	11.83	13.33	11.92	12.50	12.83
2013	10.00	12.00	13.00	13.00	12.50	12.50	12.00	13.50	11.50	12.50	13.00
2014	10.04	12.08	13.04	13.04	12.50	12.54	12.08	13.54	11.54	12.54	13.00
2015	10.67	13.00	13.50	13.50	12.50	13.00	13.00	14.00	12.00	13.00	13.00
2016	11.25	13.00	13.50	13.50	12.50	13.00	13.00	14.00	12.00	13.00	13.00
2017	11.50	13.00	13.04	13.50	12.50	13.33	12.92	12.83	11.88	13.00	13.00
2018	11.50	13.00	13.00	13.50	12.46	12.79	12.50	12.42	11.50	13.25	13.00
2019	11.50	13.00	12.83	13.50	12.00	12.50	12.50	11.67	11.54	13.50	13.00

Source: ICRG, author's calculation using Excel

A3. Stata commands

```
//Descriptive statistics
xtset Country Year, yearly
sum
order Year Code1 Code Country CountryName TFP FDI Institution Inflation Humancap Tradeopen

//Scatter plot
scatter TFP FDI if Year==1999 || lfit TFP FDI if Year==1999
scatter TFP FDI if Year==2009 || lfit TFP FDI if Year==2009
scatter TFP FDI if Year==2019 || lfit TFP FDI if Year==2019
scatter TFP FDI, ytitle("VFR") || lfit TFP FDI

//Pooled model
regress TFP FDI Institution Inflation Humancap Tradeopen
hettest (heteoscedasticity test)

//Provisional test
xtline TFP
xtline TFP, overlay
xtunitroot llc TFP, trend demean lags(0)
xtunitroot llc FDI, trend demean lags(0)
xtunitroot llc Inflation, trend demean lags(0)
xtunitroot llc Institution, trend demean lags(0)
xtunitroot llc Tradeopen, trend demean lags(0)
xtunitroot llc Humancap, trend demean lags(0)

//Generate new variable, interaction terms
gen FDI_Institution = FDI*Institution
gen FDI_Tradeopen = FDI*Tradeopen
gen FDI_Humancap = FDI*Humancap
gen FDI_Inflation = FDI*Inflation
```

```

//Fixed Effects 1, Entity fixed effects
xtset Code1 Year, yearly
xtreg TFP FDI Institution Inflation Humancap Tradeopen, fe *within estimator B
areg TFP FDI Institution Inflation Humancap Tradeopen, absorb(Code1) *LSDV
areg TFP FDI Institution Inflation Humancap Tradeopen, absorb(Code1) r *robust
(robustness, but this robust estimator assumes there is no autocorrelation)
xi: regress TFP FDI Humancap Tradeopen Inflation Institution i.Country, fe

//Heterogeneity across country
bysort Country: egen y_mean=mean(TFP)
scatter TFP Country, msymbol(circlr_hollow)|| connected y_mean Country,
msymbol(diamond) xlabel(1 "BGR" 2 "CZE" 3 "EST" 4 "HRV" 5 "HUN" 6 "LTU" 7
"LVA" 8 "POL" 9 "ROU" 10 "SVK" 11 "SVN") *find heter across countries

//Heterogeneity across time
bysort Year: egen y_mean1=mean(TFP)
tway scatter TFP Year, msymbol(circle_hollow)|| connected y_mean1 Year,
msymbol(diamond)|| , xlabel(1999(2)2019)// find heter across time

//Fixed Effects 2, Time fixed effects
xtreg TFP FDI Institution Inflation Humancap Tradeopen, fe i(Year) *within estimator
xi: regress TFP FDI Institution Inflation Humancap Tradeopen i.Year *LSDV

//Fixed Effects 3, country and time effects
xi: xtreg TFP FDI Institution Inflation Humancap Tradeopen i.Country, fe *within
estimator
xi: regress TFP FDI Institution Inflation Humancap Tradeopen i.Country i.Year *LSDV

//Random Effects
xtreg TFP FDI Institution Inflation Humancap Tradeopen, re

//FE vs RE (Hausman test)
xtreg TFP FDI Institution Inflation Humancap Tradeopen, fe
estimates store fixed
xtreg TFP FDI Institution Inflation Humancap Tradeopen, re
estimates store random
hausman fixed random
* reject H0 RE, FE is more appropriate

//Wooldridge test, serial correlation in FE
xtset Country Year, yearly
net from http://www.stata-journal.com/software/sj3-2/ *to install the module
net describe st0039
net install st0039
xtserial TFP FDI Institution Inflation Humancap Tradeopen *Wooldridge test, find first
order correlation

//Wald test, heteoscedasticity test
ssc install xttest3 *install
xttest3 *testing for heter for FE model, only for xtreg command, doesn't work for other
command, because residual has to be saved as particular form. p-value small, find
heteoscedasticity

```

```
//Pesaran CD, cross-sectional dependence test
ssc install xtcsd *install Pesaran CD (cross-sectional dependence) test
xtcsd, pesaran abs *Presence of cross-sectional dependency
// FE, exclude Croatia
xi: xtreg TFP FDI Institution Inflation Humancap Tradeopen i.Country, fe
// FE, exclude Croatia, regression with Corruption
xi: xtreg TFP FDI Corruption Inflation Humancap Tradeopen i.Country, fe
cformat(%9.3f) pformat(%5.3f) sformat(%8.3f)
//FE, after joining EU, exclude Croatia
xi: xtreg TFP FDI Institution Inflation Humancap Tradeopen i.Country, fe
cformat(%9.3f) pformat(%5.3f) sformat(%8.3f), if inrange(Year, 2006, 2019)
//FGLS model
xtset Country Year, yearly
xtgls TFP FDI Institution Inflation Humancap Tradeopen, panels(corr) corr(ksar1)
//Robustness check: lag 1 period model
xtset Country Year, yearly
gen lag1_TFP = L1.TFP
gen lag1_FDI = L1.FDI
gen lag1_Institution = L1.Institution
gen lag1_Inflation = L1.Inflation
gen lag1_Humancap = L1.Humancap
gen lag1_Tradeopen = L1.Tradeopen
xtreg TFP lag1_FDI lag1_Institution lag1_Inflation lag1_Humancap lag1_Tradeopen,
fe cformat(%9.3f) pformat(%5.3f) sformat(%8.3f)
```

Source: Compiled by the author

A4. Variables, measurements and long definitions

Variable	Long definition
TFP	TFP at constant national prices (2017=1)
Humancap	Index of human capital per person, based on years of schooling and returns to education
FDI	Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP.
Tradeopen	Merchandise trade as a share of GDP is the sum of merchandise exports and imports divided by the value of GDP, all in current U.S. dollars.
Inflation	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a

	basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.
Institutional Index	Index constructed by adding up the values of institutional indicator: control of corruption, law and order, and democracy. The index ranges from 0 to 18.

Source: Penn World Table 10.01, World Bank, ICRG

A5. Database and content

Database	Content
Penn World Table 10.01	PWT version 10.01 is a database with information on relative levels of income, output, input and productivity, covering 183 countries between 1950 and 2019.
World Bank	The World Bank Data provides access to global economic and social statistics including World Development Indicators, International Debt Statistics, Millennium Development Indicators and data on poverty, education and gender.
ICRG Table 3B (Political Risk Rating)	The ICRG (International Country Risk Guide) Researcher Dataset from the Political Risk Services (PRS) Group comprises 22 variables forecasting three subcategories of risk (political, financial, and economic), for 146 countries, since 1984. The aim of the political risk rating is to provide a means of assessing the political stability of the countries covered by ICRG on a comparable basis. This is done by assigning risk points to a preset group of factors, termed political risk components. The minimum number of points that can be assigned to each component is zero, while the maximum number of points depends on the fixed weight that component is given in the overall political risk assessment. In every case the lower the risk point total, the higher the risk, and the higher the risk point total the lower the risk.

Source: Penn World Table 10.01, World Bank, ICRG

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Välismaiste otseinvesteeringute ja majanduskasvu vaheline põhjuslik seos

Kesk- ja Ida-Euroopa riikide näitel (Estonian language summary)

Viimastel aastakümnetel on otsese välisinvesteeringute kasv ületanud kogutoodangu ja väliskaubanduse kasvu ning siirde- ja vähem arenenud majanduste poliitikakujundajad on keskendunud välisinvesteeringute ligimeelitamisele, lootes, et see võib kaasa tuua kasutatava tehnoloogia uuendamise ja tootlikkuse kasvu välisinvesteeringute sihtriikides (Driffield et al. 2013). Välismaised otseinvesteeringud on Kesk- ja Ida-Euroopa (edaspidi KIE) siirdemajandustes mänginud üliolulist rolli. Kuigi on palju empiirilist tõendusmaterjali välismaiste otseinvesteeringute positiivsest mõjust sihtriigi kogutoodangule ettevõtete andmeid kasutanud uuringutes, on pööratud välismaiste otseinvesteeringute mõjule tootlikkusele ja efektiivsusele vähem tähelepanu makrotasandil ning tõendusmaterjal välismaiste otseinvesteeringute mõjust väljundi või tootlikkusele ei ole ühene.

Käesolev magistritöö uurib välismaiste otseinvesteeringute mõju kogutootlikkusele Kesk- ja Ida-Euroopa riikides, kasutades 21-aasta pikkust ja 11 riiki hõlmavat paneelandmestikku. Seoste analüüsimiseks kasutatakse fikseeritud efektidega ja üldistatud vähimruutude (FGLS) meetodite mudeleid. Empiirilise analüüsi tulemused näitavad, et otsesed välisinvesteeringud avaldavad positiivset ja olulist otsest mõju sihtriigi tootlikkusele. Täpsemalt, otsesed välisinvesteeringud aitavad otseselt kaasa tootlikkuse kasvule ja rõhutavad stabiilse makromajandusliku keskkonna säilitamise, institutsionaalse kvaliteedi parandamise ja inimkapitali suurendamise tähtsust tootlikkuse maksimeerimiseks: Esiteks, otsese välisinvesteeringutel on KIE riikides otsene positiivne mõju tootlikkusele: Teiseks, paremad institutsioonid (sh suurem demokraatlik vastutus, tõhusam õigussüsteem ja parem kontroll korrupsiooni üle) on seotud kõrgema tootlikkusega ja võivad niisiis olla olulised tootlikkuse kasvu tegurid. Kolmandaks, stabiilne makromajanduslik keskkond, sh mõistlikus vahemikus kontrollitud inflatsioonimäärad, võib mängida tootlikkuse suurendamise hõlbustamisel otsustavat rolli. Tuvastatud negatiivne seos inflatsiooni ja tootlikkuse vahel rõhutab majandusliku stabiilsuse säilitamise tähtsust. Neljandaks, nii inimkapital kui ka

investeeringud haridusse ja teadmiste arendamisse võivad olla kasulikud tootlikkuse suurendamisel. Viiendaks, avatus rahvusvahelisele kaubavahetusele on tugevalt ja positiivselt seotud tootlikkusega, mis näitab, et kaubandust edendav poliitika võib aidata tootlikkust tõsta.

Eelnevate tulemustega seoses oleksid poliitikasoovitused KIE riikidele ja teistele üleminekumaadele, kes püüavad maksimeerida tootlikkuse kasvu eeliseid, järgmised. Esiteks, kvaliteetsete otsest välisinvesteeringu ligimeelitamine: tuleks rakendada jõupingutusi, et ligi meelitada arenenud tehnoloogiat ja juhtimispraktikaid kaasa toovaid välisinvestoreid. Teiseks, riikide institutsionaalsete raamtingimuste parandamine: õigusriigi tugevdamine, korrupsiooni vähendamine ja demokraatliku aruandekohustuse tagamine loovad keskkonna, mis soodustab tootlikkuse kasvu. Kolmandaks, makromajandusliku stabiilsus tagamine mõistliku fiskaal- ja rahapoliitika kaudu, kuna kontrollitud inflatsioon ja stabiilne majanduskeskkond loovad viljaka pinnase tootlikkuse kasvuks. Neljandaks, inimkapitali (hariduse ja oskuste arendamine) peaks olema samuti prioriteetne suund, sest kõrgelt kvalifitseeritud tööjõud peaks olema võimeline veelgi suurendama pikaajalist tootlikkuse kasvu. Viiendaks, rahvusvahelisele kaubandusele avatuse suurendamine võib omada otsest positiivset mõju tootlikkusele.

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