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FACULTY OF SOCIAL SCIENCES

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Bachelor Thesis

2012 **Klára Koubková**

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Effects of foreign investment on international trade

Bachelor Thesis

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Abstrakt

Hlavním cílem této práce je diskutovat vliv přímých zahraničních investic v oblasti mezinárodního obchodu. Přímé zahraniční investice jsou považovány za významný zdroj kvalifikované pracovní síly, technologických inovací a odborných znalostí. Tudíž se očekává jejich pozitivní dopad na ekonomický růst a exportní výkonnost hostitelské země. Nicméně, teoretická a empirická evidence neposkytuji zcela jasné stanovisko zabývající se vztahem přímých zahraničních investic a mezinárodního obchodu. V empirické části této práce aplikujeme Gravitační model na česká a německá data, abychom vyšetřili bilaterální toky přímých zahraničních investic, exportů a importů a identifikovali možný vztah mezi přímými investicemi a obchodními toky. Dospěly jsme k závěru že mezi veličinami není žádný statisticky významný vztah.

Abstract

The main objective of this thesis is to discuss the effects of foreign direct investment on international trade. The FDI are considered as an important source of skilled labour force, know-how and technological innovations. Thus it is expected its positive impact on economic growth and export performance of host country. However, the theoretical and empirical evidence do not provide any clear statement dealing with relationship of FDI and international trade. In empirical part of the thesis, we apply the Gravity model on Czech and German data to investigate bilateral flows of FDI, exports and imports and to identify the possible relationship between FDI and trade flows. We came to the conclusion that there is no statistically significant relationship between these variables.

Klíčová slova

přímé zahraniční investice, příliv kapitálu, export,import, gravitační model

Keywords

foreign direct investment, capital inflow, export, import, gravity model

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Declaration of Authorship

The author hereby declares that he compiled this thesis independently, using only the listed resources and literature. The author also declares that he has not used this thesis to acquire another academic degree.

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Prague, Klára Koubková

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Garant studijního programu Vám dle zákona č. 111/1998 Sb. o vysokých školách a Studijního a zkušebního řádu UK v Praze určuje následující bakalářskou práci

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Charakteristika tématu, současný stav poznání, případné zvláštní metody zpracování tématu:

Foreign direct investments (FDI) play currently an important role in world economies. They are source of economic growth, technological innovation and present convenient way how to finance the current account deficit. This study focuses particularly on the Irish economy, which has lately become a frequent target of foreign investors. We will be primarily interested in the impact of foreign direct investment, together with other macroeconomic and institutional variables on foreign trade of Ireland. Further, this study will provide an empirical analysis based on panel data for individual economic sectors. We will estimate models based on the export quantity and its dependence on FDI and other macroeconomic variables (e.g.labor productivity) or on the annual value of exports depending on the volume variable (e.g. price per ton), FDI and institutional variables. The aim of the study is the estimation of the relationship between export growth and the volume of investments in individual sectors.

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V Praze dne

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Klára Koubková Ing. Vilém Semerák, M.A., Ph.D.

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Acronyms

CA	Comparative Advantage
CEE	Central and Easter Europe
CNB	Czech National Bank
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
HAC covariance	Heteroscedasticity and autocorrelation consistent covariance
IEF	Index of Economic Freedom
IMF	International Monetary Fund
MNE	Multinational Enterprise
MNC	Multinational Company
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
R&D	Research and Development
TNC	Transnational Company
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
USA	United States
USD	United States Dollar
WTO	World Trade Organisation

Introduction

The importance of foreign direct investment (FDI) in world economy has steadily grown during the last century. This relates with the strengthening activities of multinational enterprises (MNEs) on the global market. The participation on the global market enables MNEs to realize certain benefits (e.g. economies of scale, low labour costs or opportunity to serve new markets), which will further enhance their competitiveness.

Moreover, the foreign direct investment has become the major object of interest of many policymakers in different countries. The vision of potential benefits related with inflow of FDI into the economy forces them to improve attractiveness of their country. The main strategies include various international and national policies stimulating inward FDI. Although the impact of FDI on the host country is uncertain, politics and economists are more aware of their positives, such as transfer of technology, know-how and managerial skills. All of them underpin the economy of country and thus its growth or economic performance.

In addition, the relationship between FDI and export performance of host country is the main subject of many theoretical and empirical discussions. There are numerous approaches attempting to identify it. Several empirical studies suggest to apply the Gravity model as a possible solution. In our empirical analysis based on study of Brenton, di Mauro and Lucke (1999) we will use the Gravity model to investigate bilateral FDI, exports and imports of Germany and of the Czech Republic.

This study is organised as follows. In Chapter 1 is defined the concept of FDI. The Chapter 2 discusses theories considering the motives of multinational enterprises for FDI. Chapter 3 presents the main determinants of FDI including national and international policies. In Chapter 5 is identified the impact of inward FDI on host countries. Chapter 6 examines the relationship between FDI and trade. In Chapter 7 is introduced Gravity Model. Chapter 8 includes an empirical analysis of Czech and

German foreign direct investments and trade flows. Chapter 9 provides the conclusion of the study.

1. The concept of FDI

The foreign direct investment belongs to one of the most important factors influencing the current global market. Their impacts are linked with transfer of capital, skilled labour, innovations in technology or with improvement of trade or current account. FDI as a handy way how to finance and encourage economic growth became the main object of interest of policymakers in many developed and developing countries (such as Ireland, USA or China) as well as of various international organizations (e.g. OECD, IMF or UNCTAD). The effort of monitoring these specific capital flows led OECD and IMF to define the foreign direct investment in accordance with international standard as:

> *" ... international investment made by a resident entity in one economy (direct investor) with the objective of establishing a lasting interest in an enterprise resident in an economy other than that of the investor (direct investment enterprise). "Lasting interest" implies the existence of a long-term relationship between the direct investor and the enterprise and a significant degree of influence by the direct investor on the management of the enterprise. Direct investment involves both the initial transaction between the two entities and all subsequent capital transactions between them and among affiliated enterprises, both incorporated and unincorporated."*
>
> (OECD & IMF, 2004)

In other words the foreign direct investment describes an activity when a firm from certain country expands or creates subsidiaries in another (host) country and thus gain the significant control over the target firm. The minimum level ensuring the enough voting power to the investing company was established according to OECD and IMF as 10% of ownership.[1]

FDI is usually reported either as FDI stocks or as FDI flows. The stocks capture the value of capital, reserves (including retained profits) and net indebtedness of a firm to the investing company at a given time, e.g. on June 31st 2012 On the other hand FDI flows refer to capital provided by or received from the investing company to a target firm during a given period, e.g.year, and consist of three components: equity capital,

[1] However Zhang (2006) states, that TNCs owning only 5% of shares in a subsidiary firm can also have a

reinvested earnings and intra-company loans (UNCTAD 1996).[2] However it must be considered that direct investment is not only related to the movement of capital and financial resources but also involves the transfer of know-how, technology knowledge or managerial skills, which are collectively labelled as non-equity forms of FDI.

[2] The relation between stocks and flows can be expressed by a following equation: *Position of stock at the end of the period = Position of stock at the beginning of the period + FDI flows + price changes + exchange rate changes + other adjustments* (Duce 2003)

2. FDI in theory of Multinational Enterprise

The growing importance of foreign direct investment in the world economy closely relates with strengthening position of multinational corporations on international markets over the last 40 years. Due to changes and systematic trends in the world economy, e.g. process of globalization, liberalization of trade or deregulation of markets, the MNEs have become crucial players operating on the markets. Their activities take place both in developed countries, such as USA, Japan or France and in developing countries, e.g. India, China or Mexico. The MNEs attempt to enhance their competitiveness through a full use of advantages offered them by participation on the global market This contributes to a remarkable growth of FDI and other capital flows as means, which enable enterprises to realize benefits related with their involvement in international production. These can be economies of scale, low labour costs or diversified supply chains.

The theory of multinational enterprises studies the behaviour of MNEs and seeks to clarify motives of firms leading them to undertake direct investment in foreign country. The main theories explaining the motives behind these activities are internalization theory, eclectic theory and theory distinguishing between vertical and horizontal FDI.

2.1. Overview of MNE's theories

2.1.1. Internalization theory

The origins of this theory can be seen in Coase's (1937) concept of firm and transaction costs. It suggests that firm will internalize those assets, whose operating costs are lower inside the firm then transaction costs of same activity at open market. This idea was later further developed by the internalization theory considering activities of firms on international scale. It was based on Kindleberger's (1969) and Hymer's (1976) concept of FDI. They supposed that investment abroad brings to firm additional costs and difficulties, which can be balanced by profitable advantage possessed by market imperfections enhancing monopolistic or oligopolistic power. Buckley and Casson (1976) extended this idea by the internalization theory by stating that the profitability of FDI comes from internal production within MNE in the case of market

imperfections on intermediary market. As the strongest reason to internalize production was considered the protection of knowledge, which cannot be sufficiently protected by licensing or other means.

2.1.2. The OLI Paradigm

The OLI paradigm is an eclectic theory suggested by Dunning in 1976. "*It was meant to convey the idea that a full explanation of the transnational activities of enterprises needs to draw upon several strands of economic theory; and that foreign direct investment is just one of a number of possible channels of international economic involvement, each of which is determined by a number of common factors."(*Dunning, 1988, p.1) These factors fall into three principal categories, which provide the investor with particular advantage and thus influence his investment decision. These advantages come from ownership-specific and location-specific factors and internalization factors.

Ownership Advantage

This advantage contains the ownership of firm-specific assets enabling the firm to face competitive pressures from domestic producers. These are mainly intangible assets such as brand name, technology or knowledge. They help the firm to generate enough profit compensating operational costs related with production abroad.

Location Advantage

The location of foreign production provides the investor with an opportunity to use country-specific characteristics, which can offer more favourable conditions and will further stimulate more effective use of firm`s assets. They include economic, political and social factors such as market size, natural resources, lower labour costs, investment risk or cultural differences.

Internalization advantage

This advantage will be beneficial for the investor if the costs resulting from internalization, realized in the context explained above, are lower than cost incurred during domestic production and exporting. Internalization is advantageous especially when it enables the firm to retain its competitiveness and keep transaction costs low (Dunning 2000, Xun 2006).

2.1.3. Theories of vertical and horizontal FDI

Activities of MNEs are driven by different motives, which affect the suitable firm strategy and consequently the type of their investment. The theory identifies two basic types of FDI. The first one is vertical and represents the segmentation of production in different countries in order to reduce costs or to get access to limited sources. The model was originally suggested by Helpman (1984) and assumed two economies with different factor endowment. On the other hand Markusen (1984) assumed the model for countries with similar endowment or technology and separation of headquarters activities from activities of production facilities. This separation enable the firm achieve the economies of scale. [3]

The second type of FDI is horizontal and means that the firm will decide to produce the same goods and services in different countries. The model often assumed the similarity between countries in size, endowment and technology and thus explains well the bilateral investment between developed countries. The model was introduced by Horstman and Markusen (1992) and by Brainard (1993) and it explains a motive for horizontal FDI as situation, when plant-level economies of scale exceed firm-level economies of scale and high transaction cost. This means that for the firm will be cheaper to set up a new affiliate in the host country rather than to extend domestic production and subsequently export in the target country.

2.2. MNEs' Motives of FDI

Motives of FDI are driven mainly by needs of MNEs and thus play a significant role in decision of investor's strategy. Among the main motives belonng, resource-seeking, efficiency-seeking and asset-seeking FDI (Dunning 2008). The Market-seeking FDI considers factors such as market growth and structure, access to regional or global markets or country-specific consumer preferences (UNCTAD 1998). It represents horizontal type of FDI. In contrast to this the vertical type of FDI is mostly characterized by resource- and efficiency-seeking motives of FDI. The resource-seeking FDI is used by firm to obtain natural resources (e.g. raw materials) or cheap labour force. The efficiency-seeking FDI attempts to minimize a wide range of costs such as costs of inputs, labour costs, transportation costs or costs of resources (UNCTAD 1998).

[3] This could be similar to the Ford's concept of specialization of work.

The result is higher efficiency of production. The last asset-seeking FDI focuses on factors such as specific physical infrastructure (ports, telecommunication), entrepreneurial environment or technological assets (Dunning 2008), which serve to suitable conditions for future business. These motives are further developed with regards to determinants of FDI related to country characteristics.

3. Drivers for FDI

Economic growth and development ensuring productive, effective and competitive economy is one of the primary goals of every country as well as its policymakers. This can be significantly stimulated with inflows of foreign direct investment, which are perceived as important tool in forming industry and economic performance. This chapter will consider the main factors that influence investors' decision and motivate them to invest in a specific country.

3.1. The locational determinants of FDI

The choice of suitable host countries is an important aspect influencing the future gains and losses from an investment. Investors must take into account a number of factors that affect the final location of their FDI and thus its potential returns. Therefore, a wide range of theoretical and empirical studies tries to identify the main reasons leading to selection of the location of FDI in a certain foreign country. Frey and Schneider (1985) distinguish between economic and political determinants, which have impact on a geographical distribution of FDI. They state that the most of previous empirical analysis were concentrated primarily either on factors considering the impact of political (in)stability, such as in works of Green (1972) and Thunell (1977), or on economic factors disregarding political influence. In contrast to Dunning's analysis of locational factors, which indicate that FDI flows are influenced just by economic factors and not by political (Dunning, 1981), Frey and Schneider (1985) emphasise the simultaneous effect of economic and political factors on developing countries.

It must be admitted, however, that there is some diversity present among results of empirical studies discussing the key determinants of FDI. The results are often controversial and ambiguous and do not testify clearly about the importance of some of determinants. This can be caused by the subject of interest, by the choice of data and relating problems with their availability as well as by the suitable methodology (Xun 2006).

3.1.1. Market-related determinants

Most of empirical studies based on aggregate econometric approach identify altogether a group of the most influential factors. First of them are related to market of host country and its characteristic such as market size, growth and structure. Not only market-seeking investments but also a wide range of theoretical and empirical studies prove the importance of market size and growth on investor's decision.

Market size

The market size hypothesis suggests that a large market of a host country is necessary for efficient utilization of resources and realization of economies of scale. This indicates that large and growing markets are able to attract more FDI. Moreover the numerous empirical evidence demonstrates a positive impact of market size on FDI. It stresses the effect of current market size, such as in Scaperlanda and Mauer (1969), Torrisi (1985), Tsai (1994) or later in Bevan and Estrin (2004), as well as the effect of investor's expectation about a market expansion leading to an inflow of FDI in study of Aristotelous and Fountas (1995). Market size plays a role not only in the current period, but also in lagged periods (Xun, 2006). Whereas Schmitz and Bieri (1972) and Lunn (1980) find the lagged variable significant, Culem (1988) finds no significance.

Market growth

Not only the absolute market size influences decision of the investor, but also growth of market. The market growth hypothesis postulates that rapidly growing economies provide more opportunities for generating profit than economies with a slower or no growth (Lim 1983). Foreign investors can perceive the extensive growth of an economy as a favourable signal. The expansion of an economy stimulates them to create a long-term commitment and support the economic growth further. This will lead to reinvestment of earnings (instead of their repatriation) and keep the on-going inflow of capital at the same time (Torrisi, 1985). It is important to note that the causality between the growth and FDI is often questioned, because it is not obvious if the growth stimulates FDI or whether FDI contributes to growth. The empirical results are ambiguous in this context, although understanding of their relationship is important for formulating government policies.

Market structure

Early theories suggest that market imperfections are the main reason for a future presence of FDI (Hymer 1976, Kindleberger 1969, Caves 1971). Kindleberger (1969) even takes the view that under condition of perfect competitive markets, there will be no motive for foreign companies to invest abroad. The market imperfections provide investors an opportunity to take a certain advantage over the competing local firms and to invest in a host country. The investors assume that advanced technology, know-how, economies of scale and managerial skills will help them to create barriers to entry of for local and foreign firms and thus to obtain a bigger market share and related profits. This leads investors to focus on industries in countries with higher market concentration and with contestability of market, where they can gain higher earnings. This point of view proves empirical evidence. The econometric studies point out that there is a strong correlation between the foreign ownership and market concentration (Blomstorm and Perrson 1987, Lall 1979, Newfarmer and Marsh 1992) as well as between market imperfections and FDI (Blomstorm 1986b, Lall 1978, Willmore 1976). The previous indicates that similarly as the market size and growth also market structure has its role in investment decision making.

3.1.2. Trade-related determinants

The next important factors, which have impact on the choice of an appropriate country, relate with its openness to trade. This does not include only the import protection and trade barriers of a target country, which play crucial role in decision of investors whether enter in a new market or not. Moreover it takes into account the export orientation of a host economy and its connection with rest of the world. Because of this the investing company can gain a larger market and achieve higher earnings.

Openness to trade

The openness of economy is associated with its investment potential and economic environment. The reason probably lies in an interest of multinational companies about the tradable sector (Xun 2006). The host country provides not only an opportunity to be a base for current imports but also the possibility to become a base for future exports. The importance of openness and orientation of host country to the international market is stressed by Lucas (1993). He states in his analysis of determinants in East and Southeast Asia that FDI are more elastic concerning the aggregate demand in export

markets than with regard to demand in the host country. Moreover other empirical studies support the positive impact of openness to trade on FDI. Schmitz and Bieri (1972) found a fragile positive link between openness and FDI in their analysis of EEC tariffs and US direct investment. Chakrabarti (2001) identified a positive correlation of openness to trade to FDI. Asiedu (2002) obtained similar results as Chakrabarti (2001), but the effect of openness to trade on FDI was smaller in Sub-Saharan Africa in comparison to other developing countries. On the other hand the later study of Seim (2009) discovered the higher responsiveness of FDI to openness of trade mainly among Sub-Saharan countries.

Trade discrimination

In contrast to the openness to trade, which symbolises the liberality of trade regime in invested country, the autarky of country and import protection can significantly influence a strategy of MNCs and motive them to invest in host economy. The trade discrimination hypothesis suggested by Mundell (1957) considers trade and capital movements as perfect substitutes for each other. In case of the imposition of high tariffs and other restrictions on trade, the trade discrimination will stimulate the increase of investments of foreign producers in effort to maintain a market and simultaneously to avoid obstacles to trade. According to this theoretical view the trade barriers have a positive effect on inflow of FDI.[4] This inspired the many empirical studies to examine more thoroughly this relationship and effect of tariff-jumping investments on the host economy. Schmitz and Bieri (1972) confirm the trade discrimination hypothesis and conclude that tariffs of EEC remarkably affected US direct investment and trade. Kawai and Lee (2006) observe similarly impact of trade restrictions on Korean outward FDI in EEC (EU). However the study of Gastanaga, Nugent and Pashamova (1998) come to conclusion that during the time the importance of tariff-jumping investments decreased and trade liberalization has become the stronger motive for foreign direct investment.

Export Orientation

Even a country with relatively small domestic markets can be seen as attractive from perspective of foreign investors. The important role there plays a tendency of such

[4] The literature recognizes this type of direct investments as ‘tariff-jumping‘ direct investments. These investments are characterized by initial incentive to avoid import restrictions and tariffs.

country to export. As it was mentioned above, Lucas (1993) stressed in his analysis of East and South-East Asian countries the higher elasticity of FDI to demand for export than to domestic demand. FDI is also found to react to some extent to incomes in major export market. This emphasises the meaningfulness of outward-oriented policies of host countries. The importance of export orientation of host economies demonstrates an empirical study of Singh and Jun (1995). The closer relationship between foreign direct investment and exports will be in more detail discussed later.

3.1.3. Cost-related determinants

According to economic theory most of activities going on in the economy can be characterised by two basic motives: profit maximisation and cost minimisation. The location of FDI is selected in similar manner. The expectation is that the future profit and benefits will offset all costs connected with investment and its realization. As a result the foreign investors must consider the factors such as costs of labour, transaction costs or level of interest rate relating to the target destination.

Costs of labour

With primary aim to minimise the production costs, the low price of labour and capital can be perceived by investors as right tool to achieve this. The driving power of such investments is given by efficiency- or resource-seeking motives of investors. The countries with lower labour costs seem to be more attractive for FDI relative to industrialised countries (Asafo-Adjei 2007). However, the low wage locations are preferred only if savings on labour cost are not diminished by lower labour productivity (Bevan and Estrin 2000). The importance of labour costs as a factor influencing the decision of investors was suggested by Culem (1988). He stated a view that low unit labour costs and large prior export flows would tend to stimulate inward FDI. In contrast to export flows, he did not find the significant impact of EEC's labour cost on US direct investment. Also other studies are not able to completely clarify the effect of low wage costs on FDI and their results are controversial. The significant relationship between FDI and low labour costs was identified in studies of Frey and Schneider (1985), Lucas (1993) or Bevan and Estrin (2000), who emphasise even the effect of rate of growth of unit labour costs on FDI.

Transaction costs

The investors must make a significant effort to analyse transaction costs associated with realization of investment to be able to decide about its future profitability and thus about commitment to undertake it. This includes being completely familiar with factors such as costs of transport, communication or costs of information relating with knowledge of legal framework and tax system in host country. It is assumed, that the differences between countries rise with longer distance from the country of origin and the transaction costs become higher. Bevan and Estrin (2000) found a negative impact of distance as a proxy of transaction costs on inflow of FDI. On the other hand it is necessary to consider that the distance can serve as an impediment as well as incentive to FDI. It works as an incentive in the case that a firm selects the possibility of local production rather than to face transaction costs and overcoming other barriers related with exporting (Asafo-Adjei 2007). Over all results of the effect of transaction costs can be ambiguous (e.g. econometrically insignificant) because of investors different motivations (efficiency-seeking vs. resource-seeking FDI).

Interest rate

Other factor remarkably influencing costs of investment is interest rate as a measure of costs of capital. The earlier theories even perceived interest rate as an only crucial determinant of FDI. The motive to invest in countries with higher interest rate is an expectation about higher future profit of investment. Therefore, the developed countries with low interest rate usually response to be a provider of FDI. This is consequence of fact that: " *differences in the financial cost of capital to a multinational firm with affiliates in various host countries will be reduced if not eliminated by the opportunity of the parent to obtain marginal funds in the cheapest market."* (Kravis and Lipsey 1982, p.215). This in Culem's (1988) words means that host countries with prevailing higher interest rate receive their funds from outside their economy. He proved this in his analysis of locational determinants of FDI among industrialized countries, in which he examined the impact of interest rate differential between host country and the rest of the world on FDI. Furthermore he added that long-term capital flows from US to EEC countries are positively related to interest rate prevailing in host economies. Similarly Cornell, Marchant and Koo (2002) analyse the negative effect of domestic interest rate on outward FDI. They found that a decrease of interest rate stimulates outflow of FDI

from US. The costs of capital, e.g. interest rate, are influencing the country of origin of funds.

3.1.4. Determinants of macroeconomic stability

The possibility of additional costs, which can occur as a consequence of sudden changes in the economy, lead the investors to consider macroeconomic stability of the host country. Stable economic environment in the host country contributes to clear expectations about likely gains and losses and enables investors to choose a feasible strategy suitable for their subsidiary. As key factors, which can easily disrupt the economic stability of a country and thus negatively influence its economic development, are mostly identified macroeconomic indicators such as inflation and exchange rate or government indebtedness.

Exchange rate

The exchange rate can be a tricky indicator. Although it might easily increase investor's wealth, it can also bring sudden losses. The theory suggests that the host country with weaker currency will be more attractive for foreign investors. The explanation for this is that the real depreciation of host country's currency will increase the relative wealth of foreign investors and this will stimulate them to further purchases of domestic assets (Aristotelous and Fountas 1995). However the necessary condition is exchange rate stability. In other case investors can suffer a significant loss. So it is important for foreign investors to take into account not only the strength of local currency but also exchange rate volatility. Some empirical studies suggest the negative impact of exchange rate volatility on inward FDI. Quere, Fontagne, and Revil (2001) found that nominal exchange rate volatility tends to reduce FDI inflows. Cushman (1988) in his study of uncertainty and FDI obtained a positive impact of volatility on outward FDI. The empirical evidence also mentions the importance of weaker currency of host economies. Studies of Aristotelous and Fountas (1995) or Blonigen (1997) confirmed effect of depreciated currency on inward FDI.

Inflation

The often indicator of economic stability for foreign investors is an inflation rate of host country. The assumption is that the high inflation indicates an internal economic tension, a failure of government to balance its budget and a loss of control of central

bank over the monetary policy (Frey and Schneider 1985). The consequence is macroeconomic instability in host country leading to uncertainty and higher riskiness of investments. Investors will prefer the host countries with more stable economic environment. It will result in a decrease of FDI in country. The empirical evidence shows the negative impact of high inflation rate on FDI (Frey and Schneider 1995, Li and Liu 2004).

3.1.5. Determinants of political stability

As it was mentioned above, the political stability can be perceived as one of crucial determinants of foreign direct investments. Frey and Schneider (1995) emphasise the importance of political stability for foreign investors:

> *A country in which there is political unrest or in which there is a threat of having the investment nationalized (without adequate compensation) is more of a risk and therefore ceterus paribus less attractive to invest in than a country offering political stability and a guarantee of property rights.*
>
> (Frey and Schneider 1995, p. 161)

In other words although the host country indicates favourable economic conditions to undertake investment, the political risk representing for investors the possibility of additional costs and loss of future profits will result in reluctance of foreign firms to invest there. The host countries that are unable to maintain political stability are seen as non-credible and thus less attractive destinations for inward FDI. This implies a negative impact of political instability on inflows of FDI. However the empirical results are not always unambiguous. The results obtained by Schneider and Frey (1985), Edwards (1990) or by Brada, Kutan and Yigit (2004) demonstrate the significant negative relationship between political instability and inward FDI. Conversely, Bennet and Green (1972) did not observe that political instability in recipient countries could affect US direct investments and they even obtained the positive relationship between them.

3.1.6. Other determinants

The investor‘s decision about suitable location of his investment can be affected also by other influential factors. There should be mentioned mainly cultural similarities and institutional framework of host country, which both can have positive influence on the

FDI inflows. *The cultural similarities* can significantly contribute to lowering of investors cost in host economy. This includes costs related with knowledge of language, local habits or consumption patterns. Likewise, the same tastes and preferences of domestic inhabitants help investors to achieve savings relating with product differentiation. Similarly the *institutional framework* encourages the FDI flows in country. Functional legal system including clear definition of property rights, and enforcement of laws can promote the economic development and growth of country and consequently the attractiveness of host economy.

A survey conducted by World Economic Forum (1997) also confirmed the importance of most of these factors. The survey, in which international executives evaluated major determinants influencing the choice of the country, found the following five factors: size of national market of host country; expected growth in market size of host country; ability to repatriate capital and remit profits; productivity and work habits of workers and quality of infrastructure. Furthermore, in countries with sufficiently large and growing markets the decision about FDI is driven by factors such as macroeconomic stability of host country, regulatory regime and cost of labour (World Economic Forum, 1997, cited in Bamford and Handy, 2000).

3.2. Policies stimulating inflows of FDI

Policymakers see FDI as a powerful tool how to enhance economic performance of a country. It has been an important topic on government agenda because the ability to attract inflows of FDI can lead to economic growth and improved competitiveness of the country. This can be achieved through effective government policies of the potential host countries, which are increasingly competing for foreign investors. The investors can nowadays choose from various incentive schemes, which are meant to lure new investments into the country. The following part will aim at government and international policies creating the more favourable environment for foreign investors and thus improving the attractiveness of their country as receiver of FDI inflows.

3.2.1. National policies

The effort of policy makers to support country's economic growth through FDI leads government to design national policies contributing to higher attractiveness of the

country. This includes both strategies ensuring hospitable economic environment and wide range of government incentives motivating transnational companies (TNC) to invest in the particular country.

Unfortunately not at all factors can be successfully influenced by active country's policy. There are aspects like market size, natural resources, strategic location or cultural similarity, which are expected to remain unchangeable in long-term horizon. On the other hand there are numerous factors, whose improvement will generate the suitable business environment promising future development and luring foreign investors. The importance most of these factors was mentioned above. Among the most beneficial factors promoting higher interests in investors belong skilled and educated labour force, quality infrastructures or removal of trade barriers and other business restrictions. This puts them in the spotlight of policymakers as well as of government policies.

Skilled and educated labour force

The endeavour to improve the business environment leads the government to ensure higher quality of labour. The policy makers see skilled and educated labour as a source of future technological growth as well as a source of improvement of national competitiveness. Educational policies are aimed at attracting MNCs in the economy, which will consequently encourage further development of worker training and skills upgrading. However the possible increase in income inequality in the country is often discussed as a negative consequence of educational policies (Velde 2001).

Quality infrastructure

Quality of infrastructure has become one of the latest priorities of policymakers. The reason is that good infrastructure can enhance long-term growth and simultaneously improve the competitive conditions in country (Égert, Kozluk, Sutherland 2009). Hence it increases the motivation of foreign investors to invest in the country and thus to contribute to its further development.

Removal of trade barriers and business restrictions

The effort of governments to open their economy to international market and to ensure better accessibility for foreign investors is closely linked with the main goals of

international policies. Countries must face strong pressure from rising globalisation, process of unification and linking of countries promising them the future growth and wellbeing. This includes elimination of trade barriers and free movement of capital, investment, technology and skilled labour.

The elimination of *trade barriers* relates with removal of protectionist measures such as customs and tariffs, import quotas or export subsidies. This promotes higher openness of the economy, which provides foreign investors with more opportunities how to effectively use domestic market as well as export potential of the country. For instance some Asian countries use the mix of FDI and trade policies motivating MNCs to support export-oriented economic strategies of their country (UNCTAD 1998). However, the policy makers should be also aware of possible outflow of FDI, which could be replaced by exports. The importance of trade barriers and openness of the economy on FDI inflows was discussed earlier in the text.

The removal of *business restrictions,* especially the operational ones, may also significantly stimulate investment potential of the country. This ensures foreign investors better access to wide range of activities important for operation in the certain country. The restrictions are associated with admission and establishment, ownership and control, and other operational measures. Banga (2003, p.19) identifies following aspects of the admission and establishment restrictions*: "closing certain sectors, industries or activities to FDI; screening, authorization and registration of investment and minimum capital requirements"*. Furthermore he suggests some different forms of the ownership and control restrictions such as "*allowing only a fixed percentage of foreign-owned capital in an enterprise; compulsory joint ventures; mandatory transfer of ownership to local private firms, usually over a period of time; and restrictions on reimbursement of capital upon liquidation*." Even after entry firms can meet other performance restrictions such as employment of their own top management (UNCTAD 1998).

Investment Incentives

Investment incentives are among the major tools of policy makers how to attract attention of foreign investors in large global competition. They also serve as a motivation for them to locate their investment in the specific country. These

government incentives do not provide benefits only to foreign investors but mostly offer the same opportunities to domestic investors and thus contribute to growth of the whole economy.

Majority of national policies have identified financial and fiscal incentives as key tools to secure higher attractiveness of the economy and FDI inflows. The *financial incentives* relates with investment grants, subsidized credits and credit guarantees (e.g. interest-free and subsidized loans or loan guarantees), publicly funded venture capital participating in investments involving high commercial risks and government insurance at preferential rates protecting against exchange rate volatility or currency devaluation. On the other hand the *fiscal incentives* are considered as a less costly form of government incentives attracting foreign investors into the country (UNCTAD 2000). This leads to their higher popularity mainly among developing countries. The fiscal incentives particularly include different tax policies such as tax holidays or other reduction of tax burden, accelerated depreciation, investment and reinvestment allowances and duty exemption (UNCTAD 2003a). The most important is probably the reduction of corporate tax, which stimulates the interest of MNCs. A recent trend shows strong competition among countries leading to the significant falling tax rates on corporate income. As Bellak and Leibrecht (2008) suggest for the EU, the solution might be in tax coordination measures combining the best from tax completion and tax coordination.

Other incentives take into account aspects such as *regulatory incentives* securing environment, health, safety and labour standards, *subsidized services* supporting services and infrastructure, *market privileges* including preferential government contracts and *foreign exchange privileges* providing an agreed warranty dealing with exchange rates (UNCTAD 2003a).

3.2.2. International policies

In contrast to national policies, which maintain some specific features reflecting the needs and objectives of the host country, international policies represent the tendency of countries to unify their interests and to converge their policies. This demonstrates the growing impact of globalisation in decision-making of countries about their future development. The effort to achieve a certain level of economic performance

leads the countries to liberalization of their economies and simultaneously to mutual co-operation. The countries coordinate their activities at bilateral, regional and multilateral level in effort to promote FDI in their countries.

Bilateral Investment Treaties

The importance of bilateral investment treaties (BITs) in world has been growing substantially since 1959, when first BIT was signed. Their amount increased by more than three-quarters during 1990s and the number of treaties exceeded 2000 in 2002 (UNCTAD 1998, 2003b). Although they were initially addressed especially to relationships between developed and developing countries, nowadays a significant number of BITs is concluded only between developing countries. This change is mainly fueled by increasing importance of developing countries as a foreign investor.

The object of interest for many BITs remains in their concentration on aspects such as *investment protection* including guaranties and compensations in case of nationalization or expropriation; *free transfer of funds* and *repatriations of capital and profit*; and *provisions for settlement of disputes* between both State-State and investor-state. Some BITs also contain other aspects considering provisions for the right to establishment or performance requirements (e.g. local content, export conditions or employment requirements) (UNCTAD 1999, 2003b). The significant advantage of the BITs can be seen in their diversity, which leaves countries enough freedom to independently select the contract partner as well as conditions related to their specific situation. On the other hand, the weakness of BITs lies in asymmetric bargaining power implying the stronger position of developed countries unlike the developing ones (UNCTAD 2003b).

Regional Investment Agreements

Regional investment agreements are intended primarily for countries located in certain regions. For this reason only limited number of countries are entitled to participate. Unlike BITs, the regional agreements are designed to cover a broader complex of investment issues, which will reflect different needs and objectives of individual countries. Among the main aims targeted by regional agreements, however, belong *liberalization of restrictions to entry, establishment of FDI*, followed by the *elimination of discriminatory operational conditions* and *aspects of investment protection* (UNCTAD 1996). This should ensure better investment environment supporting free

flows of FDI. Although the most of regional instruments is legally binding, exceptions exist. Asia–Pacific Economic Cooperation (APEC) Non-binding Investment Principles adopted in 1994 can be named as an example. Another one is ASEAN Investment Area (AIA), which was signed in 1999 (UNCTAD 1996, 2003; Banga 2003).

Multilateral Investment Agreements

Multilateral investment agreements can be perceived as an effort of international organisations, such as Organisation for Economic Co-operation and Development (OECD), World Bank (WB) or World Trade Organisation (WTO), to guarantee foreign investors consistent and stable conditions across countries, which will enhance their investment activities abroad. They focus, similarly to regional and bilateral agreements, on *protection of investments* against possible political risks controlled by the Multilateral Investment Guarantee Agency (MIGA), a section of WB, *settlement of investment disputes* between countries managed by the International Centre on Settlement of Investment Disputes (ICSID) in WB or on *performance requirements* dealing with the Agreement on Trade-related Investment Measures (TRIMs). The Agreement on Trade-related Aspects of Intellectual Property Rights (TRIPS Agreement) additionally protects intellectual property right of foreign investors and the General Agreement on Trade in Services (GATS) regulates FDI in service industries (UNCTAD 1996). The Multilateral Agreement on Investment (MAI), negotiated among members of OECD, has also a considerable weight. The multilateral disciplines give a ground to discussions to create a common legal basis and so become a starting point for the following regional and bilateral negotiations. Furthermore, multilateral negotiations provide developing countries with more negotiating power to meet desired goals than bilateral and regional ones (UNCTAD 2003b).

4. The impact of FDI on host country

"*… the key is not necessarily how much FDI comes into the host country, but rather the benefits the country derives from those investments."* (Inter-American Development Bank, 2001)

The impact of FDI has a great potential to underpin the economic growth of whole country and thus improve its image in the world economy. For this reason a wide range of countries seek attention of investors, attempt to create attractive investment environment and so achieve the desired inflows of FDI in their economies.
The host economy can be affected by inflows of FDI with benefits *directly* related with operations of MNEs in the country. Moreover, the economy can be further stimulated also by various *indirect* effects, which have influence over broad area of economic activities. However the politicians and economists should be aware of negatives of intensive FDI used to exploit target countries.

4.1. Direct and indirect effects of FDI

The effects of FDI on host country are assessed according to various criteria. The basic one is distinction between direct and indirect effects. The direct effects are related with all activities directly carried out by MNEs. They include especially positive impact on employment, output and investment. Examples of such effects are greenfield investment creating new jobs or higher productivity of foreign owned companies stimulating GDP. The duration of direct effects of FDI is by large associated with presence (and its duration) of MNEs in a particular country (Geršl, Rubene, Zumer 2007).

In contrast to this the indirect effects of FDI are created by consequences of operations of MNEs in a country and represent mainly technological and productivity spillovers in economy. They characterise transfer of technology and knowledge and cause changes in input and output demand. Therefore, they enhance productivity and competitiveness of local enterprises and thus improve the efficiency of the whole economy.

Productivity spillovers

The productivity spillovers are usually further classified into two other categories, which distinguish between *horizontal* and *vertical spillovers*. The *horizontal spillovers* are characterized by changes within one sector and thus they have impact mainly on domestic producers competing with MNEs. Kokko (1992) recognizes three major types of effects related with the presence of foreign company in same sector, which affect the productivity of local firms. The first one is demonstration effect, which is characterised by imitation of advanced foreign technology by local producers. However the influence of this effect is often limited. The MNEs attempt to fully internalize their advantage at local market and protect it with patents and other restrictions. The second type represents competition effect, which force domestic firms to innovate their production and use their resources more efficiently. The local producers must face the higher pressure caused by enter of foreign company on the domestic market. The increase of competition can lead to gradual crowding out and replacing domestic firms by stronger foreign companies. The last effect describes the movement of trained workers from MNEs affiliates to local firms. The diffusion of manager's know-how among firms can be named as an example (Blomström and Kokko, 1997).

On the other hand the *vertical spillovers* refer to activities of MNE, which affect local producers operating in other sectors. Furthermore, the vertical spillovers are categorized according to their nature of relationship with MNE as backward and forward spillovers. The backward spillovers arise from the MNE affiliate's activities with suppliers, while the forward spillovers stem from contacts with customers. The backward vertical spillovers include impacts of direct help of MNE, which improves productivity and efficiency of its local suppliers (e.g. provision of better technology or skilled managers) as well as impacts of MNE's pressure on local producers to meet higher standards of quality of their goods and services (Blomström and Kokko 1997).

The forward vertical spillovers represent the opposite effect, when a local firm uses inputs of higher quality produced by MNE and thus supports its productivity and competitiveness on the market (Geršl, Rubene, Zumer 2007).

4.2. Negative impacts of FDI

The inflow of foreign direct investment can bring wide range of favourable effects and benefits to the host country. However some effects of FDI and especially the excessive usage represent a threat, which may deviate the economy from its equilibrium. The main negative consequences of FDI influencing the well-being of host country are: crowding out of domestic savings, inflation caused by an increase in the monetary base, appreciation of currency related to a deficit growth of trade balance, increase in wages without a corresponding growth in productivity or effect of the dual economy[5] (Benáček 2000). Moreover, the presence of FDI in the country may not have harmful effect only on whole economy, but also poses a threat to individual domestic producers. Their possibilities are mostly limited and the strong competition caused by inflow of FDI frequently forces them to shutdown their production.

4.3. Positive impacts and desired effects of FDI

. Whereas the negative effects of FDI can pose a certain threat to the host economy, policymakers and economists are mostly aware of their beneficial effects. As was mentioned above the major benefits associated with the inflow of FDI include effects such as positive impact on employment, an inflow of advanced technologies, know-how and skilled labour force or financing of R&D programmes in the country. Benacek (2000) further stresses these following positives of FDI: an external financing of the shortage of domestic savings in economy[6] or improvement of institutional system in country related to higher effectiveness and competitiveness of markets, protection and enforcement of property rights or indication of credibility and future development of the economy.

All these positive features contribute to two main desirable effects, which are often associated with the influence of FDI on host country. There are economic growth and enhancement of competitiveness of the host country. Their importance can be also confirmed by vast empirical literature dealing with relationships among FDI, growth

[5] The term "*Dual economy*" refers to the situation, when co-exist two separate economic systems within one economy such as prosperous technologically advanced MNEs in contrast to primitive techniques of poor domestic producers. This effect is typical mainly for less developed countries.

[6] This can be expressed by equation $If = (S-I) + (T-G)$, when foreign investment *(If)* compensates the excess of domestic demand for investment (*I*) over supply of domestic (S) and government (*T*) savings

and export performance. Hansen and Rand (2006) applied the Granger causal test and proved the bi-directional relationship between FDI and Growth. The bi-directional causalities between FDI and growth and FDI and exports were also observed by Burridgez, Liu and Siclair (2002) using China's aggregate data. In addition, the positive impact of FDI on growth may be identified by studies of Lall (1980), Blomstrom (1986a) and Kokko (1994) considering effects of FDI spillovers in host economy. However, it must be considered that Dutt (1997) in his empirical analysis did not identify any effects of the pattern of FDI on growth. Moreover, Hein (1992) came to conclusion that FDI does not affect middle-term growth in middle-income countries in Latin America and East Asia. The empirical studies examining the effect of FDI on trade will be discussed in the next chapter.

5. Export performance and FDI

The foreign direct investment is considered as an influential tool with wide range of possible consequences on host economy. As it has been already noted, the enhancement of competitiveness is one of them. This relates to productivity growth and improvement of export performance of country on the global market. This chapter will deal with the effect of FDI on export performance of the host country. Furthermore, it will consider the relationship of foreign direct investment and international trade, which is often subject of numerous empirical studies.

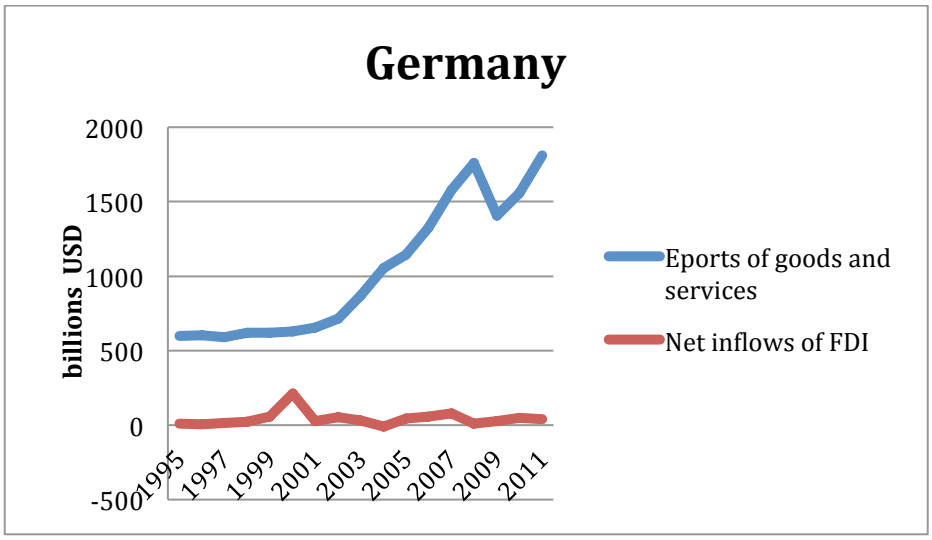
5.1. History and last trends

The last century represented a number of changes in world economy. The main of them are process of globalization, liberalization and deepening integration. The effort of mutual cooperation has led to the emergence of wide range of organizations and communities. The most influential are European Union, United Nations, WTO or free trade areas such as NAFTA, EFTA or MERCOSUR. All of them remarkably contributed to gradual removing of barriers and restrictions and to wider interconnection of countries in world. This had a significant impact on trade, investments and capital flows. The last trend indicates the growth of foreign direct investment and exports in world economy. However, the development of FDI and exports reflects most of significant changes, such as financial crises or Euro crises. According to UNCTAD (2010), there is a recovery of FDI flows after financial crises. It represented the decline of FDI inflows by 16% in year 2008 and 37% in year 2009. Despite this, we can observe the positive growth of FDI inflows, which was $ 203 billions in 2003, $ 725 billions in 2005 and 1,114 billions in 2009 (UNCTAD 1996, 2002, 2010). Further we can stress the growing importance of some transition and developing countries, which placed among the biggest recipient of FDI. The trends of trade are very similar. The substantial growth of trade during the period 1990-2008 was 5,5. Moreover, the volume of trade reflected both crises and slowdown in economic activity. It was noticed the 3 percentage points drop in 2007 (WTO 2008). Furthermore, in 2011 the growth rate was only 5% in comparison with pre-crises average growth 6% (WTO 2012)

5.1.1. FDI and Exports in Germany

Furthermore, we will discuss the special case of Germany and the Czech Republic, which will be later the subject of our empirical analysis. According to UNCTAD (2010), Germany belongs to most important players on global market. The German companies are one of the main investors. Their FDI outflows reached $136 billions in 2009 and thus it occupied 4st rank in the world (UNCTAD 2010). Moreover, German economy is one of the biggest receivers of FDI. In addition, the contraction of FDI flows in 2009 related to the financial crises has no impact on Germany (UNCTAD 2010). As we can see from picture bellowed, the export potential of Germany is still rapidly increasing. However, it shows a big leap in 2008 caused by financial crisis.

Chart 1: German exports and net inflows of FDI over the period 1995-2011



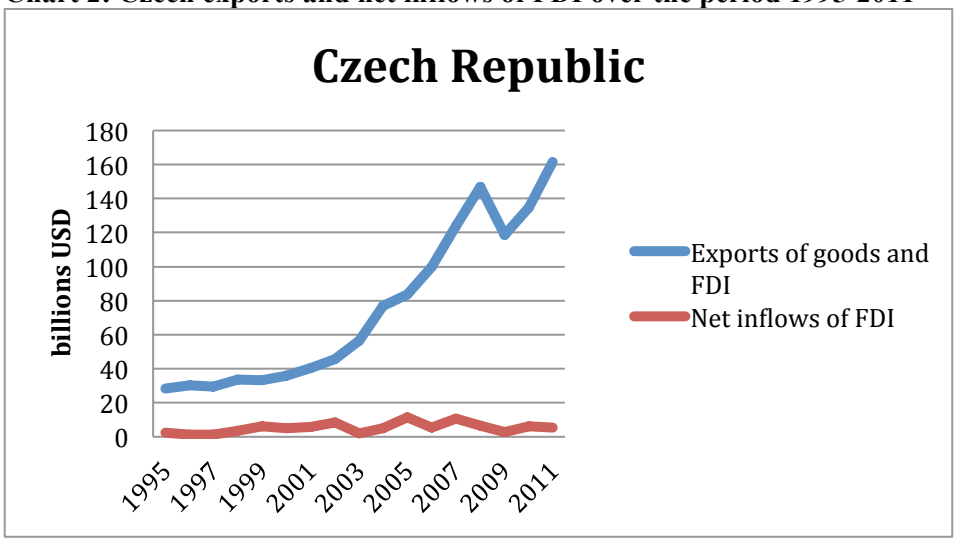
Source: World Databank, authors computation

5.1.2. FDI and Exports in the Czech Republic

The importance of the Czech Republic is gradually increasing in global context. This fact was noticed also by foreign investors. Similarly as other CEE countries, the Czech Republic has become one of the target destinations in Europe. The reason can be seen in a relatively cheap labour and strategic position in centre of Europe. Moreover, the accession to European Union encouraged its attractiveness. From the picture we can see the decline in 2003 caused by postpone of investments until the membership in EU. Therefore, we can observe an increase in year 2005. Declines in years 2009 and 2011

reflect the impact of recent crises. The picture also indicates the strengthening importance of exports of Czech Republic. The sharp increase in 2004 can be considered as one of consequences of membership in EU related to removal of barriers.

Chart 2: Czech exports and net inflows of FDI over the period 1995-2011



Source: World Databank, authors computations

5.2. FDI and trade in the framework of theory

There is a only limited number of theories considering the linkage between trade and foreign direct investment. The first one, which should not be omitted, is the theory of comparative advantage. The next one represents the theoretical concept of the impact of FDI on international trade suggested by Kojima (1975). The last theory considers the complementary and substitutive relationship between FDI and trade with respect to horizontal and vertical activities of MNEs.

5.2.1. Theory of comparative advantage

The theory of comparative advantage (CA) can be considered as one of the most important theories explaining the international trade among two and more countries. The original idea is based on the Smith's concept of absolute advantage, which should ensure a certain country a profit from mutual trade, when the country will produce the goods with higher efficiency than another country. However, Ricardo proved that both countries could be better off, if they will specialize their production according to their relative efficiencies. The idea of comparative advantage was further developed in

Hecksher-Ohlin model of factors endowment, which takes into account the different proportions of factors in production technologies. According to this, countries will concentrate on production of goods, which uses their abundant factor (e.g. labour or capital). The contrast between developing countries abundant with cheap labour and developed countries rich in advanced technologies and know-how can be given as an example of different factor endowments. In context with foreign direct investments, the theory supposes that investment will appear mainly in countries and sectors with comparative advantage (Sokol 2006). Barry and Hannan (1996) came to similar conclusion that the presence of FDI was higher in sectors, in which Ireland had revealed comparative advantage (e.g. Chemicals, Metals or Engineering).

5.2.2. Kojima's theoretical approach

The idea considering the influence of CA on international trade and foreign direct investment was further developed by Kioshi Kojima (1975). In his theoretical work *International trade and foreign investment: Substitutes or Complements* he builds on previous studies suggested by Mundell (1957) and Purvis (1972). The Mundell's study demonstrates that under the strict assumptions of Heksher-Ohlin-Samuelson model, trade and FDI will create complete substitutes for each other. In contrast to this, Puvis indicates complementarity between trade and FDI with a necessary assumption that production functions differ between two countries. According to Puvis, Kojima defines complementarity between FDI and trade as situation, when FDI "*…creates and /or expands the opportunity to import one product and to export the other product*." (Kojima 1976, p.4) Moreover, he identifies this kind of FDI as "trade-creating" or "trade-oriented". Similarly, "*…if the initial capital outflow decreases or eliminates the opportunity to import one product and to export the other product, this kind of foreign investment "substitutes" for product trade and is thus "trade-destroying" or "anti-trade-oriented." "* (Kojima 1976, p.4)

Furthermore, Kojima examines the impact of FDI on international trade according to comparative advantage of the investing country. If country invests in a pro-comparative disadvantage industry[7], it will lead to improvement of production technology of host country through training of labour, marketing and transfer of superior technologies. The

[7] The pro-comparative disadvantage industry is considered from the perspective of the investing country.

expansion of production contributes to a new harmonious commodity trade and improves the total net gain of both countries. Thus this type of FDI is trade oriented. Symmetrically, the foreign direct investment in pro-comparative advantage industry will be trade-destroying or anti-trade oriented as the competition between countries will increase.

5.2.3. Theory of complements and substitutes

As it has been already mentioned, the nature of relationship between trade and foreign direct investment may be identified according to the impact of FDI on trade. This often relates to a particular type of foreign direct investment, which was undertaken by MNEs. The horizontal type of FDI[8] suggests that firm will try to avoid high transaction costs and thus will prefer to set up a new affiliate in a foreign country instead of exporting there. The production of new affiliate will displace the original amount of exports and thus horizontal type of FDI and trade are substitutes (Markusen 1984).

On the other hand, the vertical type of FDI supposes the complementarity relationship with trade. The firm will attempt to reduce costs or to get access to limited source and thus will disperse its production across different countries (Helpman 1984). As the firm will export intermediate inputs and import final goods from the host country, the volume of trade among countries will increase. However, it must be admitted, that both theory and empirical findings do not provide the entirely clear evidence about the nature of relationship between FDI and trade and their conclusions are often ambiguous.

5.3. Empirical Evidence

This section should provide a brief summary of literature and empirical studies dealing with impact of foreign direct investments on trade and export performance of host country. The studies can be further classified according to various criteria. Firstly, we will make an overview of studies, which consider exporting as one of possible strategies of MNEs. Grossman, Helpman and Szeidl (2003) demonstrate that more productive firms will use the strategy including complex of FDI and exports. Similarly, Wagner (2005) proved that only firms with higher productivity are able to serve the

[8] For more details about horizontal and vertical type of FDI see section 3.1.3

foreign markets and the most productive of them will choose to serve these markets via foreign direct investments. This is in accordance with results of study conducted by Girma, Kneller and Pisu (2003) examining MNEs in Great Britain. Furthermore, Kneller and Pisu (2005) examined the impact of FDI spillovers on export performance in UK and found that export-oriented MNEs appear to be the source of strong export spillovers. Aitken, Hanson, and Harisson (1994) obtained similar results in case of Mexico.

Further studies attempt to identify whether the inward foreign direct investment is export-oriented or whether it improves the export performance of country. Singh and Jun (1995) applied the Granger causality test on sample of 31 countries for period 1970-1993 and detected the export-orientation as a strong motive of FDI. Bezuidenhout and Naudé (2008) obtained similar results for South Africa developing countries. Furthermore, Felmingen and Zhang (2001) analysed China's provincial trade and found the bidirectional relationship between exports and FDI in regions with high and low amount of inward FDI and causal relationship from exports to inward FDI for regions with medium amount of FDI.

Finally, we will mention the empirical analysis dealing with complementary and substitutive relationship. There are only several works, which indicate the substitutive relationship. For example, studies suggested by Cushman (1988), Blonigen (2001) and Swenson (2004). On the other hand, there is considerable empirical evidence recognizing FDI and trade as complements. The studies of Africano and Magalhaes (2005), Brainard (1997), Eaton and Tamura (1996) and Brenton, (1996) seem to be one of the most important for our further empirical analysis. These studies of bilateral distribution of FDI applied the gravity model to identify the relationship between trade and foreign direct investment.

6. Gravity Model

The concept of gravity model was originally introduced by Tinbergen in 1962 and its form was inspired by the Newtonian gravity equation. The Newton gravity law states that the gravity force Fg between two objects is proportional to the product of the masses of the two objects M_1 and M_2 divided by the square of the distance r^2 between them (Baldwin and Taglioni 2006):

$$Fg = G\frac{M_1 M_2}{r^2}$$

where G is gravitation constant (7.1)

Similarly, the gravity model defines bilateral trade T_{ij} between two countries, which is directly proportional to aggregate incomes of countries Y_i, Y_j and inversely to distance D_{ij} between them:

$$T_{ij} = \beta_0 \frac{Y_i^{\beta_1} Y_j^{\beta_2}}{D_{ij}^{\beta_3}} \tag{7.2}$$

The log-linearized form will be:

$$\ln T_{ij} = \beta_0 + \beta_1 \ln Y_i + \beta_2 - \beta_3 \ln D_{ij} \tag{7.3}$$

The variable Tij represents the trade flows (exports or imports) between countries, Y_i and Y_j characterize an economic size of country and it is commonly measured by GDP; D_{ij} measures the transaction costs proxied by distance between countries. The coefficients of national income β_1 and β_2 are expected to have a positive impact on trade. As the income of country increases, the inhabitants will spend more money. On the other hand, the coefficient of distance -β_3 is assumed to negatively influence the trade as the transaction cost will rise. The coefficient β_0 represents the gravity constant (intercept).

Although the original studies of Tinberger (1962) and Linnenman (1966) were criticized for their weak theory, the current form of model can be derived from several economic theories. The first one suggested by Leamer and Stern (1970) was based on probability model. Anderson (1979) used the Cobb-Dougles expenditure function and constant

elasticity of substitution (CES) and derived the gravity model based on the assumption that goods are differentiated according to country of origin. Bergstrand (1985) developed model with CES usage of prices. Further theoretical studies of gravity model include the monopolistic competition model applied by Bergstrand (1989) or Hecksher-Ohlin model employed in work of Evenett and Keller (1998). One of the last approaches to the gravity model includes the theory suggested by Anderson and van Wincoop (2003). They approximated prices from the Bergstrand's (1985) model with CES by price indices for exports and imports, which they assumed as a condition of consistent estimation. Thus they generalized the previous model. However, this approach can be used only for cross-sectional data. Recently, Baldwin and Taglioni (2006) further simplified the Anderson-van-Wincoop's model and enabled to apply it on panel data.

6.1. Baldwin-Taglioni's gravity model

As it has been already noted, Baldwin and Taglioni followed the work of Anderson and van Wincoop and modified their concept of gravity model to allow for panel data. The theoretical foundation of their innovated model is divided into six specific steps.

6.1.1. The expenditure share identity

The first step derives the expenditure share identity for a single exported from country *i* to country j. It assumes that quantity of goods x_{ij} exported from country i to country j multiplied by price of goods p_{ij} inside the country j, is equal to expenditures E_j of country j on goods, that compete with imports from country i, multiplied by $share_{ij}$ representing the share of expenditures in country i on variety of typical made in country j.

$$p_{ij}x_{ij} = share_{ij}E_j \qquad (7.1.1)$$

6.1.2. The expenditure function: shares depend on relative prices

According to microeconomic theory, the expenditure share depends on relation of

relative prices and income levels. Adding CES function, when we will assume that all goods are traded, the expenditure share will link only with relative prices.

$$share_{ij} = \left(\frac{p_{ij}}{P_j}\right)^{1-\sigma} , where\ P_j = \left(\sum_{k=1}^{R} n_k (p_{kj})^{1-\sigma}\right)^{1/(1-\sigma)} , \sigma > 1$$

(7.1.2)

The variable *Pj* represents the ideal CES price index, R is the number of nation, σ is the elasticity of substitution among varieties (assumed to be symmetrical), n_k is the number of varieties exported from country k.

6.1.3. Adding the pass-through equation

The price of goods imported form country i to country j must correspond to the production costs p_i in country i, the bilateral mark-up μ and to the bilateral trade costs τ_{ij}.

$$p_{ij} = \mu p_i \tau_{ij}$$

(7.1.3)

In addition, we will assume $\mu = 1$ as in Dixit-Stiglitz monopolistic completion or perfect competition with Armingtons goods.

6.1.4. Aggregating across individual goods

We aggregate per-variety exports from country i to country j by multiplying the expenditure share equation by number of symmetric varieties n_i offered by country i. Thus we obtain the total value of trade T_{ij}.

$$T_{ij} = n_i\, share_{ij} E_j = n_i\, (P_i \tau_{ij})^{1-\sigma} \frac{Ej}{P_J^{1-\sigma}}$$

(7.1.4)

6.1.5. Using general equilibrium in the exporting nation to eliminate the nominal price

The producer price p_i in country i must reflect that the country i can sell its output Y_i either at home or abroad. Assuming market clearing condition, wages and price in country i must adjust in such extent that production of trade goods in country i will

equal to its sales.

$$Y_i = \sum_{j=1}^{R} T_{ij} = n_i P_i^{1-\sigma} \sum_{i=1}^{R} \left(\tau_{ij}^{1-\sigma} \frac{E_i}{P_i^{1-\sigma}} \right) \tag{7.1.5}$$

If we solve the previous equation for $n_i p_i^{1-\sigma}$, we obtain:

$$n_i p_i^{1-\sigma} = \frac{Y_i}{\Omega_i}, \qquad where\ \Omega_i = \sum_{l=1}^{R} \left(\tau_{ij}^{1-\sigma} \frac{E_l}{P_l^{1-\sigma}} \right) \tag{7.1.6}$$

The variable Ω_i represents the market potential and measures openness of country i.

6.1.6. A first-pass gravity equation

When we substitute the equation 7.1.6 into previous equation 7.1 4, we get an equation in form:

$$T_{ij} = \tau_{ij}^{1-\sigma} \left(\frac{Y_i E_j}{\Omega_i P_j^{1-\sigma}} \right) \tag{7.1.7}$$

Finally, if we approximate E_j by GDP of country j, we obtain the gravity equation:

$$\underset{trade}{bilateral} = G \frac{Y_i Y_j}{(dist_{ij})^{1-\sigma}}, \qquad where\ G = \frac{1}{\Omega_i} \frac{1}{P_j^{1-elasticity}} \tag{7.1.8}$$

The variable G includes all GDP and bilateral trade costs, thus it is instable over time.

6.2. Problems of gravity model

The gravity model, similarly, as other theoretical concepts and models faces to its several specific problems. As a result, the estimated values may be incorrect. Foldvari (2006) identifies some weaknesses of gravity model. The first one is the application of quite common log-linearized form of gravity model, which could be replaced by Box-Cox transformation. This form of model would be estimated by method of Maximum Likelihood estimations. Further shortcoming of gravity model is an approximation of transaction cost (TrC) by distance, which does not reflect the last trend of decreasing transaction costs due to the influence of internet or cell phones.

Baldwin and Taglioni (2006) also reflect several difficulties of the gravity model, which cause its biases. The major problem they see in correlation of omitted terms with trade costs term. As a consequence of this, the estimated values will be overestimated. Another mentioned mistake is inappropriate deflation of nominal trade values by US aggregate price index. This can be fixed by including time dummies in gravity model.

7. Empirical Model

The aim of our empirical analysis is to identify the nature of relationship between foreign direct investment and trade. For this purpose, we will apply a similar procedure as was employed by Brenton and Di Mauro (1999) in their empirical work considering the impact of the economic integration between European Union (EU) and Central and East European countries (CEECs) on FDI. They used the gravity model to estimate long-term level of FDI in individual CEECS by major investing countries and to further analyse of the relationship between FDI and trade in CEE countries.

The gravity type of model will be also the main objective of our empirical analysis. This approach will enable us to study the bilateral distribution of FDI, imports and exports and furthermore to investigate whether there is present complementary or substitute relationship between FDI and trade. We will employ two types of model. The first one applied on case of German will have the following form:

$$Tijt = \beta_0 Y_{it}^{\beta_1} Y_{jt}^{\beta_2} L_{jt}^{\beta_3} D_{ijt}^{\beta_4} e^{(\beta_{\check{r}} bor_{ijt} + \beta_6 EU_{jt} + \beta_7 NM1_{jt} + \beta_8 NM2_{jt} + \beta_9 IEF_{jt})} \varepsilon_{ijt} \tag{8.1}$$

After the logarithmization of equation (7.1) we obtain a linear model:

$$\ln T_{ijt} = \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt+} \beta_3 \ln L_{jt} + \beta_4 \ln D_{ijt} + \beta_{\check{r}} bor_{ijt} + \beta_6 EU_{jt} + \beta_7 NM1_{jt} + \beta_8 NM2_{jt} + \beta_9 IEF_{jt} + \varepsilon_{ijt} \tag{8.2}$$

where Tij is the value of either FDI stocks or flows of exports and imports from country i to country j in year t; Yit and Yjt are incomes of a particular country in year t measured by GDP of country; Ljt represents population of partner's country j; Dijt is distance between country i and j. Furthermore, dummy variables in our model are bor ijt examining the impact of mutual borders between partner countries, EUjt capturing influence of membership in European Union (EU) in year t, NM1jt and NM2jt characterizing the new members of EU from years 2004 and 2007 and last one is economic freedom index considering degree of economic freedom in partner country j over years t. The variable ε_{ijt} represents the error term in equation.

The second type model will be used in our analysis of relationship between inward FDI and trade flows in the Czech Republic. Its logarithmic form will be:

$$\ln T_{ijt} = \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt+} \beta_3 \ln L_{jt} + \beta_4 \ln D_{ijt} + \beta_{\check{r}} bor_{ijt} + \beta_6 EU_{jt} + \beta_7 IEF_{jt} + \varepsilon_{ijt} \quad (8.3)$$

where the impact of new members (NM1 and NM2) will be omitted.

In addition, we expect the positive impact of Yi and Yj on trade[9] as well as on FDI. According to theory of FDI, we assume that growing markets are able attract more FDI and that the more productive countries with strong companies will invest more.[10] The influence of population should be negative for both FDI and trade. The larger countries with higher population are usually more self-sufficient (Brenton , Di Mauro and Lucke 1999). The distance as proxy of TrC has the deteriorated effect on trade. However, its impact on FDI is not fully clear. The firm often chooses between FDI ad exports to serve foreign market. On the other hand, the operational costs rise with the distance. The impact of dummy variables EU, MN1 and MN2 is expected to be positive in accordance with benefits related to Single European Market. Further, we expect positive influence of borders and of Index of Economic Freedom associated with better economic conditions for investors and traders.

Our empirical analysis will consist of three main steps for each country. In the first step, we will estimate the impact of our variables on FDI and compare it with expected values. Furthermore, we determine the most influential variables affecting foreign direct investment activities in examined country.

Secondly, we will apply our extended gravity model to explain the bilateral trade flows between our country and its partners. The obtained results will be again compared with the expected values of coefficients.

Finally, we will detect the nature of relationship between FDI and flows of trade.

[9] see Chapter 7

[10] see 4.1.1 market-related determinants of FDI and Chapter 5

According to Brenton, Di Mauro and Lucke (1999) we will substitute the residuals from FDI regression into our gravity equation. The new form of equation will be:
For Germany:

$$\ln T_{ijt} = \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt+}\beta_3 \ln L_{jt} + \beta_4 \ln D_{ijt} + \beta_{\check{r}} bor_{ijt} + \beta_6 EU_{jt} + \beta_7 NM1_{jt} + \beta_8 NM2_{jt} + \beta_9 IEF_{jt} + \beta_{10} res\_FDI_{jt} + \varepsilon_{ijt} \quad (8.4)$$

For the Czech Republic

$$\ln T_{ijt} = \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt+}\beta_3 \ln L_{jt} + \beta_4 \ln D_{ijt} + \beta_{\check{r}} bor_{ijt} + \beta_6 EU_{jt} + \beta_7 IEF_{jt} + \beta_{10} res\_FDI_{jt} + \varepsilon_{ijt} \quad (8.5)$$

The theory suggested by Graham (1996) states that the coefficient of β res_FDI will be negative for substitutes and positive for complements.

7.1. Data

In our empirical analysis we will use the two unbalanced panel data sets providing us a sufficient number of observations for both countries of our interest. In case of German, we obtained 928 observations including 63 countries over the period 1995-2009. However, the data set used for the Czech Republic offers the significantly lower number observation. It contains only 374 observations for 34 countries during the years 1999-2009. The strong limitation was a poor availability of data on foreign direct investments.

The data for exports, imports and GDP of analysed countries were obtained from Eurostat. The Data on GDP and population of partner countries are taken from the IMF database. The data on distance are collected from CEPII, the foreign direct investment are from online archives of national banks (ČNB and Deutsche Bundesbank) and the data source Index of Economic Freedom is the Heritage Foundation.

7.2. Methodology

7.2.1. Fixed and Random Effects Models

There are several models, which are usually applied on panel data. The simplest one is the model of *Pooled Ordinary Least Squares* (OLS), which is only rarely the

suitable technique to estimate panel data. However it provides a good background for default strategy for further steps.

Other possibility how to estimate the panel data is *fixed effects model*. Formally, it may be expressed by following equation:

$$y_{jt} = \boldsymbol{\beta x_{jt}} + \alpha_j + \varepsilon_{jt,}\ \varepsilon_{jt}\ is\ \ iid(0, \delta^2), \qquad j = 1 \dots m, t = 1 \dots T \tag{8.2.1.1}$$

where $\varepsilon_{jt,}$ is idiosyncratic or error term specific to each observation; α_j is unobserved or fixed effect. The unobserved effect absorbs all time-invariant factors, which differs the individual cross-sectional units and we assume that it is correlated to explanatory variable (Cipra 2008). If we use fixed effects model, we cannot include the variables, which constant over a time for individual cross-sectional units. Thus the fixed effect model will skip our variables such as distance or border. Furthermore, it enables to apply the estimation with robust standard errors in case of detected group heteroscedasticity.

In contrast to fixed effects model is *model with random effects* characterized by following equation:

$$y_{jt} = \gamma + \boldsymbol{\beta x_{jt}} + \alpha_j + \varepsilon_{jt,}, \varepsilon_{jt}\ is\ \ iid(0, \delta^2),\ \ \alpha_j\ is\ \ iid(0, \delta^2)\ \ j = 1 \dots m, t = 1 \dots T \tag{8.2.1.2}$$

where random effects $\alpha_j\ \varepsilon_{jt,}$ are mutually independent for all j and t (Cipra 2008). We assume that unobserved effect α_j is uncorrelated with explanatory variable in each period (Wooldrige 2003), therefore:

$$cov(x_{ijt}, \alpha_j) = O\ , \qquad i = 1 \dots n, j = 1 \dots m, t = 1 \dots T \tag{8.2.1.3}$$

Moreover, α_j is part of composite term $v_{jt=}\alpha_j + \varepsilon_{jt,}$ and v_{jt} is serially correlated across time:

$$Corr(v_{jt}v_{js}) = \frac{\sigma_a^2}{\sigma_a^2 + \sigma_u^2}, \qquad \sigma_a^2 = Var(\alpha_i), \sigma_u^2 = Var(u_{jt}), \qquad t \neq s, s = 1 \dots T \tag{8.2.1.4}$$

7.2.2. Tests of the suitability of models

To identify the most suitable model we will use several tests.

Pooled OLS vs. Fixed effects model

The null hypothesis is that all cross-sectional units have same intercept. If we accept the null hypothesis the pooled OLS model will be more beneficial.

Breusch-Pagan test

The null hypothesis of Breusch-Pagan test states that $\sigma_a^2 = Var(\alpha_i) = 0$. If we reject the null hypothesis, we will consider as more appropriate the random effects model.

Hausman test

The null hypothesis of Hausman test is that unobserved effect is uncorrelated with explanatory variables, therefore $H_0: cov(x_{ijt}, \alpha_j) = O$. The test is based on a measurement distance H between fixed and random effect. If the value of H is high, the fixed effects model will be suitable.

7.3. Results

At the beginning, we would like to mention several aspects, which seem to be same in whole empirical analysis. In the first step we applied the estimation with pooled OLS, which helped us to better assess the entire model. This includes tests on some of basic assumptions. In both data sets we identify the heteroscedasticity. However, we must concluded, that in such large sample of countries with different sizes, the presence of heteroscedasticity was expected. Furthermore, we are aware of fact that estimated coefficients of variables stay unchanged. The heteroscedasticity poses the more serious problem on the estimates of standard errors, which can be consequently over-evaluated. Although we applied log-linearized form of our model, we have to face problem with normality of data. One of the possible explanation may be that logarithmization has impact on skewness of distribution of data.

Furthermore, we did a panel data diagnostic with all above referred tests. In all case both Czech and German data we reject the null hypothesis of same intercept for all cross-section units in favour of fixed effects models. Similarly, we reject the null hypothesis of Breusch- Pagan test in favour of random effects models. Finally, we reject

the null hypothesis of Hausman test, that the model with random effects is consistent, in favour of models with fixed effects.[11]

In addition, we estimated all models with fixed effects. To identify the presence of group heteroscedasticity, we applied Wald test with null hypothesis, that idiosyncratic errors are groupwise homoscedastic. In all cases, the extremely low p-value[12] ($p < 0$, 05) indicates the presence of groupwise heteroscedasticity. That's why we estimated our final results with fixed effects with robust standard errors. As the result, we obtained statistically less significant coefficients without overestimation.

As we noted above, we divided our empirical analysis into 3 basic steps. Firstly we will evaluate the results of foreign direct investment. Secondly, we will consider the impact of our explanatory variable on trade. Finally we will attempt to identify whether FDI and trade flows are complements or substitutes

7.3.1. Results for outward and inward FDI

The case of German

As we can see from the table most of estimated coefficients have expected impact on German outward FDI except the variable of German income, which importance cannot be omitted. The Yi indicates as the prosperity of country increases, their firm are less willing to invest abroad. The possible explanation could be, that Germany increasing income of inhabitants caused a sufficiently big demand at the local market. Thus the firms will prefer operational activities at home rather abroad. However its influence is not significant. We identified national income of partner countries as significant variable. It indicates the market-orientation of German outward FDI. Another significant variable are new members of EU. It could be accepted that membership in EU provide German investors certain guarantees. Although, the rest of variables is statistically insignificant, the coefficient of determination R^2 is 0,95, which indicate that the selected variable should be explain 95% of model.

[11] See results in Appendix

[12] The obtained p-value was mostly around 0

Fixed Effects Model with Robust (HAC) standard errors

Dependent variable: ***l_outFDI***
Skipped variables: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−3.53511	6.26049	−0.5647	0.5724	
l_Yj	1.25769	0.519237	2.422	0.0156	**
l_Yi	−0.172523	0.841032	−0.2051	0.8375	
l_Lj	−1.08451	1.49442	−0.7257	0.4682	
EU	0.187259	0.117730	1.591	0.1121	
NM1	0.385884	0.439699	0.8776	0.3804	
NM2	1.03895	0.291443	3.565	0.0004	***
IEF	0.0175741	0.0125122	1.405	0.1605	

The case of the Czech republic

For Czech Republic we concentrated rather on inward FDI. The vast empirical evidence suggests that there is a certain potential of the Czech Republic (CR) for foreign investors. However, the obtained results show that the most influential variable is only GDP for partner country. This leads to the conclusion that more productive countries have bigger potential to become main investors in the Czech Republic. The R^2 of estimated model was 0,97, what is similarly as for Germany quite high.

Fixed Effects Model with Robust (HAC) standard errors

Dependent variable: ***l_inFDI***
Skipped variables: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−44.5004	9.72567	−4.576	6.81e-06	***
l_Yi	0.940073	1.14492	0.8211	0.4122	
l_Yj	2.97680	0.950963	3.130	0.0019	***
l_Lj	0.622132	3.87088	0.1607	0.8724	
EU	0.201125	0.313319	0.6419	0.5214	
IEF	−0.0179111	0.0294977	−0.6072	0.5441	

7.3.2. Results for trade flows

The case of Germany

The model of German exports indicates as the most significant variable the GDP of partner and economic freedom index. However, the estimated impact of statistically insignificant NM1, NM2 and Yi is quite interesting. The suggested explanation is that German exports in new member countries were replaced by exports of others. The negative coefficient of GDP could be similarly as in previous case with FDI explained by sufficient demand at local market. The coefficient of determination is also very high (0,99)

Fixed Effects Model with Robust (HAC) standard errors

Dependent variable:***:*** **l_Xij**
Skipped variables: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−3.66830	2.33405	− 1.572	0.1164	
l_Yj	1.25410	0.151817	8.261	5.45e-16	***
l_Yi	−0.0869745	0.304503	− 0.2856	0.7752	
l_Lj	−1.07020	0.703766	− 1.521	0.1287	
EU	0.193517	0.0377802	5.122	3.73e-07	***
NM1	−0.0824972	0.0861662	− 0.9574	0.3386	
NM	−0.0353609	0.124472	−0.2841	0.7764	
IEF	0.0116544	0.00354967	3.283	0.0011	***

The model of German imports displaces the very similar results as we have expected. The exception is the coefficient of NM2, which indicates the lowering of import from Bulgaria and Romania after their accession to EU. However, its impact is not significant. The only significant variable in this model was Yj. The coefficient of determination is

Fixed Effects Model with Robust (HAC) standard errors

Dependent variable: **l_Mij**
Skipped variables: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−6.18554	3.36675	− 1.837	0.0665	*
l_Yj	0.829918	0.234099	3.545	0.0004	***

l_Yi	0.513226	0.386917	1.326	0.1850
l_Lj	−1.32412	0.910840	−1.454	0.1464
EU	0.209765	0.154455	1.358	0.1748
NM1	0.0353709	0.209517	0.1688	0.8660
NM2	−0.0361035	0.208062	− 0.1735	0.8623
IEF	0.00266611	0.00479670	0.5558	0.5785

The case Czech Republic

The results of Czech exports can be considered as classic example of Gravity trade with significant variables Yi, Yj, and Lj. approximating the absolute size of country. The variable for distance was not included in fixed effects model due to its correlation. Except the coefficient of EU, all coefficients have expected signs. This leads to the conclusion that small countries with strong " demand" create main markets of Czech exports.

Fixed Effects Model with Robust (HAC) standard errors

Dependent variable: l_Xij

Skiiped variables : l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−10.6367	4.31219	−2.467	0.0142	**
l_Yi	1.16216	0.572329	2.031	0.0431	**
l_Yj	1.13591	0.456798	2.487	0.0134	**
l_Lj	−3.21809	1.69122	−1.903	0.0579	*
EU	−0.132749	0.0922764	−1.439	0.1512	
IEF	0.00904893	0.0147686	0.6127	0.5405	

We identified only one significant variable Yi. It indicates that growth of domestic market by 1 % will cause increase of imports by almost 2% .The R^2 is 0,99.

Fixed Effects Model with Robust (HAC) standard errors

Dependent variable:***:*** l_Mij

Skipped vaiables: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−19.9957	2.35417	−8.494	7.28e-16	***
l_Yi	1.88529	0.633347	2.977	0.0031	***
l_Yj	0.479775	0.633934	0.7568	0.4497	
l_Lj	−0.723524	0.961779	−0.7523	0.4524	
EU	0.0415950	0.103833	0.4006	0.6890	
IEF	−0.0101412	0.0101456	−0.9996	0.3183	

7.3.3. The results for regression with FDI residuals

The case of Germany

Unfortunately, the variable of outward FDI is in both regressions for exports and imports statistically insignificant. In other case, we could identify the complementarity between both types of flows.[13] The better results we would obtain, if do not take into account the groupwise heteroscedasticity in our data. The fixed effects model without robust standard errors show the strong complementarity in both cases.

The case of Czech Republic

Neither final results for Czech republic did not show any significant relationship between inward FDI and trade flows. In addition, we could detect the complementarity of inward FDI with exports in case of fixed models without robust standard errors. It would support the theory of Czech Republic as the export platform.

The results for both countries are disappointment in comparison with results of Brenton, Di Mauro and Lucke (1999), who found a significant positive relationship between outward FDI and exports for 7 countries out of 11. Analogously, they obtain significant positive relationship between imports and FDI for 5 countries out of 11. In contrast to Brenton, Di Mauro and Lucke (1999), who used the gravity model for cross-sectional data, we applied it on panel data sets.

[13] The estimated values of regression are in appendix

8. Conclusion

The aim of our thesis was to discuss the effects of foreign direct investment on trade and analyse the relationship between them. For this purpose, we focused on case of the Czech Republic, as our homeland, and Germany, as one of the most important investors in the global market. According to the empirical study suggested by Brenton, Di Mauro and Lucke (1999), we used the Gravity model to investigate the nature of bilateral exports, imports and foreign direct investment between our countries and their partners. In contrast to their study intended only for cross-sectional data, we applied our model on panel data sets, which reflect both cross-sectional and time series dimension.

In our model we consider the traditional Gravity model variables extended by dummy variables, such as borders, membership in European Union or Index of Economic Freedom. Furthermore, we estimated the possible impact of our variables on bilateral trade flows and foreign direct investment and attempted to detect the relationship between them. We applied fixed effects model with robust standards errors due to presence of groupwise heteroscedasticity in our data.

In case of Germany, we identified market-oriented character of outward foreign direct investment. This hypothesis could be supported by the most significant variable including last members of European Union (e.g. Bulgaria and Romania), which offer the possibility to invest in a new market. The German exports indicates that they are driven mainly by economic growth and stability of partner countries, further by their membership in EU. The imports seem to be significantly influenced only by national income of the partner country.

The inward foreign direct investment in the Czech Republic is mostly dependent on the growth of partner's GDP. It suggests, that foreign firms are more willing to invest with their increasing profit. The results for Czech exports confirm the theory of Gravity model and indicate population of partner country and both GDP as the most significant variables. The model with Czech imports displaced the positive impact of domestic GDP.

Unfortunately, we did not identify any significant relationship either between outward foreign direct investment and trade flows in case of Germany or between inward foreign direct investment and trade flows in the Czech Republic.

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Appendix

Results for Germany

Pooled OLS

OLS, za použití 928 pozorování
Zahrnuto 63 průřezových jednotek
Délka časové řady: minimálně 11, maximálně 15
Závisle proměnná: ***l_outFDI***

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	3.96300	3.44435	1.151	0.2502	
l_Yj	.14937	0.0552221	20.81	4.07e-79	***
l_Yi	−0.728880	0.247414	−2.946	0.0033	***
l_Dij	−0.402193	0.0494205	−8.138	1.30e-15	***
l_Lj	−0.302840	0.0542687	−5.580	3.16e-08	***
Bor	0.831374	0.120170	6.918	8.57e-12	***
EU	0.855231	0.106052	8.064	2.29e-15	***
NM1	0.522396	0.167678	3.115	0.0019	***
NM2	0.232070	0.393194	0.5902	0.5552	
IEF	0.0564549	0.00473218	11.93	1.32e-30	***

Test normality reziduí -
Nulová hypotéza: chyby jsou normálně rozdělené
Testovací statistika: Chí-kvadrát(2) = 79.0088
s p-hodnotou = 6.97353e-18

Whiteův test heteroskedasticity -
Nulová hypotéza: není zde heteroskedasticita
Testovací statistika: LM = 340.744
s p-hodnotou = P(Chí-kvadrát(46) > 340.744) = 1.28242e-46

Panel diagnostic

Rozptyl reziduí: 167.299/(928 - 70) = 0.194988
Sdružená signifikance rozdílných středních hodnot po skupinách:
F(62, 858) = 52.1603 s p-hodnotou 7.95321e-248
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model je adekvátní, a ve prospěch alternativy pevných efektů.)

Breusch-Paganova testovací statistika:
LM = 3363.14 s p-hodnotou = prob(chí-kvadrát(1) > 3363.14) = 0
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model je adekvátní, a ve prospěch alternativy náhodných efektů.)

Hausmanova testovací statistika:
H = 22.5499 s p-hodnotou = prob(chí-kvadrát(7) > 22.5499) = 0.00204096
(Nízká p-hodnota vypovídá proti nulové hypotéze, že model s náhodnými efekty je konzistentní, a ve prospěch alternativy pevných efektů.)

Test pro různé intercepty mezi skupinami -

Nulová hypotéza: Skupiny mají společný intercept
Testovací statistika: F(62, 858) = 52.1603
s p-hodnotou = P(F(62, 858) > 52.1603) = 7.95321e-248

Waldův test heteroskedasticity nezávislý na rozdělení -
Nulová hypotéza: jednotky mají stejný rozptyl chyb
Asymptotická testovací statistika: Chí-kvadrát(63) = 8355.17
s p-hodnotou = 0

Fixed Effects with Robust Standard Errors

Pevné efekty, za použití 928 pozorování
Zahrnuto 63 průřezových jednotek
Délka časové řady: minimálně 11, maximálně 15
Závisle proměnná: ***l_outFDI***
Robustní (HAC) směrodatné chyby
Vynecháno z důvodu přesné kolinearity: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−3.53511	6.26049	−0.5647	0.5724	
l_Yj	1.25769	0.519237	2.422	0.0156	**
l_Yi	−0.172523	0.841032	−0.2051	0.8375	
l_Lj	−1.08451	1.49442	−0.7257	0.4682	
EU	0.187259	0.117730	1.591	0.1121	
NM1	0.385884	0.439699	0.8776	0.3804	
NM2	1.03895	0.291443	3.565	0.0004	***
IEF	0.0175741	0.0125122	1.405	0.1605	

Střední hodnota závisle proměnné	7.312065
Sm. odchylka závisle proměnné	1.999852
Součet čtverců reziduí	167.2993
Sm. chyba regrese	0.441574
Koeficient determinace	0.954875
Adjustovaný koeficient determinace	0.951246
F(69, 858)	263.1273
P-hodnota(F)	0.000000
Logaritmus věrohodnosti	−521.8283
Akaikovo kritérium	1183.657
Schwarzovo kritérium	1521.969
Hannan-Quinnovo kritétium	1312.704
rho (koeficient autokorelace)	0.750827
Durbin-Watsonova statistika	0.453076

zde je poznámka o zkratkách statistik modelu

Pooled OLS

Hromadné OLS, za použití 930 pozorování
Zahrnuto 63 průřezových jednotek
Délka časové řady: minimálně 11, maximálně 15
Závisle proměnná: **l_Xij**

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	4.95191	1.63195	3.034	0.0025	***
l_Yj	1.23375	0.0261974	47.09	2.43e-247	***
l_Yi	−0.425754	0.117205	−3.633	0.0003	***
l_Dij	−0.774452	0.0234686	−33.00	3.37e-158	***
l_Lj	−0.342138	0.0257511	−13.29	5.59e-37	***
Bor	0.0654647	0.0570759	1.147	0.2517	

EU	−0.000369158	0.0503664	−0.007329	0.9942	
NM1	0.323186	0.0796400	4.058	5.37e-05	***
NM2	0.252462	0.186777	1.352	0.1768	
IEF	0.0214496	0.00224809	9.541	1.22e-20	***

Test normality reziduí -
Nulová hypotéza: chyby jsou normálně rozdělené
Testovací statistika: Chí-kvadrát(2) = 6.3949
s p-hodnotou = 0.0408663

Whiteův test heteroskedasticity -
Nulová hypotéza: není zde heteroskedasticita
Testovací statistika: LM = 187.291
s p-hodnotou = P(Chí-kvadrát(46) > 187.291) = 5.84335e-19

Panel diagnostic

Rozptyl reziduí: 30.8069/(930 - 70) = 0.035822
Sdružená signifikance rozdílných středních hodnot po skupinách:
F(62, 860) = 67.3859 s p-hodnotou 2.97148e-286
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model je adekvátní, a ve prospěch alternativy pevných efektů.)

Breusch-Paganova testovací statistika:
LM = 4177.27 s p-hodnotou = prob(chí-kvadrát(1) > 4177.27) = 0
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model je adekvátní, a ve prospěch alternativy náhodných efektů.)

Hausmanova testovací statistika:
H = 21.9632 s p-hodnotou = prob(chí-kvadrát(7) > 21.9632) = 0.00257775
(Nízká p-hodnota vypovídá proti nulové hypotéze, že model s náhodnými efekty je konzistentní, a ve prospěch alternativy pevných efektů.)

Test pro různé intercepty mezi skupinami -
Nulová hypotéza: Skupiny mají společný intercept
Testovací statistika: F(62, 860) = 67.3859
s p-hodnotou = P(F(62, 860) > 67.3859) = 2.97148e-286

Waldův test heteroskedasticity nezávislý na rozdělení -
Nulová hypotéza: jednotky mají stejný rozptyl chyb
Asymptotická testovací statistika: Chí-kvadrát(63) = 8722.7
s p-hodnotou = 0

Test normality reziduí -
Nulová hypotéza: chyby jsou normálně rozdělené
Testovací statistika: Chí-kvadrát(2) = 239.338
s p-hodnotou = 1.0678e-52

Fixed Effects with Robust Standard Errors

Pevné efekty, za použití 930 pozorování
Zahrnuto 63 průřezových jednotek
Délka časové řady: minimálně 11, maximálně 15
Závisle proměnná**: l_Xij**
Robustní (HAC) směrodatné chyby
Vynecháno z důvodu přesné kolinearity: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−3.66830	2.33405	−1.572	0.1164	
l_Yj	1.25410	0.151817	8.261	5.45e-16	***
l_Yi	−0.0869745	0.304503	−0.2856	0.7752	
l_Lj	−1.07020	0.703766	−1.521	0.1287	
EU	0.193517	0.0377802	5.122	3.73e-07	***
NM1	−0.0824972	0.0861662	−0.9574	0.3386	
NM	−0.0353609	0.124472	−0.2841	0.7764	
IEF	0.0116544	0.00354967	3.283	0.0011	***

Střední hodnota závisle proměnné	8.005738
Sm. odchylka závisle proměnné	1.657148
Součet čtverců reziduí	30.80689
Sm. chyba regrese	0.189267
Koeficient determinace	0.987924
Adjustovaný koeficient determinace	0.986956
F(69, 860)	1019.679
P-hodnota(F)	0.000000
Logaritmus věrohodnosti	264.8496
Akaikovo kritérium	−389.6993
Schwarzovo kritérium	−51.23637
Hannan-Quinnovo kritétium	−260.6076
rho (koeficient autokorelace)	0.609091
Durbin-Watsonova statistika	0.696071

Pooled OLS

Hromadné OLS**, **za použití 930 pozorování
Zahrnuto 63 průřezových jednotek
Délka časové řady: minimálně 11, maximálně 15
Závisle proměnná: ***l_Mij***

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	7.61661	2.48437	3.066	0.0022	***
l_Yj	1.00851	0.0398810	25.29	1.53e-107	***
l_Yi	−0.499047	0.178425	−2.797	0.0053	***
l_Dij	−0.900705	0.0357269	−25.21	4.84e-107	***
l_Lj	−0.0675406	0.0392017	−1.723	0.0852	*
Bor	0.130992	0.0868885	1.508	0.1320	
EU	0.0943333	0.0766743	1.230	0.2189	
NM1	0.398997	0.121238	3.291	0.0010	***
NM2	−0.0568843	0.284337	−0.2001	0.8415	
IEF	0.0368065	0.00342233	10.75	1.71e-25	***

Test normality reziduí -
Nulová hypotéza: chyby jsou normálně rozdělené
Testovací statistika: Chí-kvadrát(2) = 29.2544
s p-hodnotou = 4.4411e-07

Whiteův test heteroskedasticity -
  Nulová hypotéza: není zde heteroskedasticita
  Testovací statistika: LM = 175.578
  s p-hodnotou = P(Chí-kvadrát(46) > 175.578) = 5.03246e-17

Panel diagnostic

Rozptyl reziduí: 61.7858/(930 - 70) = 0.0718439
Sdružená signifikance rozdílných středních hodnot po skupinách:
 F(62, 860) = 80.0229 s p-hodnotou 0
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model
je adekvátní, a ve prospěch alternativy pevných efektů.)

Breusch-Paganova testovací statistika:
 LM = 4141.78 s p-hodnotou = prob(chí-kvadrát(1) > 4141.78) = 0
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model
je adekvátní, a ve prospěch alternativy náhodných efektů.)

Hausmanova testovací statistika:
 H = 48.2673 s p-hodnotou = prob(chí-kvadrát(7) > 48.2673) = 3.15679e-08
(Nízká p-hodnota vypovídá proti nulové hypotéze, že model s náhodnými efekty
je konzistentní, a ve prospěch alternativy pevných efektů.)

Test pro různé intercepty mezi skupinami -
  Nulová hypotéza: Skupiny mají společný intercept
  Testovací statistika: F(62, 860) = 80.0229
  s p-hodnotou = P(F(62, 860) > 80.0229) = 0

Waldův test heteroskedasticity nezávislý na rozdělení -
  Nulová hypotéza: jednotky mají stejný rozptyl chyb
  Asymptotická testovací statistika: Chí-kvadrát(63) = 76726.4
  s p-hodnotou = 0

Fixed Effects with Robust Standard Errors

Pevné efekty, za použití 930 pozorování
Zahrnuto 63 průřezových jednotek
Délka časové řady: minimálně 11, maximálně 15
Závisle proměnná**: l_Mij**
Robustní (HAC) směrodatné chyby
Vynecháno z důvodu přesné kolinearity: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−6.18554	3.36675	−1.837	0.0665	*
l_Yj	0.829918	0.234099	3.545	0.0004	***
l_Yi	0.513226	0.386917	1.326	0.1850	
l_Lj	−1.32412	0.910840	−1.454	0.1464	
EU	0.209765	0.154455	1.358	0.1748	
NM1	0.0353709	0.209517	0.1688	0.8660	
NM2	−0.0361035	0.208062	−0.1735	0.8623	
IEF	0.00266611	0.00479670	0.5558	0.5785	

Střední hodnota závisle proměnné	7.682535
Sm. odchylka závisle proměnné	1.783103
Součet čtverců reziduí	61.78579
Sm. chyba regrese	0.268037

Koeficient determinace	0.979082
Adjustovaný koeficient determinace	0.977404
F(69, 860)	583.3761
P-hodnota(F)	0.000000
Logaritmus věrohodnosti	−58.76015
Akaikovo kritérium	257.5203
Schwarzovo kritérium	595.9832
Hannan-Quinnovo kritétium	386.6120
rho (koeficient autokorelace)	0.651026
Durbin-Watsonova statistika	0.624771

Pooled OLS

Hromadné OLS, za použití 928 pozorování
Zahrnuto 63 průřezových jednotek
Délka časové řady: minimálně 11, maximálně 15
Závisle proměnná: ***l_Xij***

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	5.11861	1.63293	3.135	0.0018	***
l_Yj	1.23582	0.0261801	47.20	1.16e-247	***
l_Yi	− 0.438171	0.117296	−3.736	0.0002	***
l_Dij	− 0.775449	0.0234297	−33.10	1.11e-158	***
l_Lj	− 0.344007	0.0257281	−13.37	2.21e-37	***
Bor	0.0636369	0.0569712	1.117	0.2643	
EU	−0.00224764	0.050277	−0.04470	0.9644	
NM1	0.325660	0.0794940	4.097	4.56e-05	***
NM2	0.256222	0.186409	1.375	0.1696	
IEF	0.0214652	0.00224347	9.568	9.76e-21	***
res_outFDI	0.0701952	0.0341711	2.054	0.0402	**

Test normality reziduí -
Nulová hypotéza: chyby jsou normálně rozdělené
Testovací statistika: Chí-kvadrát(2) = 6.06193
s p-hodnotou = 0.0482691

Whiteův test heteroskedasticity -
Nulová hypotéza: není zde heteroskedasticita
Testovací statistika: LM = 194.451
s p-hodnotou = P(Chí-kvadrát(56) > 194.451) = 3.52837e-17

Panel diagnostic

Rozptyl reziduí: 29.8747/(928 - 71) = 0.0348596
Sdružená signifikance rozdílných středních hodnot po skupinách:
F(62, 857) = 69.0606 s p-hodnotou 2.01308e-289
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model je adekvátní, a ve prospěch alternativy pevných efektů.)

Breusch-Paganova testovací statistika:
LM = 4184.33 s p-hodnotou = prob(chí-kvadrát(1) > 4184.33) = 0
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model je adekvátní, a ve prospěch alternativy náhodných efektů.)

Hausmanova testovací statistika:
H = 22.6402 s p-hodnotou = prob(chí-kvadrát(8) > 22.6402) = 0.00385823

(Nízká p-hodnota vypovídá proti nulové hypotéze, že model s náhodnými efekty je konzistentní, a ve prospěch alternativy pevných efektů.)

Fixed Effects

Pevné efekty, za použití 928 pozorování
Zahrnuto 63 průřezových jednotek
Délka časové řady: minimálně 11, maximálně 15
Závisle proměnná: ***l_Xij***
Vynecháno z důvodu přesné kolinearity: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−3.70888	1.23302	−3.008	0.0027	***
l_Yj	1.25380	0.0791648	15.84	9.57e-50	***
l_Yi	−0.0845077	0.140139	−0.6030	0.5467	
l_Lj	−1.06604	0.172627	−6.175	1.02e-09	***
EU	0.193720	0.137076	1.413	0.1580	
NM1	−0.0829428	0.143793	−0.5768	0.5642	
NM2	−0.0349377	0.165401	−0.2112	0.8328	
IEF	0.0115771	0.00198265	5.839	7.44e-09	***
res_outFDI	0.0701952	0.0144349	4.863	1.38e-06	***

Střední hodnota závisle proměnné	8.007888
Sm. odchylka závisle proměnné	1.658269
Součet čtverců reziduí	29.87470
Sm. chyba regrese	0.186707
Koeficient determinace	0.988280
Adjustovaný koeficient determinace	0.987323
F(70, 857)	1032.403
P-hodnota(F)	0.000000
Logaritmus věrohodnosti	277.5383
Akaikovo kritérium	−413.0766
Schwarzovo kritérium	−69.93131
Hannan-Quinnovo kritétium	−282.1854
rho (koeficient autokorelace)	0.601000
Durbin-Watsonova statistika	0.706706

Test pro různé intercepty mezi skupinami -
Nulová hypotéza: Skupiny mají společný intercept
Testovací statistika: F(62, 857) = 69.0606
s p-hodnotou = P(F(62, 857) > 69.0606) = 2.01308e-289

Waldův test heteroskedasticity nezávislý na rozdělení -
Nulová hypotéza: jednotky mají stejný rozptyl chyb
Asymptotická testovací statistika: Chí-kvadrát(63) = 6622.87
s p-hodnotou = 0

Fixed Effects with Robust Standard Errors

Pevné efekty, za použití 928 pozorování
Zahrnuto 63 průřezových jednotek
Délka časové řady: minimálně 11, maximálně 15
Závisle proměnná***: l_Xij***
Robustní (HAC) směrodatné chyby
Vynecháno z důvodu přesné kolinearity: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota

const	−3.70888	2.22282	−1.669	0.0956	*
l_Yj	1.25380	0.138468	9.055	9.06e-19	***
l_Yi	−0.0845077	0.275806	−0.3064	0.7594	
l_Lj	−1.06604	0.623193	−1.711	0.0875	*
EU	0.193720	0.0306734	6.316	4.32e-10	***
NM1	−0.0829428	0.0910478	−0.9110	0.3626	
NM2	−0.0349377	0.113911	−0.3067	0.7591	
IEF	0.0115771	0.00338721	3.418	0.0007	***
res_outFDI	0.0701952	0.0436585	1.608	0.1082	

Střední hodnota závisle proměnné	8.007888
Sm. odchylka závisle proměnné	1.658269
Součet čtverců reziduí	29.87470
Sm. chyba regrese	0.186707
Koeficient determinace	0.988280
Adjustovaný koeficient determinace	0.987323
F(70, 857)	1032.403
P-hodnota(F)	0.000000
Logaritmus věrohodnosti	277.5383
Akaikovo kritérium	−413.0766
Schwarzovo kritérium	−69.93131
Hannan-Quinnovo kritétium	−282.1854
rho (koeficient autokorelace)	0.601000
Durbin-Watsonova statistika	0.706706

Pooled OLS

Hromadné OLS, za použití 928 pozorování
Zahrnuto 63 průřezových jednotek
Délka časové řady: minimálně 11, maximálně 15
Závisle proměnná: l_Mij

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	8.01108	2.48640	3.222	0.0013	***
l_Yj	1.01320	0.0398636	25.42	2.68e-108	***
l_Yi	−0.528344	0.178603	− 2.958	0.0032	***
l_Dij	−0.902971	0.0356756	− 25.31	1.30e-107	***
l_Lj	−0.0717460	0.0391754	− 1.831	0.0674	*
Bor	0.126832	0.0867480	1.462	0.1441	
EU	0.0900950	0.0765563	1.177	0.2396	
NM1	0.404779	0.121043	3.344	0.0009	***
NM2	−0.0481575	0.283838	−0.1697	0.8653	
IEF	0.0368465	0.00341605	10.79	1.28e-25	***
res_outFDI	0.0641637	0.0520311	1.233	0.2178	

Whiteův test heteroskedasticity -
Nulová hypotéza: není zde heteroskedasticita
Testovací statistika: LM = 188.445
s p-hodnotou = P(Chí-kvadrát(56) > 188.445) = 3.08301e-16

Panel diagnostic

Rozptyl reziduí: 61.0178/(928 - 71) = 0.0711993
Sdružená signifikance rozdílných středních hodnot po skupinách:
F(62, 857) = 80.2629 s p-hodnotou 0
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model je adekvátní, a ve prospěch alternativy pevných efektů.)

Breusch-Paganova testovací statistika:
LM = 4083.61 s p-hodnotou = prob(chí-kvadrát(1) > 4083.61) = 0
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model
je adekvátní, a ve prospěch alternativy náhodných efektů.)

Hausmanova testovací statistika:
H = 50.4043 s p-hodnotou = prob(chí-kvadrát(8) > 50.4043) = 3.417e-08
(Nízká p-hodnota vypovídá proti nulové hypotéze, že model s náhodnými efekty
je konzistentní, a ve prospěch alternativy pevných efektů.)

Fixed Effects

Pevné efekty, za použití 928 pozorování
Zahrnuto 63 průřezových jednotek
Délka časové řady: minimálně 11, maximálně 15
Závisle proměnná***: l_Mij***
Vynecháno z důvodu přesné kolinearity: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	− 6.24756	1.76217	−3.545	0.0004	***
l_Yj	0.829051	0.113138	7.328	5.41e-13	***
l_Yi	0.517120	0.200279	2.582	0.0100	***
l_Lj	−1.31721	0.246709	−5.339	1.20e-07	***
EU	0.210018	0.195902	1.072	0.2840	
NM1	0.0348736	0.205501	0.1697	0.8653	
NM2	− 0.0352253	0.236383	−0.1490	0.8816	
IEF	0.00255042	0.00283350	0.9001	0.3683	
res_outFDI	0.0641637	0.0206296	3.110	0.0019	***

Střední hodnota závisle proměnné	7.683338
Sm. odchylka závisle proměnné	1.784940
Součet čtverců reziduí	61.01783
Sm. chyba regrese	0.266832
Koeficient determinace	0.979340
Adjustovaný koeficient determinace	0.977653
F(70, 857)	580.3454
P-hodnota(F)	0.000000
Logaritmus věrohodnosti	− 53.82930
Akaikovo kritérium	249.6586
Schwarzovo kritérium	592.8038
Hannan-Quinnovo kritétium	380.5497
rho (koeficient autokorelace)	0.647724
Durbin-Watsonova statistika	0.629307

Test pro různé intercepty mezi skupinami -
Nulová hypotéza: Skupiny mají společný intercept
Testovací statistika: F(62, 857) = 80.2629
s p-hodnotou = P(F(62, 857) > 80.2629) = 0

Waldův test heteroskedasticity nezávislý na rozdělení -
Nulová hypotéza: jednotky mají stejný rozptyl chyb
Asymptotická testovací statistika: Chí-kvadrát(63) = 57027.2
s p-hodnotou = 0

Fixed Effects with Robust Standard Errors

Pevné efekty, za použití 928 pozorování

Zahrnuto 63 průřezových jednotek
Délka časové řady: minimálně 11, maximálně 15
Závisle proměnná: **l_Mij**
Robustní (HAC) směrodatné chyby
Vynecháno z důvodu přesné kolinearity: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	− 6.24756	3.35517	−1.862	0.0629	*
l_Yj	0.829051	0.233342	3.553	0.0004	***
l_Yi	0.517120	0.378493	1.366	0.1722	
l_Lj	− 1.31721	0.851140	−1.548	0.1221	
EU	0.210018	0.147713	1.422	0.1554	
NM1	0.0348736	0.209434	0.1665	0.8678	
NM2	− 0.0352253	0.198009	− 0.1779	0.8588	
IEF	0.00255042	0.00483235	0.5278	0.5978	
res_outFDI	0.0641637	0.0427941	1.499	0.1341	

Střední hodnota závisle proměnné	7.683338
Sm. odchylka závisle proměnné	1.784940
Součet čtverců reziduí	61.01783
Sm. chyba regrese	0.266832
Koeficient determinace	0.979340
Adjustovaný koeficient determinace	0.977653
F(70, 857)	580.3454
P-hodnota(F)	0.000000
Logaritmus věrohodnosti	− 53.82930
Akaikovo kritérium	249.6586
Schwarzovo kritérium	592.8038
Hannan-Quinnovo kritétium	380.5497
rho (koeficient autokorelace)	0.647724
Durbin-Watsonova statistika	0.629307

Results for the Czech Republic

Pooled OLS

Hromadné OLS, za použití 358 pozorování
Zahrnuto 34 průřezových jednotek
Délka časové řady: minimálně 1, maximálně 11
Závisle proměnná*: l_inFDI*

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−31.7109	6.33469	−5.006	8.83e-07	***
l_Yi	1.29021	0.543105	2.376	0.0181	**
l_Yj	2.00702	0.209875	9.563	2.11e-19	***
l_Lj	−1.31470	0.207203	−6.345	6.89e-10	***
l_Dij	−0.616664	0.125032	−4.932	1.26e-06	***
Bor	1.11355	0.331698	3.357	0.0009	***
EU	1.00303	0.227905	4.401	1.43e-05	***
IEF	0.0498869	0.0156712	3.183	0.0016	***

Test normality reziduí -
Nulová hypotéza: chyby jsou normálně rozdělené
Testovací statistika: Chí-kvadrát(2) = 25.7168
s p-hodnotou = 2.60421e-06

Whiteův test heteroskedasticity -
Nulová hypotéza: není zde heteroskedasticita
Testovací statistika: LM = 123.32
s p-hodnotou = P(Chí-kvadrát(33) > 123.32) = 2.36589e-12

Panel diagnostic

Rozptyl reziduí: 233.684/(358 - 39) = 0.732552
Sdružená signifikance rozdílných středních hodnot po skupinách:
F(33, 319) = 29.978 s p-hodnotou 1.37478e-78
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model
je adekvátní, a ve prospěch alternativy pevných efektů.)

Breusch-Paganova testovací statistika:
LM = 771.824 s p-hodnotou = prob(chí-kvadrát(1) > 771.824) = 7.21305e-170
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model
je adekvátní, a ve prospěch alternativy náhodných efektů.)

Hausmanova testovací statistika:
H = 6.53042 s p-hodnotou = prob(chí-kvadrát(5) > 6.53042) = 0.257969
(Nízká p-hodnota vypovídá proti nulové hypotéze, že model s náhodnými efekty
je konzistentní, a ve prospěch alternativy pevných efektů.)

Test pro různé intercepty mezi skupinami -
Nulová hypotéza: *Skupiny mají společný intercept*
Testovací statistika: F(33, 319) = 29.978
s p-hodnotou = P(F(33, 319) > 29.978) = 1.37478e-78

Waldův test heteroskedasticity nezávislý na rozdělení -
  Nulová hypotéza: jednotky mají stejný rozptyl chyb
  Asymptotická testovací statistika: Chí-kvadrát(33) = 31731.5
  s p-hodnotou = 0

Fixed Effects with Robust Standard Errors

Pevné efekty, za použití 358 pozorování
Zahrnuto 34 průřezových jednotek
Délka časové řady: minimálně 1, maximálně 11
Závisle proměnná: l_inFDI
Robustní (HAC) směrodatné chyby
Vynecháno z důvodu přesné kolinearity: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−44.5004	9.72567	−4.576	6.81e-06	***
l_Yi	0.940073	1.14492	0.8211	0.4122	
l_Yj	2.97680	0.950963	3.130	0.0019	***
l_Lj	0.622132	3.87088	0.1607	0.8724	
EU	0.201125	0.313319	0.6419	0.5214	
IEF	−0.0179111	0.0294977	−0.6072	0.5441	

Střední hodnota závisle proměnné	4.792569
Sm. odchylka závisle proměnné	2.875263
Součet čtverců reziduí	233.6841
Sm. chyba regrese	0.855893
Koeficient determinace	0.920822
Adjustovaný koeficient determinace	0.911390
F(38, 319)	97.62856
P-hodnota(F)	9.5e-153
Logaritmus věrohodnosti	−431.6253
Akaikovo kritérium	941.2506
Schwarzovo kritérium	1092.591
Hannan-Quinnovo kritétium	1001.439
rho (koeficient autokorelace)	0.482217
Durbin-Watsonova statistika	0.873814

Pooled OLS

Hromadné OLS, za použití 364 pozorování
Zahrnuto 34 průřezových jednotek
Délka časové řady: minimálně 1, maximálně 11
Závisle proměnná: l_Xij

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−4.16272	2.37513	−1.753	0.0805	*
l_Yi	1.01115	0.204244	4.951	1.14e-06	***
l_Yj	0.741486	0.0793132	9.349	1.00e-18	***
l_Lj	0.118071	0.0782054	1.510	0.1320	
l_Dij	−1.32471	0.0471755	−28.08	2.69e-92	***
Bor	0.507345	0.125763	4.034	6.71e-05	***
EU	0.0286336	0.0861896	0.3322	0.7399	
IEF	0.0208196	0.00581211	3.582	0.0004	***

Test normality reziduí -
  Nulová hypotéza: chyby jsou normálně rozdělené
  Testovací statistika: Chí-kvadrát(2) = 249.981
  s p-hodnotou = 5.21526e-55

Whiteův test heteroskedasticity -
  Nulová hypotéza: není zde heteroskedasticita
  Testovací statistika: LM = 97.32
  s p-hodnotou = P(Chí-kvadrát(33) > 97.32) = 2.91189e-08

Panel diagnostic

Rozptyl reziduí: 51.017/(364 - 39) = 0.156975
Sdružená signifikance rozdílných středních hodnot po skupinách:
 F(33, 325) = 17.3462 s p-hodnotou 1.58552e-53
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model je adekvátní, a ve prospěch alternativy pevných efektů.)

Breusch-Paganova testovací statistika*:*
 LM = 526.077 s p-hodnotou = prob(chí-kvadrát(1) > 526.077) = 2.01582e-116
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model je adekvátní, a ve prospěch alternativy náhodných efektů.)

Hausmanova testovací statistika:
 H = 25.5192 s p-hodnotou = prob(chí-kvadrát(5) > 25.5192) = 0.000110584
(Nízká p-hodnota vypovídá proti nulové hypotéze, že model s náhodnými efekty je konzistentní, a ve prospěch alternativy pevných efektů.)

Test pro různé intercepty mezi skupinami -
  Nulová hypotéza: Skupiny mají společný intercept
  Testovací statistika: F(33, 325) = 17.3462
  s p-hodnotou = P(F(33, 325) > 17.3462) = 1.58552e-53

Waldův test heteroskedasticity nezávislý na rozdělení -
  Nulová hypotéza: jednotky mají stejný rozptyl chyb
  Asymptotická testovací statistika: Chí-kvadrát(33) = 21699.3
  s p-hodnotou = 0

Fixed Effects with Robust Standard Errors

Pevné efekty, za použití 364 pozorování
Zahrnuto 34 průřezových jednotek
Délka časové řady: minimálně 1, maximálně 11
Závisle proměnná: l_Xij
Robustní (HAC) směrodatné chyby
Vynecháno z důvodu přesné kolinearity: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−10.6367	4.31219	−2.467	0.0142	**
l_Yi	1.16216	0.572329	2.031	0.0431	**
l_Yj	1.13591	0.456798	2.487	0.0134	**
l_Lj	−3.21809	1.69122	−1.903	0.0579	*
EU	−0.132749	0.0922764	−1.439	0.1512	

IEF	0.00904893	0.0147686	0.6127	0.5405

Střední hodnota závisle proměnné	9.281857
Sm. odchylka závisle proměnné	2.093607
Součet čtverců reziduí	51.01698
Sm. chyba regrese	0.396201
Koeficient determinace	0.967936
Adjustovaný koeficient determinace	0.964187
F(38, 325)	258.1835
P-hodnota(F)	2.5e-219
Logaritmus věrohodnosti	−158.8645
Akaikovo kritérium	395.7290
Schwarzovo kritérium	547.7180
Hannan-Quinnovo kritétium	456.1376
rho (koeficient autokorelace)	0.598148
Durbin-Watsonova statistika	0.793230

Pooled OLS

Hromadné OLS, za použití 364 pozorování
Zahrnuto 34 průřezových jednotek
Délka časové řady: minimálně 1, maximálně 11
Závisle proměnná: l_Mij

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−13.1994	2.89037	−4.567	6.84e-06	***
l_Yi	1.11716	0.248550	4.495	9.43e-06	***
l_Yj	1.00375	0.0965186	10.40	2.70e-22	***
l_Lj	−0.0331572	0.0951705	−0.3484	0.7277	
l_Dij	−0.884282	0.0574092	−15.40	2.21e-41	***
Bor	0.786522	0.153045	5.139	4.56e-07	***
EU	0.0977416	0.104887	0.9319	0.3520	
IEF	−0.00426368	0.00707293	−0.6028	0.5470	

Test normality reziduí -
Nulová hypotéza: chyby jsou normálně rozdělené
Testovací statistika: Chí-kvadrát(2) = 11.1153
s p-hodnotou = 0.00385792

Whiteův test heteroskedasticity -
Nulová hypotéza: není zde heteroskedasticita
Testovací statistika: LM = 194.947
s p-hodnotou = P(Chí-kvadrát(33) > 194.947) = 7.15388e-25

Panel diagnostic

Rozptyl reziduí: 20.3716/(364 - 39) = 0.0626819
Sdružená signifikance rozdílných středních hodnot po skupinách:
F(33, 325) = 91.008 s p-hodnotou 1.04127e-143
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model je adekvátní, a ve prospěch alternativy pevných efektů.)

Breusch-Paganova testovací statistika:

LM = 1282.93 s p-hodnotou = prob(chí-kvadrát(1) > 1282.93) = 5.78347e-281
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model
je adekvátní, a ve prospěch alternativy náhodných efektů.)

Hausmanova testovací statistika:
H = 22.7361 s p-hodnotou = prob(chí-kvadrát(5) > 22.7361) = 0.000379111
(Nízká p-hodnota vypovídá proti nulové hypotéze, že model s náhodnými efekty

Test pro různé intercepty mezi skupinami -
Nulová hypotéza: Skupiny mají společný intercept
Testovací statistika: F(33, 325) = 91.008
s p-hodnotou = P(F(33, 325) > 91.008) = 1.04127e-143

Waldův test heteroskedasticity nezávislý na rozdělení -
Nulová hypotéza: jednotky mají stejný rozptyl chyb
Asymptotická testovací statistika: Chí-kvadrát(33) = 2040.23
s p-hodnotou = 0

Fixed Effects with Robust Standard Errors

Pevné efekty, za použití 364 pozorování
Zahrnuto 34 průřezových jednotek
Délka časové řady: minimálně 1, maximálně 11
Závisle proměnná: l_Mij
Robustní (HAC) směrodatné chyby
Vynecháno z důvodu přesné kolinearity: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−19.9957	2.35417	−8.494	7.28e-16	***
l_Yi	1.88529	0.633347	2.977	0.0031	***
l_Yj	0.479775	0.633934	0.7568	0.4497	
l_Lj	−0.723524	0.961779	−0.7523	0.4524	
EU	0.0415950	0.103833	0.4006	0.6890	
IEF	−0.0101412	0.0101456	−0.9996	0.3183	

Střední hodnota závisle proměnné	6.024192
Sm. odchylka závisle proměnné	2.093039
Součet čtverců reziduí	20.37161
Sm. chyba regrese	0.250363
Koeficient determinace	0.987190
Adjustovaný koeficient determinace	0.985692
F(38, 325)	659.0773
P-hodnota(F)	6.4e-284
Logaritmus věrohodnosti	8.214514
Akaikovo kritérium	61.57097
Schwarzovo kritérium	213.5600
Hannan-Quinnovo kritétium	121.9796
rho (koeficient autokorelace)	0.628512
Durbin-Watsonova statistika	0.627446

Test pro různé intercepty mezi skupinami -
Nulová hypotéza: Skupiny mají společný intercept

Testovací statistika: F(33, 325) = 91.008
s p-hodnotou = P(F(33, 325) > 91.008) = 1.04127e-143

Pooled OLS

Hromadné OLS, za použití 358 pozorování
Zahrnuto 34 průřezových jednotek
Délka časové řady: minimálně 1, maximálně 11
Závisle proměnná: l_Xij

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−5.20574	2.35642	−2.209	0.0278	**
l_Yi	1.09896	0.202028	5.440	1.01e-07	***
l_Yj	0.772944	0.0780707	9.901	1.57e-20	***
l_Lj	0.0836057	0.0770767	1.085	0.2788	
l_Dij	−1.32175	0.0465101	−28.42	8.02e-93	***
Bor	0.520015	0.123387	4.214	3.19e-05	***
EU	0.0504337	0.0847774	0.5949	0.5523	
IEF	0.0155370	0.00582948	2.665	0.0081	***
res_inFDI	0.0773982	0.0402668	1.922	0.0554	*

Whiteův test heteroskedasticity -
Nulová hypotéza: není zde heteroskedasticita
Testovací statistika: LM = 177.355
s p-hodnotou = P(Chí-kvadrát(42) > 177.355) = 1.46961e-18

Test normality reziduí -
Nulová hypotéza: chyby jsou normálně rozdělené
Testovací statistika: Chí-kvadrát(2) = 267.574
s p-hodnotou = 7.88794e-59

Panel diagnostic

Rozptyl reziduí: 49.2252/(358 - 40) = 0.154796
Sdružená signifikance rozdílných středních hodnot po skupinách:
F(33, 318) = 16.2502 s p-hodnotou 2.50732e-50
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model
je adekvátní, a ve prospěch alternativy pevných efektů.)

Breusch-Paganova testovací statistika:
LM = 426.885 s p-hodnotou = prob(chí-kvadrát(1) > 426.885) = 7.74218e-95
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model
je adekvátní, a ve prospěch alternativy náhodných efektů.)

Hausmanova testovací statistika:
H = 16.5956 s p-hodnotou = prob(chí-kvadrát(6) > 16.5956) = 0.0108904
(Nízká p-hodnota vypovídá proti nulové hypotéze, že model s náhodnými efekty
je konzistentní, a ve prospěch alternativy pevných efektů.)

Fixed Effects

Pevné efekty, za použití 358 pozorování
Zahrnuto 34 průřezových jednotek

Délka časové řady: minimálně 1, maximálně 11
Závisle proměnná: l_Xij
Vynecháno z důvodu přesné kolinearity: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−10.3265	1.97028	−5.241	2.91e-07	***
l_Yi	1.21904	0.370128	3.294	0.0011	***
l_Yj	1.14135	0.309388	3.689	0.0003	***
l_Lj	−3.53139	0.966209	−3.655	0.0003	***
EU	−0.141188	0.111866	−1.262	0.2078	
IEF	0.00743464	0.00971513	0.7653	0.4447	
res_inFDI	0.0773982	0.0257375	3.007	0.0028	***

Střední hodnota závisle proměnné	9.311851
Sm. odchylka závisle proměnné	2.084704
Součet čtverců reziduí	49.22520
Sm. chyba regrese	0.393442
Koeficient determinace	0.968273
Adjustovaný koeficient determinace	0.964382
F(39, 318)	248.8455
P-hodnota(F)	1.7e-214
Logaritmus věrohodnosti	−152.8212
Akaikovo kritérium	385.6424
Schwarzovo kritérium	540.8637
Hannan-Quinnovo kritétium	447.3742
rho (koeficient autokorelace)	0.370189
Durbin-Watsonova statistika	1.030878

Test pro různé intercepty mezi skupinami -
Nulová hypotéza: Skupiny mají společný intercept
Testovací statistika: F(33, 318) = 16.2502
s p-hodnotou = P(F(33, 318) > 16.2502) = 2.50732e-50

Waldův test heteroskedasticity nezávislý na rozdělení -
Nulová hypotéza: jednotky mají stejný rozptyl chyb
Asymptotická testovací statistika: Chí-kvadrát(33) = 81334.3
s p-hodnotou = 0

Fixed Effects with Robust Standard Error

Pevné efekty, za použití 358 pozorování
Zahrnuto 34 průřezových jednotek
Délka časové řady: minimálně 1, maximálně 11
Závisle proměnná: l_Xij
Robustní (HAC) směrodatné chyby
Vynecháno z důvodu přesné kolinearity: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−10.3265	4.24261	−2.434	0.0155	**
l_Yi	1.21904	0.554288	2.199	0.0286	**
l_Yj	1.14135	0.442481	2.579	0.0103	**
l_Lj	−3.53139	1.65665	−2.132	0.0338	**
EU	−0.141188	0.0966457	−1.461	0.1450	

IEF	0.00743464	0.0149883	0.4960	0.6202
res_inFDI	0.0773982	0.0908503	0.8519	0.3949

Střední hodnota závisle proměnné	9.311851
Sm. odchylka závisle proměnné	2.084704
Součet čtverců reziduí	49.22520
Sm. chyba regrese	0.393442
Koeficient determinace	0.968273
Adjustovaný koeficient determinace	0.964382
F(39, 318)	248.8455
P-hodnota(F)	1.7e-214
Logaritmus věrohodnosti	−152.8212
Akaikovo kritérium	385.6424
Schwarzovo kritérium	540.8637
Hannan-Quinnovo kritétium	447.3742
rho (koeficient autokorelace)	0.370189
Durbin-Watsonova statistika	1.030878

Pooled OLS

Hromadné OLS, za použití 358 pozorování
Zahrnuto 34 průřezových jednotek
Délka časové řady: minimálně 1, maximálně 11
Závisle proměnná*: l_Mij*

	koeficient	směr. chyba	t-podíl	p-hodnota
const	−13.3929	2.93678	−4.560	7.08e-06 ***
l_Yi	1.14080	0.251785	4.531	8.08e-06 ***
l_Yj	1.01846	0.0972988	10.47	1.76e-22 ***
l_Lj	−0.0508145	0.0960599	−0.5290	0.5972
l_Dij	−0.889138	0.0579651	−15.34	5.92e-41 ***
Bor	0.781288	0.153776	5.081	6.14e-07 ***
EU	0.0938396	0.105657	0.8882	0.3751
IEF	−0.00705147	0.00726523	−0.9706	0.3324
res_inFDI	0.0263951	0.0501841	0.5260	0.5992

Whiteův test heteroskedasticity -
Nulová hypotéza: není zde heteroskedasticita
Testovací statistika: LM = 196.447
s p-hodnotou = P(Chí-kvadrát(42) > 196.447) = 7.90296e-22

Test normality reziduí -
Nulová hypotéza: chyby jsou normálně rozdělené
Testovací statistika: Chí-kvadrát(2) = 11.8708
s p-hodnotou = 0.00264416

Panel diagnostic

Rozptyl reziduí: 19.335/(358 - 40) = 0.0608018
Sdružená signifikance rozdílných středních hodnot po skupinách:
F(33, 318) = 92.73 s p-hodnotou 8.14101e-143
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model je adekvátní, a ve prospěch alternativy pevných efektů.)

Breusch-Paganova testovací statistika:
LM = 1230.69 s p-hodnotou = prob(chí-kvadrát(1) > 1230.69) = 1.30659e-269
(Nízká p-hodnota vypovídá proti nulové hypotéze, že hromadný OLS model
je adekvátní, a ve prospěch alternativy náhodných efektů.)

Hausmanova testovací statistika:
H = 17.665 s p-hodnotou = prob(chí-kvadrát(6) > 17.665) = 0.00712622
(Nízká p-hodnota vypovídá proti nulové hypotéze, že model s náhodnými efekty
je konzistentní, a ve prospěch alternativy pevných efektů.)

Fixed Effects

Pevné efekty, za použití 358 pozorování
Zahrnuto 34 průřezových jednotek
Délka časové řady: minimálně 1, maximálně 11
Závisle proměnná: l_Mij
Vynecháno z důvodu přesné kolinearity: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−19.5772	1.23483	−15.85	4.04e-42	***
l_Yi	1.85276	0.231969	7.987	2.56e-14	***
l_Yj	0.541186	0.193902	2.791	0.0056	***
l_Lj	−0.993149	0.605549	−1.640	0.1020	
EU	0.0340506	0.0701097	0.4857	0.6275	
IEF	−0.0102280	0.00608873	−1.680	0.0940	*
res_inFDI	0.0263951	0.0161303	1.636	0.1028	

Střední hodnota závisle proměnné	6.064379
Sm. odchylka závisle proměnné	2.080021
Součet čtverců reziduí	19.33497
Sm. chyba regrese	0.246580
Koeficient determinace	0.987482
Adjustovaný koeficient determinace	0.985947
F(39, 318)	643.2088
P-hodnota(F)	1.5e-278
Logaritmus věrohodnosti	14.45255
Akaikovo kritérium	51.09490
Schwarzovo kritérium	206.3162
Hannan-Quinnovo kritétium	112.8267
rho (koeficient autokorelace)	0.602034
Durbin-Watsonova statistika	0.660020

Test pro různé intercepty mezi skupinami -
Nulová hypotéza: Skupiny mají společný intercept
Testovací statistika: F(33, 318) = 92.73
s p-hodnotou = P(F(33, 318) > 92.73) = 8.14101e-143

Waldův test heteroskedasticity nezávislý na rozdělení -
Nulová hypotéza: jednotky mají stejný rozptyl chyb
Asymptotická testovací statistika: Chí-kvadrát(33) = 1738.25
s p-hodnotou = 0

Fixed Effects with Robust Standard Errors

Pevné efekty, za použití 358 pozorování
Zahrnuto 34 průřezových jednotek
Délka časové řady: minimálně 1, maximálně 11
Závisle proměnná: l_Mij
Robustní (HAC) směrodatné chyby
Vynecháno z důvodu přesné kolinearity: l_Dij Bor

	koeficient	směr. chyba	t-podíl	p-hodnota	
const	−19.5772	2.22722	−8.790	9.56e-17	***
l_Yi	1.85276	0.614344	3.016	0.0028	***
l_Yj	0.541186	0.627176	0.8629	0.3888	
l_Lj	−0.993149	0.989630	−1.004	0.3164	
EU	0.0340506	0.101033	0.3370	0.7363	
IEF	−0.0102280	0.00980933	−1.043	0.2979	
res_inFDI	0.0263951	0.0269106	0.9808	0.3274	

Střední hodnota závisle proměnné	6.064379
Sm. odchylka závisle proměnné	2.080021
Součet čtverců reziduí	19.33497
Sm. chyba regrese	0.246580
Koeficient determinace	0.987482
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Durbin-Watsonova statistika	0.660020