Influence of Foreign Direct Investment (FDI) on the regional economic growth in the Republic of Bulgaria

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Abstract: In the study, the differential impact of foreign direct investment (FDI) on growth in six regions in Bulgaria for the period 2000-2014, is examined and assessed. The paper is motivated by the Solow growth model, as well as the Augmented Solow growth model. The results show that the spillover effect of the foreign capital varies across the territorial areas in the Balkan country. In particular, one euro investment from abroad leads to the highest increase in the GDP per capita in Southwest region, followed by Northeast and North Central. South Central and Southeast regions experience significant impact of FDI on growth as well, unlike Southwest region, where the regression output shows dubious results and minimal spillover effect.

Contents

1 Introduction

After forty-five years of socialism, the Republic of Bulgaria made its first steps into the market economy. Following the introduction of the policy of *perestroika*[1] and the subsequent events in the late 1980's and the early 1990's, the Soviet Union collapsed. The former Soviet States and USSR-aligned countries (Bulgaria, East Germany, Hungary, Czechoslovakia, Romania and Poland)[2] opened their boarders for political and economic interaction with the rest of the world. They found themselves in a difficult situation due to the lack of experience in the new economic system. Bulgaria started building institutions suitable for the "new world". Democratic elections, followed by the emergence of the private sector, were the first crucial steps. The necessity of fresh capital was indispensable (especially after the dissolution of the economic alliance – Comecon, and the economic benefits that were stemming from it). The country needed new trade partners and establishment of multilateral political and economic relationship with the economically powerful Western world. Significant investments from abroad began flowing into the country almost immediately after the opening of the market. During the first five to ten years following 1989, the state started building its economy and tried to take advantage of the FDIs and their spillover effects (the latter will be thoroughly examined below). At that time, the private sector was still weak and highly dependent on the foreign capital flowing into the market. This dependency continued until the beginning of the 21st century, although it is widely considered that it is still an ongoing process. Furthermore, the statistics speak for themselves regarding the political instability and unfavourable economic environment in the country in the 1990s. For instance, the annual average rate of inflation in the period 1990-1997 was 210% compared to 5.7% in the period 1998-2002. The GDP growth was -4.6%, compared to 4.1%, the increase of the investments -8.8% compared to 20% for the second period[3]. This striking change was attributed to several policies, among which was the introduction of the currency board, decrease of the international prices of major commodity

[1] Perestroika – "*a program instituted in the Soviet union by Mikhail Gorbachev in the mid-1980s to restructure Soviet economic and political policy*" (Encyclopædia Britannica, 2016). The purpose of the perestroika was to help the Soviet Union to catch up with the big capitalist economies by that time.

[2] USSR-alligned countries were defined by the member states of the Warsaw Treaty Organization in 1955 (Encyclopædia Britannica, 2016).

[3] Source: National Statistical Institute Bulgaria.

groups, additional liberalization of the foreign trade, decrease of a number of taxes (including VAT) etc.

The above-described events and the fact that Bulgaria has a long way to go, in order to accomplish its goal of catching up with the developed Western European economies, motivated the conduct of this research. The results aim to clarify the role of foreign capital on the economy and to define what the governmental policy towards it should be. Since the *perestroika*, Bulgaria is assumed to be significantly dependent on the FDI in order to develop the domestic economy. Due to the accession of Bulgaria to the European Union (EU), the cheap labor force and low tax rates, the country has increased its attractiveness over the years. But to what extent is the expansion of foreign capital helping the domestic economy? The easiest and clearest way to measure this is through regression analysis on the relationship between GDP and FDI.

The study uses panel data for all six regions in Bulgaria – Northeast, North Central, Northwest, Southeast, South Central and Southwest, and explores whether the effect varies across regions, and if so, to what extent. In addition, it uses several control variables, such as Employment, Fixed Capital, Expenditures for R&D and Inflation. Through some of the control variables the paper also tests the applicability of the Solow growth model on a regional basis in the case of the Bulgarian economy.

The big differences in the economic development across districts in Bulgaria is another reason that motivates this study, namely the effect of foreign direct investments on a regional level. Furthermore, four out of the ten poorest regions in the EU are Bulgarian, whereby only the Southwest (where the capital city is situated), is not included in this statistics. Why is this the case? What distinguishes different regions within one country, in regard to utilization of foreign investments and growth, in general? Is there a way to find the weaknesses and stimulate the implementation of new successful policies? This study will attempt to give satisfactory answers to all of the questions posed above.

The structure of the paper is as follows: First, a historical overview of the trends of the GDP and FDI in Bulgaria on a national and regional level will be presented. Then, a brief analysis will be conducted on the reasons that make Bulgaria attractive for foreign investors, including both the advantages and disadvantages of investing in the country will be examined. In the next

part, both viewpoints encountered in the literature of foreign capital as a stimulating or deterring growth factor will be presented an analysis on what determines the strength of the effect of foreign capital on GDP is conducted, with a special focus on the well-developed financial markets, human capital, domestic political and economic environment. Furthermore, the theoretical model behind the empirical study will be looked at in the next part, for the purpose of which Solow growth and Augmented Solow growth models will be applied. Both models capture the main idea of the paper - namely, the role that capital plays in stimulating growth. Furthermore, the theoretical part is followed by an empirical one, which begins with the introduction of the data used and descriptive statistics. Then, the regression equations, together with the hypothesis, are presented. The potential problems that can occur with the model used and the way it is dealt with are included as well. In addition, issues like stationarity, autocorrelation, heteroscedasticity, and setting the most appropriate panel data model (Fixed effects, Random effects, Pooled OLS model) are addressed. Next part is the essential one, where the results are commented. Overall, the study discusses the outcome and provides possible reasons behind it. As a conclusion, the results are summarized and inference is made, followed by a concise policy recommendation.

As a part of the analysis one should look at the following questions: Why FDI is so important for countries to develop? Why are we using GDP as a measure of growth? What is the relationship between FDI and GDP? Attracting capital from abroad is an appropriate tool for promoting growth in transition economies. If one compares them with other forms of capital investment, what distinguishes the FDI is the period for which the investor is committed to its investment (Barrell & Holland, 2000). Their intention is to create environment for sustainable trade across countries as well as obtain control over the enterprise's management. In other words, foreign capital enables the transition economies to benefit from the spillover effect that occurs, following the introduction of more productive technical knowledge and managerial techniques. In such a way, the former soviet countries can reduce the economic gap they have, compared to developed Western capitalist economies.

In order to observe the influence of FDI on a country's growth rate, it should first be determined how growth is measured. The most well known and frequently tracked one is the gross domestic product. Even though there are some other potential ways of estimation such as the increase of living standard (it is difficult to quantify), GDP remains the most appropriate

and accurate measurement. The interaction between FDI and GDP will be elaborated in the Literature Review chapter.

2 Literature Review.

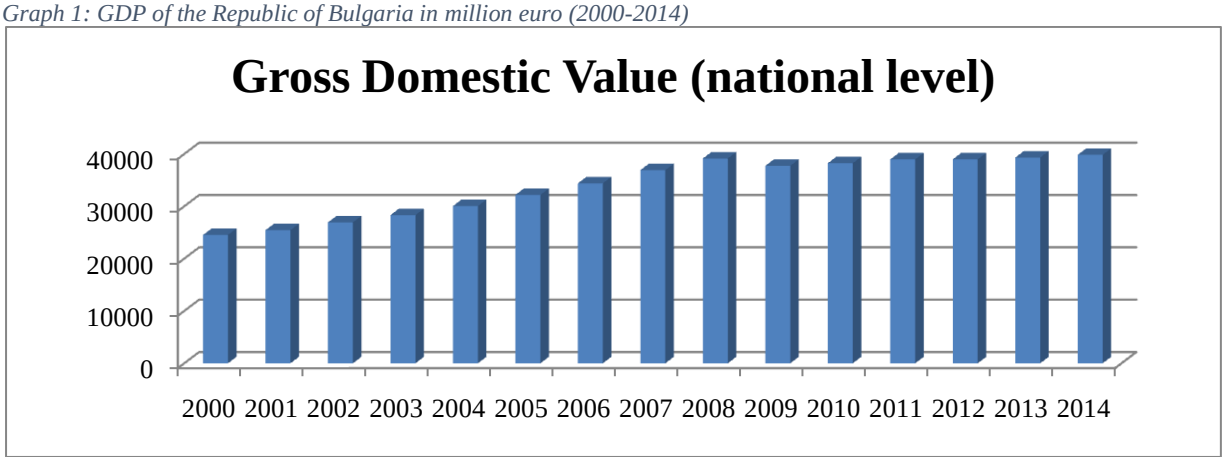
2.1 GDP and FDI statistics: Historical Overview for Bulgaria

For the purpose of this analysis, the fluctuations and trend of the gross domestic product and foreign direct investments through time will be examined. The historical overview of the paper looks at the period 2000-2014 for numerous reasons. First, the data availability is restricting the scope of the research. Second, the period 1989-2000, was a period of an unceasing economic and political crisis. Including the latter time span into the analysis will lead to wrong conclusions since most of the macroeconomic indicators in such a situation will give biased and incredible results. In the following section, the trends and yearly fluctuations of the two parameters on a national and regional level will be examined.

The spatial separation of the regions is based on the Nomenclature of Territorial Units for Statistics (NUTS). Essentially it is a geocode standard which is used to separate territories within one country, so as to facilitate the performing of the potential statistical analysis (Eurostat). The standard has been established by the EU. The union has defined three levels of the spatial separation. For the purpose of this study NUTS2 is used, which divides the territories of EU members into 273 regions and Bulgarian territory into 6 planning regions (*Picture 1*).

2.1.1 Gross Domestic Products (analysis on national and regional level)

Graph 1: GDP of the Republic of Bulgaria in million euro (2000-2014)



Source: National Statistical Institute, Bulgaria

Graph 1 and *Chart 1* represent the GDP of Republic of Bulgaria in total value and percentage change respectively. Both depict the indicator at constant 2010 prices, as the World Bank in their World Development Indicators elaborates it[4]. This measure is chosen to take into account the influence of the inflation, which in 2008 reached nearly 13%, and could be the reason of making erroneous conclusions. Looking at the period under consideration, several major inferences could be made. First, the period 2000-2008 was marked by a stable growth (between 4 and 8% on a yearly basis). The total value increased by almost 70% for 8 years. In 2000, the GDP was 24.5 billion euro, in comparison to the value in 2014 of 39.8 billion euro. Many factors played a role in this economic boom, including the stable political and economic environment. The economic expansion during that time was a worldwide tendency. Bulgaria implemented a number of reforms and policies that aimed to help the country to meet the requirements for joining the Union[5]. They affected positively the domestic economy.

As regards to the second sub period, it started in 2008. This was the year when the economic peak was reached and the housing bubble in the United States bursted. As it can be seen on *Chart 1,* the period was characterized with initial substantial drop of the growth rate (negative for 2009), followed by gradual recovery, which up until 2014 did not reach the pre-crisis level. Now, an examination of the reasons for these trends to occur is needed. During the period 2000-2008, a sustainable and competitive economy was established. The maintained political stability and macro-economic environment led to a gradual convergence with the EU. Taking into account the size of the economy 4-8% growth rate for over 10 years is an impressive result. The main engines of growth during this period were the final consumption and the investments in fixed capital, which were supported by the significant increase of the credit activity of the banks and the increasing of the disposable income of the households, due to the increment of the average wage. It is arguable to what extent this progress is due to the country by itself or due to the favourable world economic environment. In this time span Bulgaria joined the EU, as a legitimate consequence of the political and economic stability in the state. The bursting of the housing bubble in US was the first big shock for the country after the devaluation of the currency and the tremendously high levels of inflation in the end of the 20th century. The world

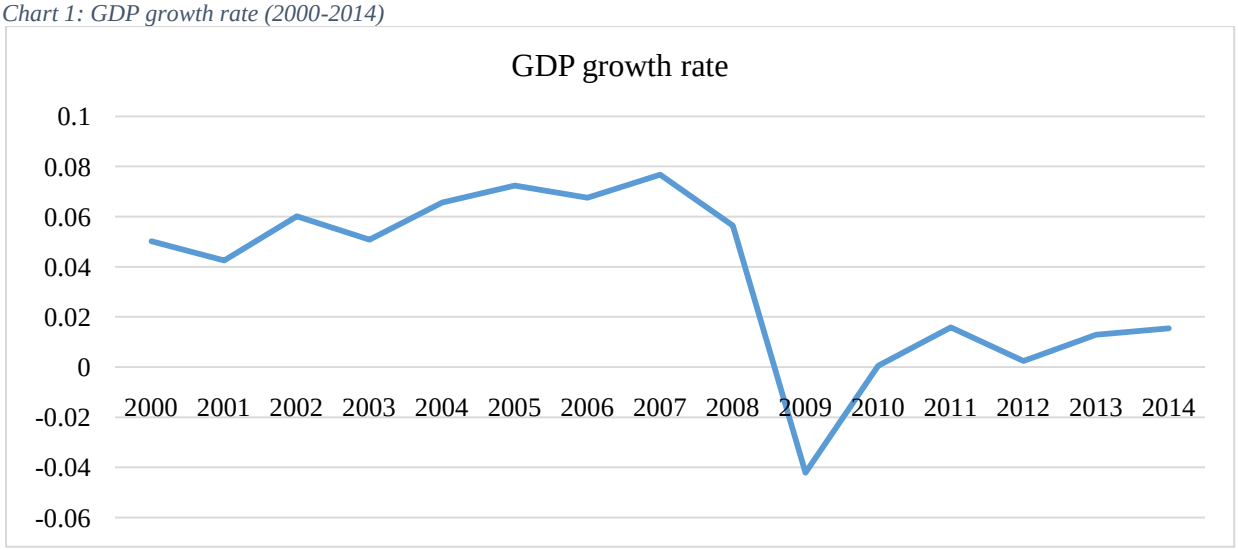
[4] World development indicators (WDI) is "*the primary World Bank collection of development indicators, compiled from officially recognized international sources*" (The World Bank).

[5] Such a requirment is the fulfillment of The Copenhagen criteria that require several conditions and principles to be met. These conditions are related to presence of "*institutions guaranteeing democracy, rule of law, human rights", "functioning market economy*" and acceptance of the EU obligations (European Comission).

crisis affected Bulgaria with a lag. It influenced the domestic economy mainly through the decrease of the demand of the goods produced for export, the decrease of the prices of the same goods, the reduction of the credit activity of the banks and the decrease of the level of growth of foreign direct investments, caused by the rising levels of risk for the investors. All these consequences logically caused the first negative growth of GDP since more than 7 years. All of the economic sectors contributed to this drop. The severe effect of the global crisis was persistent and even though the negative economic growth lasted for a year, the pre-crisis levels cannot be reached. Six years after the shock that affected the domestic economy, the growth rate cannot exceed the 2% barrier.

The recovery process from the world financial crisis occurs at different rates in different regions. All of the country's regions were affected by it. In *Graph 2* one can notice a decrease in the total value of GDP in every region except the Southwest and South Central. The measure is responsible for the lack of contradiction in the total value of GDP. Due to the lack of available data in constant prices, on regional level GDP in current prices is used, which does not take into consideration the influence of the inflation. Thus, the effect of the crisis is mitigated and from the graph it appears that there is no evidence of a drop in the GDP in 2009.

Chart 1: GDP growth rate (2000-2014)



Source: National Statistical Institute, Bulgaria

What more can be added about the growth on a regional basis? For the whole period observed, the distribution of GDP across regions has stayed relatively constant, even though there is a tendency of centralization. The contribution of the capital city region for the total GDP increases each year. *Table 2* represents the percentage of the GDP generated in the corresponding region from the total GDP value for the country. Due to the unavailability of the

data for GDP in constant prices on a regional level, as it was previously mentioned, in the table the contribution of the districts through GDP in current prices is calculated. This does not distort the inference we aim to derive. In 2000, near 35% of the whole gross domestic product was generated in the capital region. The other 5 did not exceed16%. Fourteen years later the district of Sofia contributed by almost 50% of the total produced goods and services in the country. The others remained under the 14% share[6]. These results are mainly due to the economic power of the capital city. A significant part of the economic activities is situated there and it remains the most attractive place for business and employment in the country. The reasons for that will be presented in the FDI chapter.

The regional disparities are a common characteristic for most of the EU members in Eastern and Central Europe. There is one area "metropolis" with a high population density. It is an area of high activity and income. Usually in the area, the capitals and the whole public administration are situated. Contrary to the metropolis are the border areas, which have much lower economic activity and lower income. Such examples are the Southwest region with the capital Sofia for Bulgaria, Attiki (Athens) for Greece, Bucuresti (Bucharest) – Romania, Közép-Magyarország (Budapest) - Hungary, Mazowieckie (Warsaw) - Poland, Praha (Prague) - Czech Republic. Typical for the countries mentioned is that economic processes cause the regional disparities from the centre-periphery type[7], which are significant in Bulgaria and even exacerbate over time. This causes migration to the capital and lead to depopulation of the other parts of the countries. The degree of this problem is so severe that recovery seems problematic even in the long run.

As the economic heart of Bulgaria, Sofia and Southwest region attract the biggest domestic and international companies. The region has the highest percentage of people with tertiary education in the whole country. The government institutions are situated there. It is the most populated area as well. Sofia is located on a strategic geographical place, between Europe and Turkey (Middle East respectively), as well as Greece. A-class international roads pass through

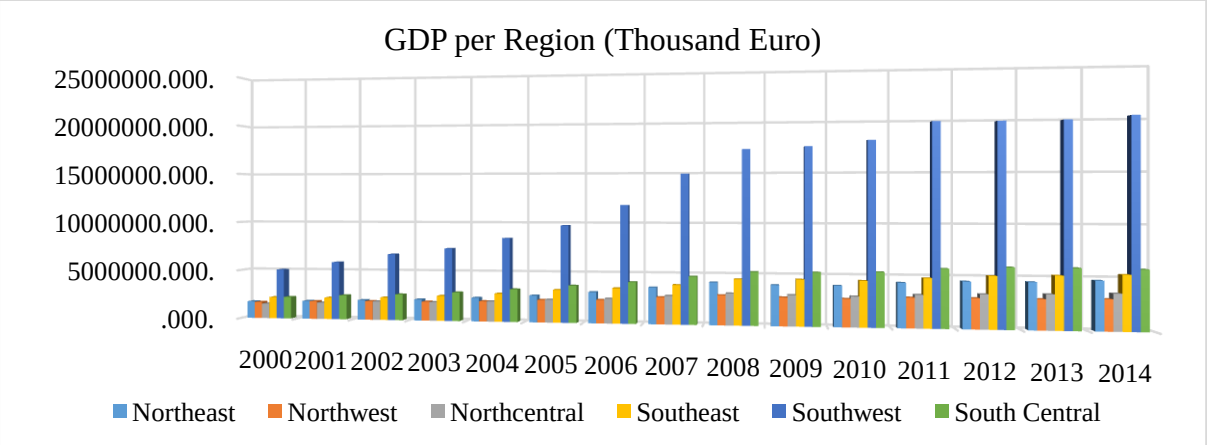
[6] Source: National Statistical Institute Bulgaria.

[7] "*The centre-periphery (or core-periphery) model is a spatial metaphor which describes and attempts to explain the structural relationship between the advanced or metropolitan 'centre' and a less developed 'periphery', either within a particular country, or (more commonly) as applied to the relationship between capitalist and developing societies*" (Scott & Marshall, 2009).

the city (E80, E79, and E83) and one B class (E871)[8]. In 2015, Forbes published an article called "10 Top cities around the World to Launch Your Startup" (Amy Guttman, 2015). In it, Sofia was included in the ranking alongside cities like Sydney, Cairo, London Beijing and Moscow. The main reasons behind this listing is the "low corporate tax" in the city/country (10% flat rate), the "extremely fast internet connection speed", as well as the presence of "several investment funds" like "*LAUNCHub, Eleven Startup Accelerator and Neveq"* (Amy Guttman, 2015).

After Southwest region, with respect to GDP contribution, are the South Central, Southeast and Northeast regions. The difference between them is relatively small. There are objective reasons for that. To start with is the South Central region, where the second largest city in Bulgaria (Plovdiv) is situated. As a one of the oldest cities on the continent, and European capital of culture for 2019, the city is well known with its cultural heritage and background of an economic centre. In Plovdiv one of the largest and oldest international trade fairs is annually held, which was established in August 1892 as an industrial and agricultural show. In addition to the copper ores, South Central region is ranked as the second biggest contributor of the total GDP in the country. We should mention also the tobacco processing plants, bicycle plant and electrical factories in the city. In the region of Plovdiv the largest electronic plant on the Balkans is situated.

Graph 2: Nominal GDP per Region in thousand euro (2000-2014)



Source: National Statistical Institute, Bulgaria

[8] The international E-road network was developed by the United Nations Economic Comission for Europe (UNECE) and was adopted "*as a coordinated plan for the construction and development of roads of international importance which they intend to undertake within the framework of their national programmes*" (United Nations Economic Comission for Europe, 1975).

As regards to the Southeast and Northeast Regions, one level down of the NUTS classification should be performed to understand more deeply the processes happening in this area. For simplicity, the regions based on NUTS 3 classification will be called districts. The districts that contribute to the GDP growth are the coastal ones. They have access to Black sea. Bourgas (Southeast region) is an important industrial centre. In the city, the largest oil refinery in Southeast Europe and the largest manufacturing plant on the Balkans are situated. The Russian oil company Lukoil currently owns the former (OAO Lukoil). Varna's economy (Northeast region) is 61% service based (trade and tourism mainly). Major industries in the city are transportation (Bulgarian shipping company, Varna port and airport), distribution, shipbuilding, ship repair and other marine industries. In the adjacent region the largest chemical, thermal power and manufacturing facilities in Bulgaria are to be found. In Southeast and Northeast regions, many reputable resorts such as Golden Sands, Sunny Beach and Nesebar (which is part of the UNESCO's list of World Heritage Sites since 1983 (UNESCO/World Heritage Convention) are located.

To conclude this section of the paper, a brief analysis on the poorest regions not only in Bulgaria, but in European Union - Northwest and North Central, is conducted. The Northwest region experiences the highest rate of population reduction in the country. Poorly functioning administration (lowest rating among all regions[9]), lowest education level[10] of the population and incapability of the government to develop the region are among the reasons why this area is the least developed one in the country. As regards to the North Central Region, during the last 2-3 years an economic awakening (the region with the highest increase of GDP as a percentage of total country GDP for the last 3 years) has been observed, even though it is too early to claim the presence of a tendency.

Since the study deals with GDP per capita as dependent variable, this indicator is depicted on *chart 3.* A trend of a steady increase is present, due to the technological development and the increase of the productivity of labor in the country. The constantly growing value of the GDP per capita could also be explained by the fact that Bulgaria was far behind the developed world, in terms of productivity during the period around the *perestroika.* The opening of the domestic market, explained in the introduction, and the process of catching up underlies the trend

[9] According to Institute for Market Economy, Bulgaria.

[10] The data is available on a NUTS 3 level, therefore an averages are calculated to obtain NUTS 2 regional data.

obtained in *chart 3*. There is no need of further analysis of the reasons for the fluctuations across time, since they overlap with the ones for GDP growth rate and *chart 1*.

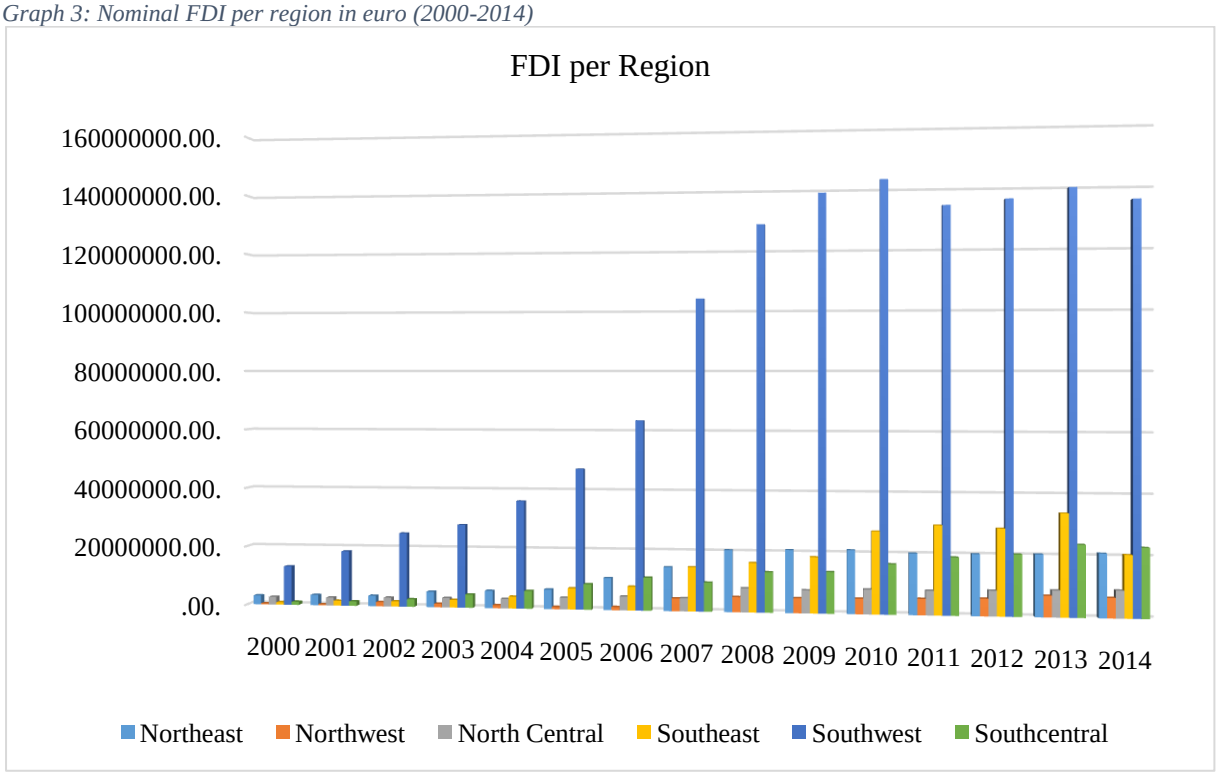
2.1.2 Foreign Direct Investments (analysis on national and regional level)

As regards to FDI, the trends observed are relatively similar to the ones for the GDP. For the period 2000-2010 the amount of investments from abroad is constantly increasing in absolute value, but the growth rate was influenced by the economic crisis from 2007-2009 as it can be seen on *graph 3* and *chart 2*. Why? First, the 2000-2007 period is understandably beneficial in terms of capital flow. In that period, after a significant instability in economic and political aspect, the country started to develop a sustainable economy. The accession to NATO, as well as approaching the final stage of preparing for joining the EU and the gradual pacification of the region after the Yugoslav Wars only supported this claim. The global credit expansion and the EU enlargement significantly increased the interest of international investors in Eastern Europe. The benefits that came with the enlargement facilitated the European investors. Because of the free movement of capital within the Union (the youngest of all Treaty provisions[11]), investors were given an opportunity to benefit from the emerging markets in Eastern Europe. They have taken steps to exploit both the potential of the internal market by investments in construction, real estate and trade, as well as to take advantage of the export potential of the respective country through investments in export-oriented industrial companies. The growth rate during this time span was understandably high. Another reason for the significant growth was the presence of still unstructured companies with state and municipal participation (majority and minority) that are proposed for privatization[12]. Thus, one part of the total FDI, mainly in the form of equity capital is formed from the sale of the state or municipal share of the local enterprise. An increase in the investments from domestic loans and reinvested earnings were also present, due to the economic development of the country.

[11] The four Freedoms are: "*free movement of goods*", "*freedom of movement for workers*", "*right of establishment and freedom to provide services*" and "*free movement of capital*" (European Policy Centre).

[12] Source The Privatization and Post-Privatization Control Agency (PPCA).

Graph 3: Nominal FDI per region in euro (2000-2014)



Source: National Statistical Institute, Bulgaria

Unfortunately, one year later (2008) the world financial crisis disrupted the inflow of the foreign capital into the country. During this insecure period for investors, capital movement initiatives were minimized. This trend is clearly visible on *Chart 2*. The growth rate of FDI in the time span 2009-2014 is the lowest one in the entire observed period and it is clearly difficult to find a trend of returning to the pre-crisis levels. The main sectoral distribution of foreign capital in Bulgaria is focused on the finance, commerce and real estate field. These sectors were most severely affected. The share of investments in the high-tech industries was and is still not big. Such sector has a high value-added and can contribute to a sustainable growth. However, the shock on the FDI flow was not as severe as in other economies, because it coincided with the accession of the country to the EU. Thus, the opening of the Bulgarian market to foreign investments made it possible for the capital from Europe to mitigate the effect of the crisis. Nevertheless, there is a global trend of decrease of the investments in developed countries in comparison to the developing ones (UNCTAD, 2013). This fact undoubtedly influences the amount of foreign capital in Bulgaria. The country competes with states possessing big

economic power and strong competitive advantages such as the states from BRICS[13], Chile, Indonesia, Mexico, Philippines, Turkey, Hungary etc.

The paper continues by examining the allocation of the FDI across regions. The capital city meets most of the needed requirements for a region to be attractive enough for foreign investors. First of all, Sofia has the biggest population in the country, as well as the highest percentage of people with tertiary education across regions. Key infrastructure, institutions and businesses are focused there. The average income of the citizens is the highest one (average annual gross salary for 2013 is around 4323 euro, with the second highest region with 4057 euro). Many firms define their policy by those criteria because depending on the business they establish, they can also use the country/region, in which they invest, as a market.

The two regions with the most significant fraction of FDI are Northeast and Southeast, which are the most attractive areas for tourism due to the many Black sea resorts. Leading economic centres in the Northeast region are the cities Varna and Shumen. Good conditions for attracting young people and providing highly trained stuff are created, partly because of the universities there. In the Southeast region leading cities are Bourgas (transport activities and shipbuilding plant), Stara Zagora (investments in industry and energy) and Sliven (manufacturing industry and winemaking).

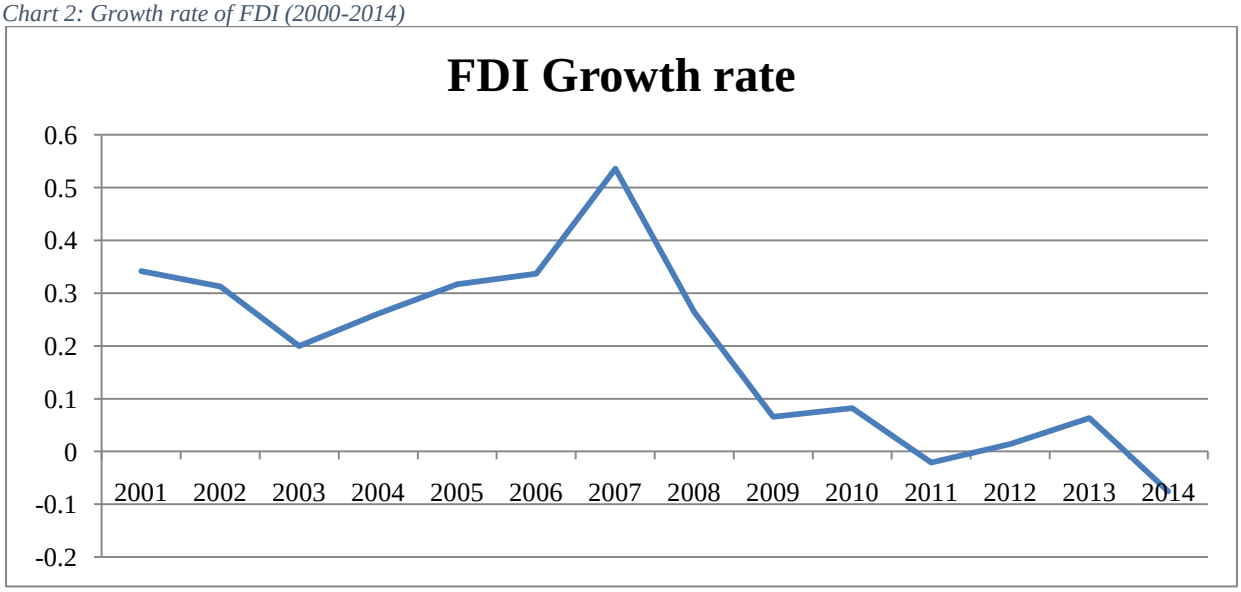
Part of the reasons for the small interest from investors regarding the other less attractive regions are the high structural unemployment[14], inflexible labor market and the fact that high percentage of the unemployed people are not qualified. Such lack of uniform distribution across regions leads to uneven distribution of the positive effects of the activities of the transnational corporations (TNCs) (Mihaylova, 2014). Thus, the potential benefits of FDI such as technology transfer, employment creation, raising productivity and income, etc. are concentrated in the region of the capital city. Moreover, Kolev (2012) points out that imbalance in the territorial distribution of FDI and the benefits stemming from them would create further economic

[13] The acronym BRIC was first introduced by Jim O'Neill. It is associated with the first letters of four fast emerging economies such as Brazil, Russia, India and China (O'Neill, 2001). The accession of South Africa into the above mentioned countries, transformed the acronym into BRICS.

[14] Unemployment resulting from industrial reorganization, typically due to technological changerather than fluctuations in supply or demand.

disparities. In his paper, he also expresses the opinion that, although FDI creates job opportunities for the local population they do not decrease the regional disparities in income.

Chart 2: Growth rate of FDI (2000-2014)



Source: National Statistical Institute, Bulgaria

If the investments across sectors are examined in the period 2000-2006 the main directions of the foreign investments were 1) Production of food, beverages and tobacco. 2) Trade, repair of motor vehicles, personal and household goods and 3) Transport, storage and communication. Significant amount was invested in metallurgy and real estate. In the second sub period 2008-2014, in addition to the ones mentioned above, we should add the increase into the following sectors: Production and distribution of electricity, heat and gaseous fuels; construction; telecommunication[15].

2.2 What makes Bulgaria attractive to foreign investors?

The country is a member of EU and NATO since 2007 and 2004 respectively. Joining EU simplifies the procedures of starting a business and moving capital, labor force and money, especially if the investor is a resident of another member state. The membership ensures sustainable and predictable business environment. Many mutual policies and cooperation agreements[16] between EU members and third parties should also be taken into account,

[15] Source: National Statistical Institute Bulgaria.

[16]Since 1992 EU concluded "*Partnership and Cooperation Agreements (PCA) with Russia and the New Independent States of Eastern Europe , the Southern Caucasus and Central Asia (Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Ukraine, Uzbekistan and Tajikistan.*" (EUR-Lex, 2010).

concerning trade, capital movement and many others. Investors outside of the Union, transferring capital to Bulgaria and initiating a business activity, also gain access to the 500 million people market of the EU. Bulgaria is also situated in the centre of the Southeast Europe, a market with a population of 122 million.

The GDP growth rate for the period 2000-2008 varied between 3.8-6.9% and this pattern of persistent growth rate was interrupted by the financial crisis 2007-2009. The inflation rate after 2000 was stable. The unemployment rate varied between 5.6-13.7%. The budget deficit is low as well. The period 2004-2008 was characterized with budget surplus between 1.1-1.8% of GDP and 2009-2015 with budget deficit in the range of 0.3-5.5%. Only one year (2014), within the 12-year time span, Bulgaria's budget deficit is above the EU average. The gross government depth in the period 2005-2015 does not exceed 30% of the GDP, and for the period 2000-2005 does not exceed 70% with a decreasing trend. For the last 8 years (2008-2015) only Estonia, and during last 2 years Luxembourg, have shown better values of this indicator[17].The exchange rate risk is minimized because in 1997 Bulgaria established a currency board and the local currency (lev) is fixed to the euro since then. This provides consistency and predictability of the monetary policy and was one of the turning points for the Bulgarian economy, after the years of economic and political instability in the years after the fall of the Berlin wall. Maintaining macroeconomic and fiscal stability leads to accelerating the pace of economic growth and gradual convergence with other EU countries.

The consistent tax policy has created a favourable environment for investment in the economy. In 2007, the rate of corporate tax was reduced from 15% to 10%, which made Bulgaria the country with the most favourable taxes in the EU. In addition, the corporate tax is 0% in regions with high unemployment. The system of taxation of personal income is proportional to a unified tax rate of 10%, which automatically increases the disposable incomes of the households. The government also provides additional incentives for foreign investors, e.g. the 2-year VAT exemption on equipment imports for investment projects over $5 Million[18].

In addition, there is a Law on Encouragement of Investment. The main purpose of the Act, as the name suggests, is to promote investments in the territory of Bulgaria. It aims to facilitate the implementation and maintenance of the investment projects of greater importance for the

[17] The data for Budget surplus, deficit and government debt are gathered from Eurostat.

[18] Source: InvestBulgaria Agency.

country's economy. It addresses capital flows that meet the minimum requirements for size and for specific job positions created, as determined by the Law. The investors are backed in the investment intentions from the start of the project to putting it into service.

However, several drawbacks become obvious, and deter investors from transferring capital into the country. Such disadvantages are lack of effective justice system, relatively small inner market and limited purchasing power of the population, presence of grey economy and high level of corruption, and need of investments in infrastructure.

2.3 How FDI affects growth

In the economic literature, the prevalent theoretical and empirical results show that FDI has a positive impact on the economic growth of a country. But the effect varies depending on many internal factors, which will be discussed in the following pages. To give an insight of how different characteristics of the observed countries could lead to totally different inferences, the study uses the paper of Bloningen and Wang (2004), which states that the host country level of development is crucial, as regards the effect of FDI. They state that in the case of developed country, the foreign capital crowd-out the domestic companies, but for developing countries not only that the effect disappears, but also could lead to crowd-in effect.

The neoclassical growth theory suggests that growth can be stimulated by three factors: capital, labor availability and technology. Our main variable FDI is affecting two of these factors directly. The amount of capital in the country increases due to the investments from abroad and also triggers a spillover effect in the domestic industry, leading to a technology transfer. This applies most closely to the developing countries. However, there are specific conditions in which FDI can have a negative effect on growth. Several papers point out that foreign and domestic investments are substitutes, which in the long-term harms the economy of the host country. In their paper, Agosin and Mayer (2000), conclude that even tough for Asian countries the effect of FDI meets the expectations of positive influence, in Latin America the foreign capital crowd out the domestic investments. Authors suggest that the states in Latin America are not selective enough for FDI, in comparison to Asian ones, in terms of preliminary evaluation or attraction of specific preferable companies that have priority over other (Agosin and Mayer, 2000). This concept is also backed by the view that increase of the market power of the foreign investing companies can lead to distortion of the market and to raise prices above

the perfectly competitive level (Belleflamme and Peitz, 2010). Even though the evidence for these concepts is highly limited, they should be included in the study for its completeness.

2.3.1 How FDI stimulates growth?

GDP, as a measure of the economic growth, by definition consists of the value of the produced goods and services for a certain period on the territory of a specific country (Callen, 2012). Now a question arises on what factors increase the production capacity of a state. The classical economics of Adam Smith (1776) give us the answer. The factors of production are land, capital and labor. Later a forth factor was added to the initial three – entrepreneurship. Since land is fixed in quantity, i.e. perfectly inelastic, the capital and labor are the most volatile and fragile. Neo-classical growth models enrich and complement this idea, and state that growth can be achieved through technological progress and/or population/labor force growth (Solow,1956). But what is the link between these factors and FDI? Investments from abroad are the most direct and the easiest way to increase the capital in a country and initiate the transfer of technology into a developing host state.

Before proceeding with the topic of investments from abroad, it should be clarified why the emphasis in this study is put on the foreign and not on domestic ones. One way to answer these questions is to take into account the fact that much of the developing countries are in a situation of a savings gap, an idea developed by Chenery and Strout (1966). Their main source of economic growth cannot be domestic investments. This idea is examined in the paper of Shafique and Hussain (2015). They conclude that because Investments = Savings, and the Savings in developing countries are very low, they are highly dependent on foreign capital. This claim is true especially after foreign direct investments are considered as the most effective method of attracting cash flow from external sources. Furthermore, FDI contributes lot more than domestic investment (Borensztein et al, 1998). Such an effect can be found in many LDCs. The poorer a country is, the bigger the effect of the technology transfer is. Thus, here the complexity of economics can be seen. Many economists were working on the idea of the threshold effect, in particular the minimum requirements or needed environment, for a FDI to influence the GDP. On one hand, we have a poor country, which benefits more from FDIs, but, on the other hand, the poverty should not oppress the host and should not drop below certain level. If not, in addition to possessing specific characteristics, the country can trigger the effect of the newly attracted capital.

In their paper Borensztein et al (1998) conclude that since domestic firms have better access to their own market, in addition to some other advantages, a foreign firm that chooses to invest in a country should compensate these benefits of the domestic one. In most cases, the compensation occurs through lower costs and/or higher productivity. Usually, the managerial skills are on a higher level. All these advantages, after establishing the investments, are turning into a technological transfer channel, from which domestic firms benefit. Furthermore, his paper states that the benefit from FDI could occur not only from the higher capital accumulation but also from the higher efficiency. Even trade between headquarters and affiliates could increase the export of a country and could have some positive effect.

FDI affect growth, in the short-run, through the increase in output, but the greater value comes from the technology transfer, which has long-run effect. In their paper, Markusen & Venables (1999) observe the possible consequences of a foreign company entering the market. They state that the arrival of an FDI project leads to enhancing the competition, which can damage the local competitive industries, but the presence of foreign company in one sector could be beneficial to other. It can lead to the emergence of the so-called forward and backward linkages (price reductions of customer firms or increase of the demand of intermediate goods, needed for the production process of the new established foreign company) (Markusen and Venables, 1999). Furthermore, the paper points out that the entry of foreign capital could establish new sectors. They can grow to a point where domestic production can overtake and displace the FDI plants.

2.3.2 How FDI deter economic growth?

Evidence from Venezuela shows, however, that FDI could harm the economy of the host country. Even though most of the evidence for a negative effect are derived from papers examining the Latin American countries, one should not disparage them. During the examined period, this geographical region is characterized with problematic economic environment that will be discussed again in the following paragraphs.

Aitken & Harrison (1999) conduct a research on the effect of FDI on the productivity of firms within country. They acquired some interesting results. The idea of the paper is to find out if the "*whether foreign equity participation is associated with an increase in the plants' productivity*" (Aitken & Harrison, 1999). It examines also, "*whether foreign ownership in an industry affects the productivity of the domestically owned firms in the same industry*" (positive

or negative spillovers). The main results are that there is a presence of positive correlation between foreign equity participation and plant productivity, but the case with the competitors is the other way around. The FDI affects negatively the productivity of domestically owned companies and the net impact from the FDI is quite small (the two offsetting effects) (Aitken & Harrison, 1999). The data is about Venezuela in the period 1976-1989. Drawback of this research is that the period that is examined is a period of crisis in the most of Latin American economies, in which countries experienced solvency constraints, erratic growth and unstable domestic investments. More interesting is that previous studies found positive effects, but Aitken and Harrison (1999) explain the different outcome due to the trend for international companies to locate and invest in industries that are more productive. Foreign firms gravitate towards more productive industries and this specification cannot control for differences across industries and will report a positive association even without any spillover effect.

Although negative results are present (for which possible explanations were given), this may only be valid in short-run. The long-run effect could be significantly positive. There will be higher employment, due to the investments, in addition to the raise of labor and inflow of capital in the country. Also, if the influence on domestic firms is temporary, but the benefits from the FDI are constant, in future periods the host state will only benefit. For instance, some of the low- effective domestic companies will leave the market and only the most stable once will remain, thus with the new foreign capital making the sector more efficient (Melitz, 2003).

Prestowitz (1998) and Tolchin and Tolchin (1988) expressed concerns that FDIs could steal the high paid jobs and high-valued production by shifting them to do parent company (reference to Japan and US). But in their article Graham and Krugman (1993) found that empirically this is not true and companies were paying the same wages as in the other companies in the industry, same R&D etc. Although there was one aspect that was admittedly true, that multinationals had different propensity to use home suppliers leading to increase in import, but through time this tendency disappears.

2.4 What determines the strength of the effect of FDI on growth?

As a conclusion of the question whether FDI influence the GDP or not, it can be claimed that the positive effect is existent and prevalent. With small exceptions (caused mainly by specific economic and social events in different countries unrelated to the foreign investments), the

beneficial effect of FDI can be concluded. But how a country can derive maximum benefit from the positive influence of foreign investments? In the following paragraphs, the most important determinants that are crucial for maximizing the utility of the host country from FDI will be examined.

2.4.1 Well-developed financial markets

The impact that financial markets have on the effectiveness of FDI is a subject of research for many authors. The idea behind this assumption is that, when a country possesses well-functioning financial system, the beneficial effect of FDI on growth significantly exceeds the one in a country with less effective one. Furthermore, since most of the FDIs arrive in the host country "*through mergers and acquisitions*", not only the availability of loans, but also well-developed stock market is necessary (Alfaro et al., 2004). As Claessens et al. (2001) empirically proved, "*FDI is a complement and not a substitute of domestic stock market development*".

In their research paper, Ahmad et al. (2009), test this hypothesis through a regression model based on the idea of the threshold effect. For this purpose the relationship between FDI and GDP is "*piecewise linear with the financial market indicator acting as a regime-switching trigger"*, which represents the idea that after a country manage to achieve a certain amount of financial development, the positive influence of FDI increases sharply. Until this threshold level is surpassed, the effect is insignificant. Banking sector is the measure of well-developed financial sector (four measures - private sector credit, bank credit, commercial bank assets, and liquid liabilities of the financial system) (Ahmad et al.,2009). There was a threshold estimate.

Alfaro et al. (2004) perform a more thorough analysis. The paper examines different types of measures of the financial markets condition and interact them with the FDI value in the regression. The authors also use private credit, bank credit, commercial-central bank assets, and liquid liabilities of the financial system. They also include the average value of listed domestic shares on domestic exchanges in a year as a share of the size of the economy (GDP), as well as the value of stock trading relative to the size of the economy (Alfaro et al., 2004). All of the interaction terms are showing positive and significant results. Even though the indicators are insignificant by themselves (even negative in some cases), that explains the "*important allocation function that the financial sector performs"*, captured by the interaction terms with the value of the FDI.

2.4.2 Human capital

Many economists, examining the determinants of the positive influence of FDI on growth, were conducting a research on the role of the human capital. But why is that so? One of the main arguments is the technological transfer. Firstly, the labor productivity is a measure of technical efficiency (capital intensity, labor quality, scale of production). Secondly, if a lack of ability and knowledge of the domestic economy to implement the technological innovations is present, the effect disappears (Borensztein et al., 1998). FDI leads to a spillover of technology and increase the professional experience of the population, but this could occur only when the specific threshold stock of human capital is passed (similar to the financial one). Without it multinationals would not be interested in starting investment processes and will choose different country. The results in the paper (Borensztein et al., 1998) shows positive effect of FDI on growth, and including the interaction between FDI and human capital, improve the overall performance of the regression. It says that "*countries with secondary school attainment above 0.52 will benefit positively from FDI*".

Blomstrom and Persson (1983) find another way to prove the same idea about the spillover effect, namely whether a positive correlation between *"labor productivity of domestic plants and the presence of foreign firms"* in numerous industries is present. The disadvantage of the model is that we cannot observe the big picture. Namely, if the foreign share in various industries has a spillover effect on the whole economy or on the most appealing sector. Also because of the fact, that the examined country is Mexico, the paper gives us an answer about the spillover effect but specific for a highly industrialized country. By economic complexity index, Mexico has the most complex economy in Latin America. As an opposing statement, we can present the results about Venezuela in some of the previous paragraphs.

2.4.3 Other factors

Market size is a very important factor, especially when the affiliates of a company sell mainly in the local markets (Lipsey, 1999), i.e., larger market contributes to higher sales of company's products and services. That "*allows the achievement of economies of scale and encourages horizontal FDI*" (Love and Lage-Hidalgo, 2000). That is the reason why large markets do not attract so much manufacturing investments in export-oriented industries (for instance, the export-oriented nonelectrical and electrical machinery industries of US companies in Asia).

Economic policies and macroeconomic condition of the host country are very important preconditions. In Latin America, there was evidence of how the debt overhang affects the FDI and growth. That is the probable reason of the negative effect we get earlier for Venezuela. Many multinationals take into account foreign debt burden, remittances, inflation and fiscal and monetary policies. Tung and Cho (2001), for example, study the effect of taxes on different China regions and find that they are highly significant and strongly correlated with the FDI. A paper examining the Latin countries (Bengoa and Sanchez-Rolles, 2002) observe also the effect of economic freedom that is determinant of the growth and finds the following: More economic freedom leads to more FDI, which leads to growth, but this is possible only with the necessary human capital economic stability and liberalized markets. De Haan and Sturm (2000) have found also the nexus between the economic freedom and growth. From the other factors that could influence the strength of the positive effect of FDI on growth, we could also mention infrastructure, institutional features, openness to trade etc.

As a conclusion of this part of the paper, it can be stated that, a certain level of development is needed from a country to reap the benefits of the FDI and the higher productivity that comes from that. More developed a country is, stronger the impact of FDI is (Blomstrom and Persson, 1983). Conclusive view of the absorptive capacities and how does this applies in real life, is given to us by the paper of Beatrice Farkas (2012). The author finds the expected positive and significant influence of FDI on growth. However, a threshold level of human capital, as well as financial market development, should be surpassed, in order the domestic economy to experience the spillover effect from the foreign capital. Farkas (2012) also made "*a unified study of absorptive capacities that tests the robustness of the linear interaction terms previously constructed relative to each other*". The results show that the most appropriate environment for spurring economic growth through FDI is when countries possess well-developed financial market. The states should also have natural resources deficiency or should record low rate of exports of agricultural goods as a percentage of GDP (Farkas, 2012). Financial market is more dominant factor than the other component – human capital.

Natural resource scarcity, of course, does not lead, by itself, to better investing environment, but this results is obtained because of the dependence of poorer countries on natural resources and the exploitation of their mineral sources from the developed states. In addition, financial markets are the most crucial one, maybe because of the easiest way to measure it as an

independent variable, in comparison with the human capital, or governmental policies. The development level of the host country is also crucial. In the preface of the previous section „How FDI affects growth?‘‘ this statement was already mentioned by the Blonigen and Wang (2004) paper. Also the Wang (2010) scientific work might be added, where the author concludes that "*the effect of contemporaneous FDI on domestic investment is negative*" in developed countries (what we already mentioned), but the aggregate effect is neutral, whereas for developing countries strong evidence suggest that the contemporaneous effect is neutral, but the long run is positive.

3 Methodology.

3.1 Theoretical background

We base our theoretical framework on the Solow growth model (Solow, 1956). It states that the determinants of the economic growth can be separated into inputs (population growth and capital accumulation) and technical progress. However Mankiw et al. (1992) created an augmented version of the Solow growth model. It differs from the former Solow growth model by the fact that it incorporates the human capital as a decisive for the output variable. The authors state in their paper that *"for any given rate of human capital accumulation, higher saving or lower population growth leads to a higher level of income and thus a higher level of human capital; hence accumulation of physical capital and population growth have greater impacts on income when accumulation of human capital is taken into account"* (Mankiw et al. , 1992). Starting point of our model is exactly the examined paper. Mankiw et al. (1992) constructed a model that can test their hypothesis of adding human capital into the classic textbook Solow growth model and obtaining the main factors influencing the growth of a country.

3.1.1 The Solow growth model

Firstly, we should present the textbook Solow growth model, before proceeding to the model of interested, namely the Augmented Solow Growth model of Mankiw et al. (1992). We start by using the Cobb-Douglas production function at time t:

(1) $$\mathbf{Y_t = K_t^{\alpha}(A_t L_t)^{1-\alpha}}$$

$$0<\alpha<1 \ \& \ b=1-a;$$

where Y is production, K - capital input, L -labor and A indicates the level of technology. Thus, we include the level of capital accumulation in the economy, increase in population and the development in terms of technology. Additional assumptions are made for "a" and "b", which represent the "*output elasticities*" for domestic capital and labor (Charnes et al. ,1976). Their sum should equal "one", thereby representing constant returns to scale in the model. Furthermore, since "a+b=1", both elasticities are less than one. Therefore a diminishing returns for each factor is present. The growth of labor and technology is considered to be exogenous, at rates "n" and "g" respectively (Mankiw et al.1992). This assumption is represented by equations (2) and (3):

(2) $$\mathbf{L_t = L_0 e^{nt}}$$

(3) $$\mathbf{A_t = A_0 e^{gt}}$$

The model considers that the amount of investments, as a share of the total production of the country, is constant over time (Mankiw et al. 1992). As regards k, it represents "*the stock of capital per effective unit of labor*", k = K/AL, whereas y as "*the level of output per effective unit of labor*", y = Y/AL (Mankiw et al. 1992), the progression of k is adjusted by:

(4) $$\acute{k}_t = \mathbf{sy_t - (n + g + \delta)k_t = sk_t^{\alpha} - (n + g + \delta)k_t}$$

The newly introduced sign in the above equation – δ, indicates the depreciation rate. What Mankiw et al. (1992) suggested, is the assumption "*that k converges to a steady-state value k* defined by* $sk^{*\alpha} = (n+g+\delta)\,k^*$". By simple mathematical transformation, the expression can be converted into:

(5) $$\mathbf{k^* = [\frac{s}{n + g + \delta}]^{1/(1-\alpha)}}$$

Therefore equation (5) postulate the idea that "*the steady state capital-labor ratio*" increases, when an increment of the saving rate is observed. On the contrary, when the population increases, it decreases the value of the ratio (Mankiw et al. 1992).

The main contribution of the Solow model is related to the influence that saving rate and increase of the population have on real income (Mankiw et al. 1992). "*Substituting (5) into the production function and taking logs*", we obtain the following:

(6) $$\mathbf{Ln}\left[\frac{\mathbf{Y_t}}{\mathbf{L_t}}\right] = \mathbf{lnA_0} + \mathbf{gt} + \left(\frac{\boldsymbol{\alpha}}{\mathbf{1}-\boldsymbol{\alpha}}\right)\mathbf{ln}(\mathbf{s}) - \left(\frac{\boldsymbol{\alpha}}{\mathbf{1}-\boldsymbol{\alpha}}\right)\mathbf{ln}(\mathbf{n}+\mathbf{g}+\boldsymbol{\delta})$$

As it can be seen in the equation, the expected relationship between the indicators should be the following: increase in the savings rate, should lead to growth. On the other hand, rise of the population decrease the real income growth.

3.1.2 The augmented Solow growth model

What distinguishes the Solow from the Augmented Solow growth model is the adding of Human-Capital Accumulation to the Solow model. This was needed, because there was a long time discussion of the significant effect that human capital has on stimulating the economic growth. We start again from the Cobb-Douglas production function:

(7) $$\mathbf{Y_t} = \mathbf{K_t^{\alpha} H_t^{\beta} (A_t L_t)^{1-\alpha-\beta}}$$

K, A, L and Y indicate the same variables as in section 3.1.1. What enriches the model is the human capital (H). s_k denotes the share of income that one household invests in physical capital and s_h denotes the share invested in human capital. Similar to equation (4), the progression of k and h is represented by:

(8) $$\acute{k}_t = \mathbf{s_k y_t} - (\mathbf{n}+\mathbf{g}+\boldsymbol{\delta})\mathbf{k_t}$$

(9) $$\acute{h} = \mathbf{s_h y_t} - (\mathbf{n}+\mathbf{g}+\boldsymbol{\delta})\mathbf{h_t}$$

Where the small letters y, k, and h represent "*the quantities per effective labor*" (Mankiw et al.1992). The authors assume that "*$\alpha+\beta<1$, which implies that there are decreasing returns to all capital*".

Equations (10) follow the same approach of converging k and h into a steady-state values.:

(10)

$$\mathbf{k^*} = [\frac{\mathbf{s_k^{1-\beta} s_h^{\beta}}}{\mathbf{n+g+\delta}}]^{\mathbf{1/(1-\alpha-\beta)}}$$

&

$$\mathbf{h^*} = [\frac{\mathbf{s_k^{1-\beta} s_h^{\beta}}}{\mathbf{n+g+\delta}}]^{\mathbf{1/(1-\alpha-\beta)}}$$

Substituting both equations under number (10) into (7) and taking logs contributes to deriving an equation for income per capita identical to the equation (6) from the previous model:

(11)

$$\mathbf{\ln\left[\frac{Y_t}{L_t}\right] = \ln A_0 + gt - \left[\frac{\alpha+\beta}{1-\alpha-\beta}\right]\ln(n+g+\delta) + \left[\frac{\alpha}{1-\alpha-\beta}\right]\ln(s_k) + \left[\frac{\beta}{1-\alpha-\beta}\right]\ln(s_h)}$$

As Mankiw et al. (1992) postulate "*this equation shows how income per capita depends on population growth and accumulation of physical and human capital*". Like in the initial Solow model, the augmented one also predicts not only the sign but the coefficients of the equation.

To transform the theoretical framework of the model into empirical equation we should consider several assumptions. Firstly, the population growth is not a constant, unlike δ and g. Secondly, we do not include the whole expression - (n+g+δ), because the yearly values of fixed domestic capital already include depreciation and we assume g is constant. We take into account only the Population growth rate – n. Thirdly, we include the FDI, R&D expenditures and Inflation as control variables. Bajo-Rubio et al. (2007) proposed that FDI could be added into the model as a "gt" variable, since the technological progress depends on the externalities from FDI inflows. This approach is adopted by the study and R&D expenditures are also included. The other variables that fit in the model in equation (11) are s_k – Domestic investments/GDP, s_h – Employment/Total Population and for Y/L I use GDP/Total Population, instead of GDP/Labor force. Furthermore, Mankiw et al. (1992) use education as measure of human capital investment, as opposed to this study, in which we use the share of people employed in the Total population. The reason for that is the lack of data on a regional level, as well as the fact that the

3.2 Research hypothesis.

The research consists mainly of three parts. *Hypothesis 1: The augmented Solow growth model is applicable to the Bulgarian economy on a regional level. Human and physical capital affects positively the GDP per capita growth, whereas the Population growth affects it negatively.* This hypothesis is tested using the Pooled OLS and Fixed effects estimators. The second hypothesis is closely linked to the first one. To test the robustness of the model additional variables are included, such as FDI, Expenditures for R&D and Inflation. Most of them are associated with the technological progress, which is included in the Augmented Solow Growth model as well. *Hypothesis 2: In addition to the expected signs of the variables from the first hypothesis, a positive effect of FDI and R&D expenditures is expected, as well as negative effect of Inflation.* The third, and main hypothesis, is to test whether the effect of foreign capital on output per capita differs across regions. The FDI variable from the previous hypothesis is replaced by the foreign capital accumulated within each region. *Hypothesis 3: A significant difference in the positive effect of FDI on GDP per capita across regions is present.* To enrich the study, a possible effect of joining the EU on the productivity of the foreign capital is performed. Generally, it is expected that FDI will have a bigger spillover effect on the economy after the accession of Bulgaria in the European Union.

3.3 Model.

In the panel data, individuals are observed at several points in time. The Fixed effects model can be represented by the following equation:

$$y_{it} = \alpha_i + \beta x_{it}^{'} + \varepsilon_{it}$$

where i = 1,…,N is the cross-section index and t = 1,…,T is the time dimension. y_{it} is the dependent variable, $x_{it}^{'}$ represents the K-dimensional vector independent variables, β is the slope coefficient and α_i is the individual-specific intercept and ε_{it} is the error term.

In order to test Hypothesis 1, a log of the dependent variable – GDP per capita, is used. As it was clarified in section 3.1.1, Employment/Population and Domestic investments/GDP represent the human and fixed capital respectively from the Augmented Solow growth model. The model looks like this:

$$\log(GDP)_{it} = \alpha_i + \beta_1 empl_{it} + \beta_2 inv_{it} + \beta_3 pop_{it} + \varepsilon_{it}$$

Then the main variable FDI together with the control variables Inflation and expenditures on R&D are added, to test the second Hypothesis regarding the technological progress. Foreign direct investment is in log form. Thus, the elasticity of Foreign Direct Investments with respect to GDP per capita can be estimated. It will show how much percentage increase is caused by 1% increase in FDI. In addition, it helps simplify the numbers and the complexity of the interaction terms later. Practically, it is difficult for an investment to start paying off right away. Usually it takes several months for a foreign capital to trigger the effect on the GDP of the host country. Thus, a lagged variable of FDI is included into the equation. Log $(FDI)_{t-1}$ captures part of the effect of the current values of FDI on GDP and contributes to the unbiasedness of the estimator.

$$\log(GDP)_{it} = \alpha_i + \beta_1 empl_{it} + \beta_2 inv_{it} + \beta_3 pop_{it} + \beta_4 \log(FDI)_{it} + \beta_5 \log(FDI)_{it-1} + \beta_6 infl_{it} + \beta_7 \log(R\&D)_{it} + \varepsilon_{it}$$

After testing the relationship of FDI and growth, it should be observed how this effect varies across regions (or *Hypothesis 3*). The easiest way to do this is to use dummy variables for all the six regions and implement an interaction term between the dummies and the FDI inflow in the concrete region. The study uses Ewing and Yang (2009) paper for depicting the regression equation on a regional basis. It will acquire the following form:

$$\log(GDP)_{it} = \alpha_i + \beta_1 empl_{it} + \beta_2 inv_{it} + \beta_3 pop_{it} + \beta_4 infl_{it} + \sum_{1}^{6} \beta_{j+4} (Region)_j \log(FDI)_{it} + \varepsilon_{it}$$

An indicator that possibly contributes to the GDP per capita growth is the variable 'EU membership'. It is tested together with the initial Solow growth equation (1) variables. Hence, we obtain the following equation:

$$\log(GDP)_{it} = \alpha_i + \beta_1 empl_{it} + \beta_2 inv_{it} + \beta_3 pop_{it} + \beta_4 EU_{it} + \varepsilon_{it}$$

The main purpose of this study is to examine the different effect of FDI on GDP per capita among different regions. As a conclusion, a final equation that is very similar to eq. (3) is estimated, but instead of including log (FDI) in the interaction term, the lagged value is added, to check for significant difference in comparison to the static model. This modification looks like:

$$\log(GDP)_{it} = \alpha_i + \beta_1 empl_{it} + \beta_2 inv_{it} + \beta_3 pop_{it} + \beta_4 infl_{it} + \sum_{1}^{6} \beta_{j+4} (Region)_j \log(FDI)_{it-1} + \varepsilon_{it}$$

3.4 Data and variables.

3.4.1 Data

The study uses a strongly balanced panel of 6 regions in Bulgaria for the period 2000-2014. The sample consists of annual observations. The main variables are GDP per capita and FDI, as well an interaction term between FDI and regional dummy variables. The control variables include Employment, Domestic investments, Inflation, Expenditures for Research and Development and dummy variable for EU membership (*table 1*).

The first main variable - *GDP per capita*, is calculated by applying the output approach. Measuring the gross domestic product by region, an estimation at current prices is used. The GDP per capita indicator is a main economic index, which estimate the level of total economic production within country/region/city, divided by the people inhabiting the territory concerned. It is better measure in comparison to the total value of GDP, because it shows the extent to which its population shares the total production. The indicator is very useful in comparing several states/regions, because it shows the relative performance of the regions. Sometimes even it is used as a measure for standard of living. The main purpose of the GDP per capita is to measure the productivity of the regions workforce, even though some economists argue that GDP per hour is more realistic way to obtain a notion for the standard of living in two countries. Thus, the factor leisure time plays crucial role as well. However finding such data is difficult. Therefore the GDP per capita indicator is used, which can show us what is the influence of the foreign capital on the productivity of the workforce and hence on the economic growth. For the purpose of the study, the GDP per capita is transformed into log form.

The next main variable, *FDI*, is measured as the net inflow of foreign direct investments on a yearly basis. It provides information for *"the share of foreign owners in the equity capital and the inter-company debt transactions (loans) between the foreign direct investor and the investment enterprise"* (National Statistical Institute Bulgaria, 2014). A requirement for a capital flow to be defined as a foreign direct investment is to be directed towards non-financial institutions. Furthermore the investor should possess certain amount of control over the institution, i.e. 10-100% shares in equity capital, "*lasting interest and significant degree of influence on the management*" (National Statistical Institute Bulgaria, 2014). This data is also transformed into log form for convenience.

To estimate the effect of FDI on GDP per capita for the different regions, an "*interaction term*" between *log(FDI)* and a *dummy for the different regions* is added. The purpose of this is to estimate the difference in the strength of the impact of FDI on GDP across regions. It will give us an insight of the extent to which the foreign capital contributes to the enhancing of the growth across all six regions in Bulgaria.

As far as the selection of the control variables, this study relies on the augmented Solow growth model (Mankiw et al., 1992). Several variables that can possibly influence the dependent variable according to the theory are tested. First, we include indicator for *Employment*. Employed, according to ESA 2010[19], "*covers all persons – both employees and self-employed, engaged in some productive activity that falls within the production boundary of the system*". Since there is difference in the population between regions, the total employment cannot be used. Therefore, this study uses employment-to-population ratio to proxy for the employment across all six regions. This variable represents the human capital, according to the Solow growth model[20].

Furthermore, the physical capital is included as well, represented by *Domestic Investments.* This variable is measured by *"the expenditure on acquisition of tangible fixed assets and the acquired tangible fixed assets"* (National Statistical Institute Bulgaria, 2014). The investment activity is estimated in all sectors of the economy. The above mentioned costs consists of the

[19] "*The European System of National and Regional Accounts (ESA 2010) is the newest internationally compatible EU accounting framework for a systematic and detailed desription of an economy*" (Eurostat).

[20] Source: National Statistical Institute Bulgaria (2014).

expenses for: "*land purchase and building construction, construction equipment, for machinery, equipment and means of transport, for geological and hydrological prospecting, etc*". The concerned variable does not include maintenance expenses of current fixed assets. To be considered as "*acquired tangible fixed assets*", the capital should be "*acquired by the company through construction or by purchase*". In order to obtain more representative and suitable for comparison estimator, Domestic Investment is divided by the GDP of all corresponding regions. Hence, *inv* denotes the share of investment in total production.

After the discussion of the human and physical capital, the third factor in the augmented Solow growth model is the population growth. This variable is easy to calculate, as long as we have the data. We subtract the population in period t with the population in period t-1 and divide the whole expression by the population in period t-1. Thus, the population growth (percentage change of the population) with respect to the previous year is estimated.

Inflation is a variable that is often present in studies related to growth (Khan and Ssnhadji, 2001). The link between the variable and the GDP is not so straightforward. Whether it is positively or negatively correlation depends on the degree of the inflation (Barro, 2013). For the study, the annual Consumer Price Index (CPI) is used, which is "*the official measure of inflation in the Republic of Bulgaria. It measures the total relative price change of goods and services used by resident households for private (non-production) consumption*" (National Statistical Institute Bulgaria).

Another variable that can contribute to the increase of the GDP per capita is the *Research and Development Expenditure.* The indicator consists of expenditures incurred by the private sector, by the government and by non-profit institutions. The R&D survey, by itself, "*covers all scientific institutions and organizations, enterprises and other organizations, which irrespective of their main activity perform R&D as well*".

The last variable that will be included in the study is a dummy variable. *EU membership* examines the effect of the Bulgaria's accession to EU. The indicator takes the value of 0 for the period 2000-2006 and value of 1 for the time span between the first observed year- 2007 and the last year considered in the study – 2014. *EU Membership* is interacted with *log (FDI)*, to observe the influence that *FDI* make on *GDP per capita*, before and after Bulgaria joined EU, and compare it.

3.4.2 Summary statistics

The panel dataset used in the study is strongly balanced and consists of 90 observations – 6 regions across 15 years. *Table 3* represents summary statistics of the variables used in the study. It is adjusted for panel data, so that it provides information about the variance within, between cross-sections and overall. Furthermore, the minimum and maximum values for each category are reported as well. Several important things could be mentioned. The variation between regions, in terms of amount of foreign capital invested, is bigger than the variation across time. The same holds for Expenditures for R&D and Employment/Population. On the contrary GDP per capita, Domestic Investments/GDP and Population growth vary more across time than between cross-sections. The population decreases with rates between 0.1 - 4.8% over time. Since the cross-sectional data in this study is regions within one country, the inflation does not vary between cross-sections. The average inflation rate for the observed period is 3.5%. The lowest rate is -1.4% (deflation) in 2014 and the highest rate is 12.3% in 2008. The standard deviation across time of the percentage of employed people is 3.5%. The minimum average value of GDP per capita belongs to Northwest region (2710.13 euro) and the maximum to Southwest (6369.71 euro). A significant disproportion can be pointed out with the other main indicator – FDI. The foreign capital minimum and maximum average values belong to the same regions as GDP with 334.5 million against 8.6 billion euro.

3.5 Estimation method.

3.5.1 Stationarity, serial correlation, heteroscedasticity and Hausman tests[21]

To establish the most suitable model for our data set I perform the Durbin-Wu-Hausman test (also known as Hausman specification test). The null hypothesis of the test states that the difference in coefficients is not systematic (StataCorp LP, 2015). With a p-value of zero the null hypothesis is rejected, which means that more appropriate is to use the Fixed Effect model. Following this specification, the paper tests the FE model against the alternative of Pooled OLS. The F-statistic, which tests the significance of the fixed effects, yields a highly significant

[21] All tests performed are sumarized in table.

p-value. This outcome shows that the FE estimator is a more appropriate approach for this study.

Testing the dependent variable (GDP per capita) for stationarity is performed by using the Levin-Lin-Chu (LLC) test (Levin et al., 2002). This test is appropriate for the purpose of this research, since "*the panel based unit root tests suggested*" in the Levin et al. (2002) paper "*are more relevant for panels of moderate size*" ("*between 10 and 250 individuals, with 25-250 time series observations per individual*"). The null hypothesis in LLC test is that all panels contain a unit root (StataCorp LP, 2015). The obtained results are significant and the p-value is below the 5% significance level, which means that we should reject the null of unit root.

Our panel data consists of time series of 14 years. For that reason, a test for heteroscedasticity and autocorrelation should be necessarily performed. The *serial correlation test*, performed in the study, is Wooldridge test for autocorrelation in panel data (StataCorp LP, 2015). The null hypothesis of no serial correlation is rejected. Therefore, there is a presence of autocorrelation in my model. The next implemented test is the one for presence of *heteroscedasticity*. For this purpose a modified Wald statistics for groupwise heteroscedasticity in the residuals of a FE[22] regression model is performed, following Greene (2000). The resulting test statistic is distributed Chi-squared under the null hypothesis of homoscedasticity. Through the modified Wald test the null hypothesis of homoscedasticity is rejected. Thus, after the analysis, the conclusion is that there is presence of heteroscedasticity and serial correlation. To deal with the both problems robust standard errors (White) are used. As a rule, when we are dealing with panel data, more appropriate is to use clustered standard errors, which "*allow for intragroup correlation, relaxing the usual requirement that the observations are independent*" (StataCorp LP, 2015). However, in the STATA software the robust and cluster options are identical for the fixed effect regressions.

3.5.2 Endogeneity

The biggest threat of endogeneity in the model comes from the possibility of reverse causality between FDI and GDP. Why we are considering such an issue? It is feasible the growth of the economy to serve as a sign for foreign investors how risky it is to allocate their capital in the

[22] Fixed effect model.

country. To understand the real direction of the relationship between the variables, we could use an instrumental variable (IV). However, is it going to help us at all? An IV for FDI, which is not correlated with the GDP, and in my panel model case, is not constant over time is very difficult to find. Most of the variables, which influence FDI, will also affect GDP. As an example, a variable, will also affect the amount of domestic investments, which will resonate on the GDP. Infrastructure, crime rate and administration are not appropriate instruments either. A possible solution could be the tax incentives that government provides to foreign investors, but unfortunately, there is not enough data for this variable on a regional basis to perform the 2SLS model. We can however use general taxes and charges for starting business or investing capital, but firstly it will probably be correlated to some extent with GDP and to other variables as well and, secondly, the provided data is time invariant.

Therefore, as Kangoye (2008) suggests, "*in principle, the endogeneity problem can be avoided by applying instrumental variable techniques*", but "*the fundamental problem is that there are no ideal instruments available*" in this case. IV estimates are only as good as the instruments used. Moreover, in the presence of weak instruments, the 2SLS estimator can actually produce worse results than the simple OLS. Recognizing it as a drawback of my analysis is a preferable option than using inappropriate way of dealing with the endogeneity, which leads to erroneous results and wrong interpretations.

3.5.3 Additional panel data specifications

Models (1) - (6) test for a significant difference between estimation results, in terms of including time dummy or time trend in the regression. This is a reasonable approach, since sometimes time-varying could be more important than the control variables.

4 Results

This section discusses the obtained estimation results. The data set consists of six regions of the Republic of Bulgaria and includes observations from the year 2000 to 2014. The Fixed effects that we use, account for differences between the level of development among the regions, as well as the specific advantages, conditions and predisposition of them in regards to certain policies or economical activities.

First, the applicability of the Solow growth model (Solow, 1956) on Bulgaria is tested. A regression including the explanatory variables Employment, Domestic investment and Population growth are ran. Model (1) includes time dummies, model (2) contains a time trend. A model containing both time trend and dummies is not included, since it has the same results as the model with time trend only. The coefficients of Employment and Domestic investments are positive (except Domestic Investments in model (1)), which is in accordance with the augmented Solow growth model. The population growth variable has a negative sign in model (2), as Robert Solow stated. However, the variable turns out to be positive in model (1), but insignificant. The results state that increase in the employment rate increment the GDP per capita. One percent increase of employment-to-population ratio leads to 1.63-2.7% increase in the GDP per capita, depending on the model and the number of control variables included.

In models (3) and (4) further control variables are added. Among these is the main object of analysis – FDI. In comparison to the previous results, the initial three variables remain relatively unchanged, except Domestic investments. The coefficient of the latter becomes negative, and in (3) significant at 10% significance level. The added control variables include log (FDI), the one-period lag of log(FDI), Inflation and the log(R&D expenditures). The expected results are that the coefficient of FDI and R&D expenditures are positive, i.e. foreign capital and expenditures for R&D stimulate growth, throughout the channels described in the literature review section. Regarding the inflation, economic theory suggests that the relationship is not very straightforward. A positive inflation could stimulate economic growth, through increasing demand, but only to some extent. If the increment is too strong, this could lead to a sharp and fast depreciation of money, and thus repelling potential investors, indirectly leading to a decrease in GDP (Barro, 2013). Therefore, the sign of the coefficient depends on the degree of the inflation. However, in this case, the inflation rate in Bulgaria (especially within the last six years) is maintained at healthy levels and does not exceeds 3%, except in 2011 (4.2%). Even in the preceding period of relatively high inflation rates, the average rate was below 8 % - a value, relatively normal for a fast-growing transition economy. It is also noteworthy to say, that in our case we do not have total GDP as dependent variable, but the productivity per capita, which makes interpretation even more difficult. What the study obtains as an output? Models (3) shows that a higher rate of inflation has a negative effect on the GDP (potentially because of the higher values in 2008), but in model (4) the coefficient is positive, when time trend is included.

The coefficient for R&D expenditures confirms the theory and show positive influence, in the case of incorporating year fixed effects. For the regression with time trend the sign is positive. Both values obtained are statistically insignificant.

The main variables FDI and lagged FDI are in accordance with what is expected. One fact that deserves special attention is that the lagged variable of log (FDI) is significant in both models. This means that part of the increase in GDP per capita is determined by the amount of foreign direct investments in the previous period.

In the following models – (5) and (6), dummy variables for all of the six regions in Bulgaria are introduced and interacted with the level of foreign direct investment in the respective region. The log (FDI) and lagged log (FDI) variables are excluded to prevent creating multicollinearity. This part of the analysis is the most crucial one for the purpose of this paper. The main goal is to examine the effect of FDI on growth on a regional basis. Thus the study aims to evaluate the potential reasons for the significant differences in the effect of invested foreign capital on the GDP per capita levels and to analyze the big regional disparities as measured by their geographical and social-economic status.

The results indicate that the investment of foreign capital into the Southwest region leads to a higher positive increase of the GDP per capita compared to the other regions. This area is followed by the North Central and Northeast region (which region benefits more from foreign capital depends on inclusion of time trend or dummies in the model). The least increase in GDP due to a 1% increase of the FDI inflow is registered in Northwest region. Is there an apparent explanation of these results? Undoubtedly there is.

To conduct a fruitful regional analysis, data from the Bulgarian Institute of Market Economy is used. The statistics provided are based on districts, whereas one region consists of around 4-5 separate ones. For the comparison between regions, the values between different districts within one region are averaged.

First, the economic growth of North Central area is a specific case. The infrastructure in this region is among the most developed ones in the country. The average density of the road network between the districts is the highest one in the country with 20.03 km/100 km^2. For the Southwest region, it should be considered that it includes the capital, which does not include

data for road network density, because there are only inner city roads. The railway network density is again the highest in the Southwest- and North Central regions. The proportion of the households with internet access in the North Central region is 60.74, which is the highest value for the whole country. Even these economic and infrastructural advantages cannot explain the high coefficient sufficiently. The interaction between the above-mentioned factors however, may have given initial impetus of the development process and the presence of catching up effect. In other words, the less developed regions are, bigger the increase of the welfare is, (followed by the capital and technology flowing in the area). Even though it has the second lowest GDP level after the Northwest, the strong influence of FDI is due to the catch-up effect[23] supported by a business-enabling environment in recent years.

Another factor that partially explains the bigger contribution of FDI to the growth in specific regions is the obtained university degree by the population within the territorial entity. The highest percentage of population between 25 and 64 with higher education can be observed in the Southwest region again (25.08%), with 48.60% only for the capital that belongs to the region.

The difference between the poorest region in Bulgaria and EU, Northwest, and the more advanced ones is significant. The negative economic perspective in front of the latter region emerged due to higher corruption, low educated population (the only one under 20% share of people with higher education among all the other regions), and incapability of implementation of innovative policies such as the ‘‘electronic government’’, which provides easier and faster access to the public administration[24]. The institute of market economy is providing information about the level of development of this type of public service using a five-point system. Northwest region, for example is assessed with 2.36, in comparison to Southeast region – 3.1, and Northeast = 2.6.

The last two models (7) and (8) consists of model (3) and (4) (applicability of the Augmented Solow-growth model) and “EU membership” added. The difference between the two models is again the inclusion of time trend and year fixed effects. The EU membership dummy variable interacted with the FDI variable is used to measure the difference of the contribution of FDI on growth in the two periods, namely before and after the accession of the country into the

[23] Less developed countries/regions have higher growth rate – the concept of convergence (Dervis, 2012).
[24] Source: Institute of Market Economy Bulgaria.

European Union. Therefore, I implement the dummy variable "EU membership," which takes the value of '0' for the 2000-2006 and '1' for the period 2007-2014. The results show that after Bulgaria joined the EU, the investments from abroad contributed more to the increase of the GDP, as the coefficients are 0.086 and 0.052 (with time dummy and time trend respectively) in both models and are statistically significant at 1% significance level.

There are several explanations of these results. First, there is a possibility of spurious relationship. The country was part of the politico-economic union the development of many sectors occurs. The trade was boosted by the removal of custom duties and tariffs, the free movement of capital and people brought additional benefits. Structural and cohesion funds flowed into the country. All of these factors could lead to increase of the value of the GDP, without the contribution of FDIs.

However, in the literature several papers could be found, examining the positive effect of EU membership on the attracting of FDI mainly because of the market-access reasons. Barell and Pain (1998) perform such a study. Since FDI raises productivity levels through the spillover effect and the higher amount of FDIs in the economy-contribute towards a bigger effect on the GDP. In addition to the benefits of the accession, which improved the economic environment and made the movement of FDI easier, joining EU contributed through several channels like implementing free trade and removal of non-tariff barriers, cohesion funds, free movement of labor and capital, education abroad, competition policies, etc. The Bulgarian business also got access to a market of more than 500 million people.

Since positive significant results of lagged value of log (FDI) on the dependent variable were obtained, the regions are also interacted with the lagged value, since it contributes to the increase of the GDP per capita. The results I obtained are represented in table 3 and are similar to the outcome of the static model. The difference lies in the fact that South Central region is forth not third, in terms of biggest contribution of FDI on GDP per capita growth, and North Central region is third not forth. In general, all the coefficients are highly significant (except the poorest region Northwest) at 1% significance level.

5 Conclusion and policy recommendations

This paper studied the effect of FDI on GDP per capita growth in the Republic of Bulgaria as well as the regional differences in the effect of FDI on growth for the six regions established by the "NUTS"[25]. This relationship has not been explored throughout regression analysis so far. In the literature review, the relationship between FDI and growth and through which channels the foreign capital is contributing to the increase of the gross domestic product are summarized.

Many studies conclude that FDI has a positive impact on growth. The technological progress and labor force growth are the consequences of increasing the foreign capital in the domestic economy. Also FDI could help countries with low level of savings to trigger the economic activity. Moreover the strength of the effect of the capital from abroad on the economy is examined. Several preconditions should be met, in order to maximize the effect of FDI on GDP such as development of well-functioning financial markets, educated labor force, backing economic policies, good macro-, and microeconomic environment for the investors. As more of these conditions are fulfilled, more companies may choose the country as a destination for their capital and increase the impact that these investments will make on the whole economy.

In general, the expected output is obtained. Solow growth and Augmented Solow growth models are applicable to the domestic economy. The paper concludes that the results are in accordance with the conclusions derived in the literature review, that FDI affects growth positively. In addition to that, the supplementary regression estimation further supported the fact that the contribution of FDI to the increase of the GDP varies across regions.

The paper found significant positive effect of FDI on growth. In North Central and Southwest (capital) region, the FDI has the biggest effect. The presence of educated labor force, well-functioning administration and policies that stimulate investment activities, are helping these regions to distinguish themselves in terms of growth rate potential.

These results show that it is important not only to attract foreign investments and stimulate the domestic industrial activity, but also the government should ensure adequate conditions for investment activities, because Bulgaria is still far behind the developed economies in terms of

[25] See p.6.

growth rate of GDP per capita. On a regional basis, the municipalities should reassess their policies regarding attracting capital from abroad and examine the factors that deter the positive influence of the foreign capital in the region. A preparation of development program for improving the economic conditions is needed. In addition, the type of FDI that is attracted and the value added that brings to the economy should be assessed.

6 Appendix

6.1 Data appendix

Table 1.Variable description

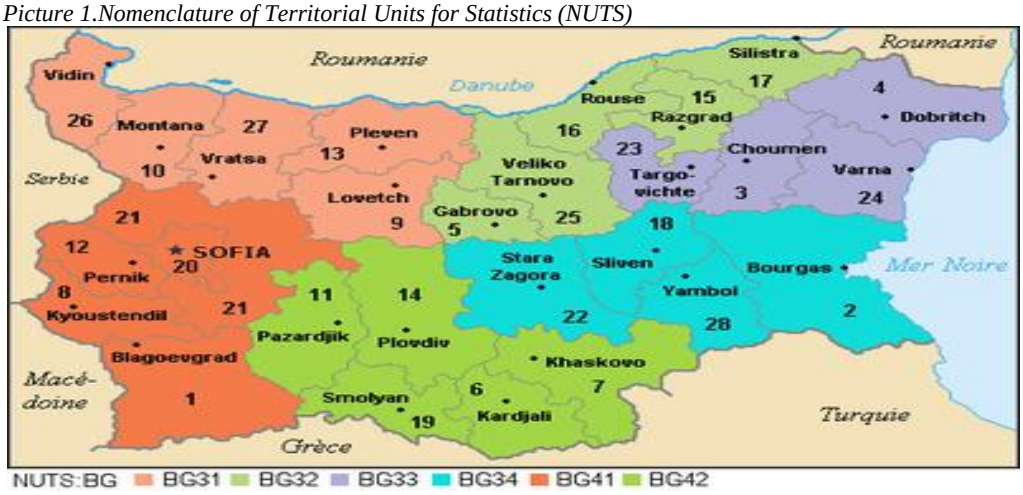
Variables	Definition	Type of measurement
Dependent variable		
Log(GDPpercapita)	Log(GDP/Total Population)	Measured in Euro
Independent variables		
Fixed Capital	Domestic Investments/GDP	Measured in Euro as % of total GDP
Population Growth	[Population(t)-Population(t-1)]/Population(t-1)	Measured as growth rate compared to previous year
Labor	Employed population/Total population	Measured as % of total population
Log(FDI)	Log(Foreign Direct Investments in total value)	Measured in Euro
Inflation	Annual Consumer Price Index (CPI)	Total relative % price change of goods and services
Log(R&Dexp)	Log(Expenditures for research and development from government and private companies)	Measured in Euro
Log(NorthCentralFDI)	Log(Foreign Direct Investments in North central region of Bulgaria)	Measured in Euro
Log(NortheastFDI)	Log(Foreign Direct Investments in Northeast region of Bulgaria)	Measured in Euro
Log(NorthwestFDI)	Log(Foreign Direct Investments in Northwest region of Bulgaria)	Measured in Euro
Log(SouthCentralFDI)	Log(Foreign Direct Investments in South central region of Bulgaria)	Measured in Euro
Log(SoutheastFDI)	Log(Foreign Direct Investments in Southeast region of Bulgaria)	Measured in Euro
Log(SouthwestFDI)	Log(Foreign Direct Investments in Southwest region of Bulgaria)	Measured in Euro

6.2 Tables and figures.

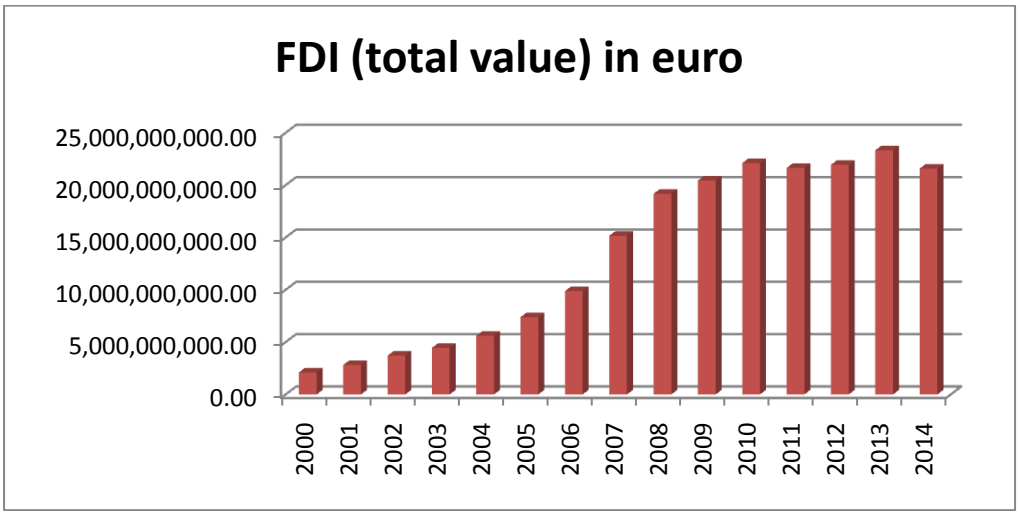
Table 2. Percentage of the total GDP by region.

	Percentage of total GDP for the country														
Northeast	12.0	11.5	11.4	11.4	11.3	11.2	11.3	11.1	11.3	10.8	10.6	10.7	10.9	10.9	11.1
Northwest	11.6	11.4	10.9	10.2	9.7	9.4	8.6	8.2	7.9	7.6	7.3	7.2	7.1	7.0	*7.1*
North Central	10.4	10.6	10.8	10.0	9.7	9.6	9.0	8.6	8.4	8.2	7.9	7.9	8.0	8.2	*8.3*
Southeast	15.3	13.9	13.2	13.5	13.5	13.7	12.8	12.0	12.1	12.3	12.0	11.8	12.2	12.4	*12.5*
Southwest	35.3	37.0	38.7	39.3	40.1	40.6	43.1	45.5	46.2	47.1	48.0	48.4	47.5	47.4	*47.3*
South Central	15.5	15.5	15.1	15.5	15.7	15.5	15.2	14.5	14.1	14.2	14.2	14.0	14.2	14.1	*13.7*

Picture 1.Nomenclature of Territorial Units for Statistics (NUTS)

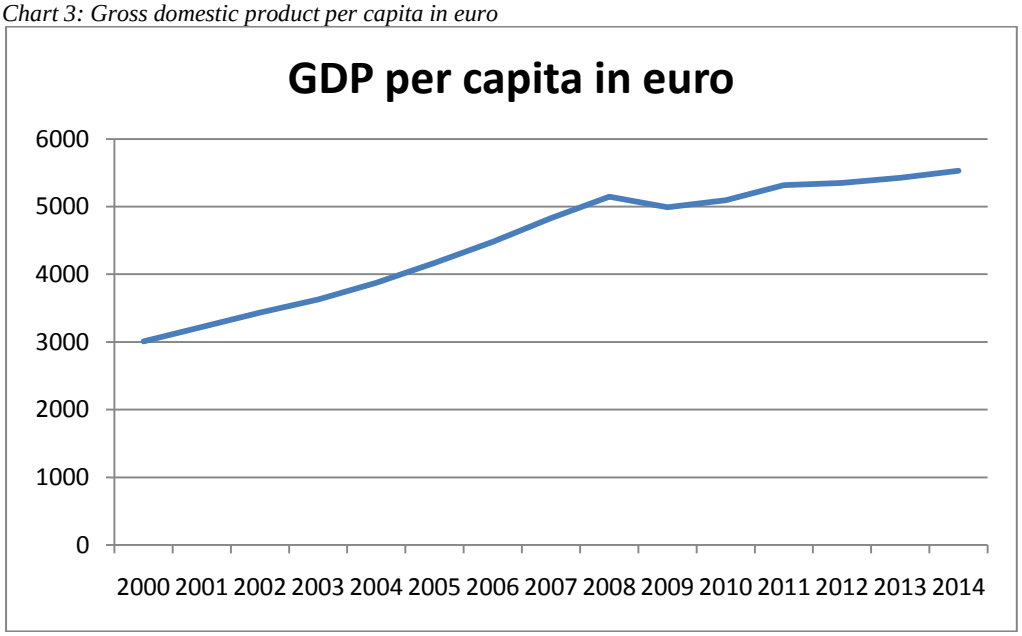


Graph 4. Foreign Direct Investment in total value



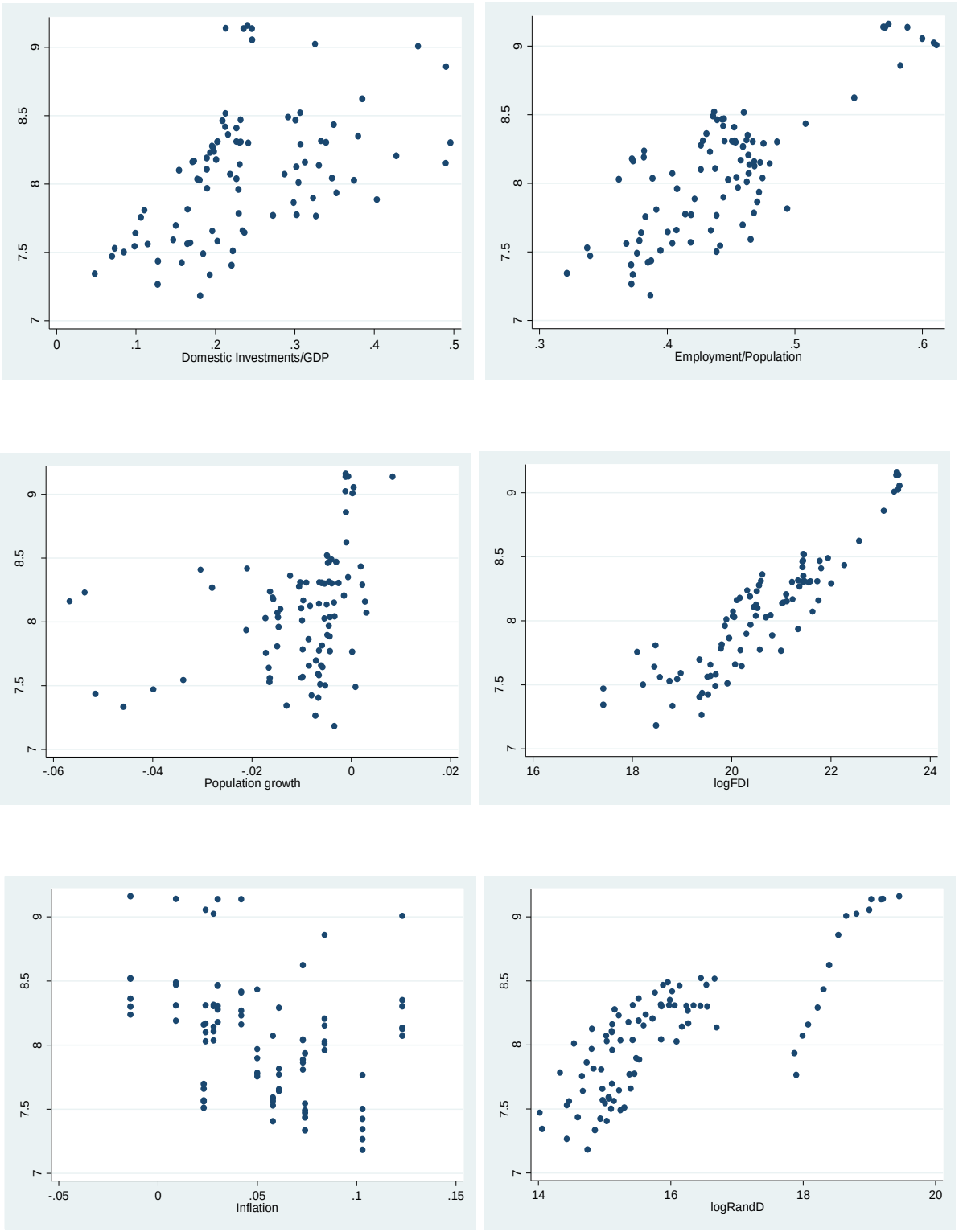
Source: National Statistic Institute of Bulgaria

Chart 3: Gross domestic product per capita in euro



Source: National statistical Institute Bulgaria

Figure 1.Scatter plots of Dependent Variable on several Independent variables



6.3 Summary statistics

Table 3. Summary statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
Year	overall	2007	4.344698	2000	2014	N = 90
FDI	overall	2.24E+09	3.64E+09	3.65E+07	1.43E+10	N = 90
	between		3.15E+09	3.35E+08	8.61E+09	n = 6
	within		2.21E+09	-5.06E+09	7.93E+09	T = 15
Expenditures for R&D	overall	2.70E+07	5.49E+07	1226522	2.82E+08	N = 90
	between		5.17E+07	3233092	1.32E+08	n = 6
	within		2.76E+07	-4.79E+07	1.76E+08	T = 15
Inflation	overall	0.0512	0.035499	-0.014	0.123	N = 90
	between		7.60E-18	0.0512	0.0512	n = 6
	within		0.035499	-0.014	0.123	T = 15
GDP per capita	overall	3602.228	1900.88	1318.896	9517.333	N = 90
	between		1386.524	2710.132	6369.711	n = 6
	within		1411.843	-408.867	6749.85	T = 15
Employment/Population	overall	0.443667	0.060795	0.321497	0.611023	N = 90
	between		0.054218	0.372829	0.538511	n = 6
	within		0.034912	0.343856	0.51618	T = 15
Domestic Investments/GDP	overall	0.238441	0.09578	0.048231	0.495874	N = 90
	between		0.058271	0.145671	0.318085	n = 6
	within		0.079451	0.073955	0.485192	T = 15
Population growth	overall	-0.01003	0.012066	-0.05673	0.008364	N = 90
	between		0.007042	-0.02005	-0.00053	n = 6
	within		0.010188	-0.04807	-0.00114	T = 15
logFDI	overall	20.62128	1.371064	17.41264	23.38321	N = 90
	between		1.119925	19.20495	22.6001	n = 6
	within		0.907126	18.27548	21.99874	T = 15
Log(Expenditures for R&D)	overall	15.9138	1.347852	14.01969	19.45613	N = 90
	between		1.362971	14.8848	18.57505	n = 6
	within		0.501235	14.85943	16.85442	T = 15
Log(GDP per capita)	overall	8.076526	0.463971	7.18455	9.16087	N = 90
	between		0.296419	7.865152	8.653983	n = 6
	within		0.375801	7.188374	8.583413	T = 15
EU membership	overall	0.533333	0.501683	0	1	N = 90

6.4 Econometrics Tests.

Test 1. Hausman test

```
. hausman fe re

                 ---- Coefficients ----
              (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
                fe           re         Difference          S.E.
-------------------------------------------------------------------------
Employment~n    1.745599     2.496137       -.750538        .0699193
DomesticIn~P    -.160726     .1035058       -.2642318               .
Population~h    .4320397     1.036498       -.6044582               .
        Year
       2001     .1203369     .1255856       -.0052487               .
       2002     .1917628     .1751955        .0165673               .
       2003     .2350965     .2018919        .0332046               .
       2004     .3223995     .2746856        .0477138               .
       2005     .4411003     .3749133        .0661869               .
       2006     .5314622     .4421291        .0893331               .
       2007      .681895     .5587152        .1231798               .
       2008     .7899781     .6648016        .1251764               .
       2009     .7794813     .6875131        .0919683               .
       2010     .8068548     .7460084        .0608463               .
       2011     .9230342     .8724112        .0506229               .
       2012     .9650327     .9008115        .0642212               .
       2013      .975221     .9117232        .0634978               .
       2014     1.000726     .9306625        .0700637               .
-------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(17) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                           =       50.48
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

Test 2. Wooldridge test for serial correlation.

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,       5) =    326.829
          Prob > F =      0.0000
```

Test 3. Modified Wald test for groupwise heteroscedasticity

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (6)  =      160.80
Prob>chi2 =      0.0000
```

Test 4. Levin-Lin-Chu Unit-root test

```
. xtunitroot llc logGDPpercapita

Levin-Lin-Chu unit-root test for logGDPpercapita
---------------------------------------------------
Ho: Panels contain unit roots                Number of panels  =       6
Ha: Panels are stationary                    Number of periods =      15

AR parameter: Common                         Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Not included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 7.00 lags average (chosen by LLC)
------------------------------------------------------------------------------
                     Statistic       p-value
------------------------------------------------------------------------------
 Unadjusted t         -4.2471
 Adjusted t*          -3.4056         0.0003
------------------------------------------------------------------------------
```

Test.5. Test for time-fixed effects.

```
. testparm i.Year

 ( 1)  2001.Year = 0
 ( 2)  2002.Year = 0
 ( 3)  2003.Year = 0
 ( 4)  2004.Year = 0
 ( 5)  2005.Year = 0
 ( 6)  2006.Year = 0
 ( 7)  2007.Year = 0
 ( 8)  2008.Year = 0
 ( 9)  2009.Year = 0
 (10)  2010.Year = 0
 (11)  2011.Year = 0
 (12)  2012.Year = 0
 (13)  2013.Year = 0
 (14)  2014.Year = 0

       F( 14,    67) =  116.81
            Prob > F =    0.0000
```

Table 4 Summary of all tests performed

Test	Purpose	Null hypothesis	Statistic	p-value
Hausman test	Fixed or Random effects	H_0: difference in coefficients not systematic	Chi^2 (6) = 50.48	0.0000
F test	Time effects	H_0: i.Year = 0	F(14,67) = 116.81	0.0000
levin-lin-chu test	Unit-root	H_0: y_{it} is nonstationary	t_δ^* = -3.4056	0.0003
Wooldridge test	No Serial correlation	H_0: no first order autocorrelation	F (1,5) = 326.829	0.0000
Modified Wald test for groupwise heteroscedasticity	Homoscedasticity	H_0: $\sigma_i^2 = \sigma^2$ for all I	Chi^2 (6) = 160.80	0.0000
F-test	Fixed effects or Pooled OLS	H_0: all $u_i = 0$	F(5,67) = 70.48	0.0000

7 Results.

Table 5. FDI and Growth: fixed effect regression results (2001-2014) Dependent variable: log(GDP per capita)

Explanatory variables	**(1) FE**	**(2) FE**	**(3) FE**	**(4) FE**	**(5) FE**	**(6) FE**	**(7) FE**	**(8) FE**
Empl/Pop	1.745*	2.737***	1.629*	2.005**	0.239	1.097**	0.400	2.106***
	(0.831)	(0.652)	(0.697)	(0.5495)	(0.364)	(0 .285)	(0.231)	(0 .285)
Dom inv/GDP	-0.161	0.277	-0.285*	-0.1436	0.016	0.139**	-0.256*	0.208
	(0.114)	(0.160)	(0.119)	(0.131)	(0.071)	(0.052)	(0.100)	(0.106)
Pop growth	0.432	-0.896*	-0.131	-0.208	-0.137	-0.731	-0.136	-0.629
	(0.618)	(0.383)	(0.473)	(0.209)	(0 .525)	(0.453)	(0.480)	(0.387)
log(FDI)			0.033	0.054**			0.014	0 .055
			(0.023)	(0.0185)			(0.016)	(0.033)
$Log(FDI)_{-1}$			0.039**	0.361**				
			(0.014)	(0.012)				
Infl			-8.358***	1.265***	-7.419***	0.790***		
			(0.445)	(0.176)	(0.392)	(0 .165)		
Log(R&D)			0.002	-0.0063	0.017	0.022		
			(0.029)	(0.0163)	(0.015)	(.020)		
Log(FDI)*North Central					0.079**	0.196***		
					(0 .030)	(0 .034)		
Log(FDI)*Northeast					0.100***	0.159***		
					(0 .022)	(0 .022)		
Log(FDI)*Northwest					-0.012	0.035*		
					(0 .015)	(0.015)		
Log(FDI)*South Central					0 .077**	0 .121***		
					(0.020)	(0.018)		
Log(FDI)*Southeast					0.047**	0 .101***		
					(0 .014)	(0.015)		
Log(FDI)*Southwest					0.213***	0.246***		
					(0 .023)	(0.024)		
EU							-0.781**	-1.023**
							(0 .228)	(0.507)
Log(FDI)*EU							0.086***	0.052***
							(0.009)	(0.003)
_cons	6.760***	3.641***	6.149***	2.599***	6.149***	1.688***	7.027 ***	3.066***
	(0.325)	(0.222)	(7.398)	(0.502)	(0.361)	(0.363)	(0 .378)	(0 .546)
Time fixed effects	Yes	No	Yes	No	Yes	No	Yes	No
Time trend	No	Yes	No	Yes	No	Yes	No	Yes
N	90	90	84	84	90	90	90	84
Robust standard errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 6 FDI and Growth: fixed effect regression results (2001-2014)
Dependent variable: log(GDP per capita)

Explanatory variables	**(1)**
EmploymentPopulation	0.459
	(0.371)
DomesticInvestmentsGDP	0.057
	(0.118)
Populationgrowth	-0.297
	(0.305)
logFDI	
$Log(FDI)_{-1}$	
Inflation	-8.652***
	(0.797)
logRandD	-0.0003
	(0.023)
$Log(FDI)_{-1}$ x North Central	0.083*
	(0.0334)
$Log(FDI)_{-1}$ x Northeast	0.103***
	(0.0141)
$Log(FDI)_{-1}$ x Northwest	-0.003
	(0.009)
$Log(FDI)_{-1}$ x South Central	0.0722***
	(0.0117)
$Log(FDI)_{-1}$ x Southeast	0.0593***
	(0.0097)
$Log(FDI)_{-1}$ x Southwest	0.191***
	(0.0156)
EU	
_cons	6.312***
	(0.642)
Time dummies	Yes
Time trend	No
N	*84*
Robust standard errors in parenthesis: * p<0.1, ** p<0.05, *** p<0.01	

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