

## Comparative Analysis of FDI Determinants in Russia and Brics Countries

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### Abstract

*In recent years changes in direction of foreign direct investments (FDI) started to attract more attention of economists. In this paper different economic indicators and variables as a factor of FDI growth are investigated. In the first part were given different classifications of FDI determinants. The second part was based on quantitative analysis of FDI determinants in BRICS countries. Data for analysis was provided by World Bank database of economic statistics. The last part includes polynomial regression model for Russia's FDI inflows and their dependence on different variables.*

**Keywords:** polynomial regression, foreign direct investments, FDI determinants, variables

### 1. Introduction

In recent years the correlation between foreign direct investments is being investigated in economic literature, especially after the crisis in 2008. Special attention is being attracted to an influence of FDI to GDP and key determinants of foreign direct investment flows.

This paper offers unique classification of determinants of FDI and their qualitative analysis based on BRICS countries – Russia, China, India and Brazil.

### 2. Review of Literature

In this section, we provide brief literature reviews which investigate the determinants of FDI inflows across various economies. The classical model for determinants of FDI begins from the earlier research work of Dunning (1973, 1981) which provide a comprehensive analysis based on ownership, location and the internationalization (OLI) paradigm [6]. The empirical studies based on aggregate econometric approach are made by Agarwal (1980), Schneider et al (1985). Later on Lucas (1993) examines the determinants of FDI inflows for select East and South Asian economies during 1960 to 1987 by using a model based on a traditional derived-factor of a multiple product monopolist [1,9,11]. The study finds that FDI inflows are more elastic with respect to cost of capital than wages and also more elastic with respect to aggregate demand in exports than domestic demand. Garibaldi et al (2002) analyze the FDI and Portfolio investment flows to 26 transition economies in Eastern Europe including the former Soviet Union from 1990 to 1999 [7]. The regression estimation indicates that the FDI flows are well explained by standard economic fundamentals such as market size, fiscal deficit, inflation and exchange rate regime, risk analysis, economic reforms, trade openness, availability of natural resources, barriers to investments and bureaucracy. However, the portfolio flows are poorly explained by the fundamentals. The study of Nonnenberg and Mendonca (2004) finds that the factors such as the market size measured by GNP, growth rate of the product, the availability of skilled labor, the receptivity of foreign capital, the country risk rating and stock market behavior seem to be the important determinants of FDI flows for developing countries comprising of 33 countries from 1975 through 2000 [10].

### 3. Classification of FDI Determinants

Different sources offer different classifications of FDI determinants. Summarizing them we could segregate five major groups of factors of attracting FDI into economy:

1. Economic factors: market size, cost of primary factors of production, quality of primary factors of production,

GNP;

2. Infrastructure: transport services, communications, financial institutes;
3. Economic policy;
4. Ease of doing business;
5. Geographical characteristics of market.

Among different international classifications the most interesting one is the United Nations Conference on Trade and Development (UNCTAD) index of investment potential. Since 2002 UNCTAD is publishing a yearly report of world investments where the investment attractiveness of countries-recipients of FDI is being described. UNCTAD segregate four basic factors of investment attractiveness for a region or a country:

1. Market;
2. Cost and quality of labor force;
3. Natural resources;
4. Infrastructure development.

These are the main groups of FDI determinants. Every one of them includes more specific factors:

<p><u>Market</u></p> <ul style="list-style-type: none"> <li>• Market size (GDP);</li> <li>• Purchasing power (GDP per capita, Purchasing power parity);</li> <li>• Market growth potential (GDP growth).</li> </ul>	<p><u>Infrastructure development</u></p> <ul style="list-style-type: none"> <li>• Transport                         <ul style="list-style-type: none"> <li>○ Road net density</li> <li>○ Share of roads with hard coating</li> <li>○ Length of railroads</li> </ul> </li> <li>• Power resources                         <ul style="list-style-type: none"> <li>○ Electricity consumption</li> </ul> </li> <li>• Communications                         <ul style="list-style-type: none"> <li>○ Mobile cellular subscribers</li> <li>○ Internet subscribers</li> </ul> </li> </ul>
<p><u>Cost and quality of labor force</u></p> <ul style="list-style-type: none"> <li>• Labor cost per unit of production;</li> <li>• Labor productivity.</li> </ul>	
<p><u>Natural resources</u></p> <ul style="list-style-type: none"> <li>• Fuel and ores stocks</li> <li>• Agriculture resources</li> </ul>	

Every investor finds the most profitable combination of four main determinants and chooses the most advantageous region for investments.

All these factors have a significant impact on FDI flows but this classification does not embrace the whole specter of FDI factors. To see the whole picture, we should look at them from a position of investor. The basis of every investment project is a combination of three major parameters: *reward*, *risk* and *liquidity*. Obviously, the best scenario should be based on high profitability and reward, high liquidity and low risk. Some sources in addition to *risk* and *reward* take *time*. But from the investor's point of view this is not correct, because time itself is one of the determinants of profitability. Thus, every factor determining FDI inflows to the economy one way or another has influence on one of three major parameters. According to this we offer different investor-orientated classification (Table 1.)

**Table 1.** FDI determinants.

	Group of factors	Determinant	Variable	Source	
Profitability	Market capacity	GDP value	US\$	WorldDevelopmentIndicators. World Bank Database	
		Growth potential	GDP dynamics, %		
		Effective demand	Average wage, US\$		
	Labor potential	Labor force	Number of people		
		Labor productivity	Share of GDP per person employed		
		Education	Index, rating		InternationalHumanDevelopmentIndicators. Educationindex
	Infrastructure potential	Transport services	Goods transported (million ton/km)		WorldDevelopmentIndicators. WorldBankDatabase
		Power sources	Electricity production		
		Communication	Mobile cellular subscription per 100 people		
	Financial potential	Taxes	Total tax rate, % of commercial profits		WorldDevelopmentIndicators. World Bank Database
Cost of capital		Discount rate, %			
Cost of starting a business		% of income per capita	Doing business		

Risk	Government policy	Strength of investor protection	Index (1-10)	Doing business
	Administrative factors	Registration of business	Time in days	
		Registration of property	Time in days	
		Dealing with construction permits	Time in days	
Political factors	Rating of political instability	Index, rating	Failed State Index	
Liquidity	Stock markets	Capitalization	Billion US\$	WorldDevelopmentIndicators. WorldBankDatabase
	Closing a business	Recovery rate	Cents per dollar	Doing business

Apparently, this classification also cannot be universal. The main limitation for this classification was the ability to analyze all of the factors quantitatively, so only those factors which could be calculated were added to the model.

#### 4. Analysis of FDI Determinants

Statistical data for the analysis was provided by open sources such as World Bank database, "doing business" reports, ratings and government's statistical databases. The analysis was based on four BRIC countries - Russia, Brazil, China and India for the period between 2007 and 2012.

All the factors of FDI inflows which could be calculated were put in unified database. At the first stage the correlation between the share of world FDI inflows of every country and each determinant for the whole period. Results of these calculations shows that set of FDI determinants cannot be unified for each country.

For example, the best match with chosen determinants has China. Most of the factors have a very strong correlation (over 0.9) with FDI inflows. In the meantime India has almost no correlation at all.

For Russia, the most important determinants appeared to be:

- GDP value
- Average wage
- Labor force
- Electricity production

#### 5. Model Specification

At the first stage as model of evaluation of determinants of FDI inflows in Russia was offered a linear regression model with four variables from the above. It was assumed that these variables could allow figuring the degree of influence of each one of them to the dependent variable – the share of Russia in FDI world inflows. However, initial results have showed their low significance and low values of t-statistics despite the high coefficient of determination. This fact could be explained by multicollinearity between the independent parameters of regression. Evaluation of correlation coefficients between variables shows their strong linear dependence, so they cannot be used in an adequate model.

**Table 2.** Pair correlation of variables

	GDP (trillion US\$)	Labor force (million people)	Average wage (hundreds US\$)	Electricity production (trillion kWh)	FDI (% of world inflows)
GDP (trillion US\$)	1				0,93
Labor force (million people)	0,79	1			0,80
Average wage (hundreds US\$)	0,99	0,74	1		0,92
Electricity production (trillion kWh)	0,96	0,91	0,93	1	0,92

As the parameters degree of influence on dependent variable cannot be adequately calculated, it was decided to build four different non-linear polynomial regression models. To measure the degree of influence of independent variable on the result the K. Pearson correlation ratio for non-linear regressions was calculated. The formula for this ratio is given below:

$$r = \sqrt{\frac{\sigma_y^2 - \sigma_{yx}^2}{\sigma_y^2}}$$

For every regression equation coefficients of determinations and t-statistics were calculated as well.

1. Relationship between FDI in Russia in % of world FDI inflows and GDP values.

$Y = -0.0084604x^2 + 0.0352237x - 0.003909$ , where

Y – Russia's FDI share of world FDI inflows in %.

x – GDP value in trillion US\$.

$R^2=0.91$ ; t-statistic – 42.85;  $r=0.96$ .

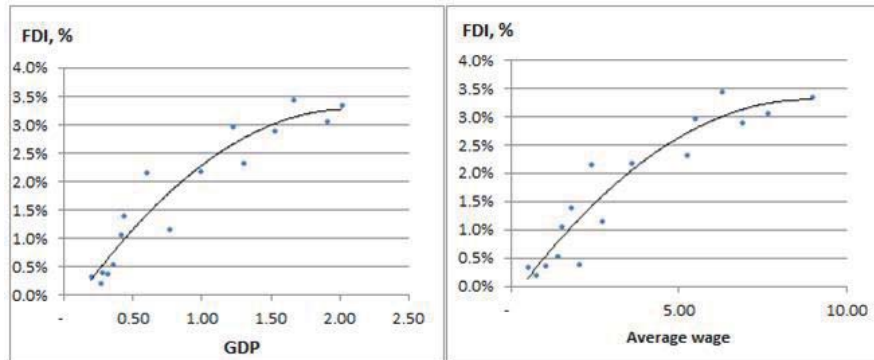
2. Relationship between FDI in Russia in % of world FDI inflows and average wage in hundreds US\$.

$Y = -0.00045x^2 + 0.00802x - 0,00251$ , where

Y – Russia's FDI share of world FDI inflows in %.

x – Average salary in hundreds US\$.

$R^2=0.89$ ; t-statistics – 36.35,  $r=0.94$ .



**Figure 1.** Scatter diagrams of relationship between Russia's share of FDI world inflows and GDP value (left side);

Average wage (right side)

3. Relationship between FDI in Russia in % of world FDI inflows and labor force in million people.

$Y = -0.0007x^2 - 0.1054x + 3.7151$ , where

Y – Russia's FDI share of world FDI inflows in %.

x – Labor force in millions people.

$R^2=0.90$ ; t-statistics – 38.01,  $r=0.95$ .

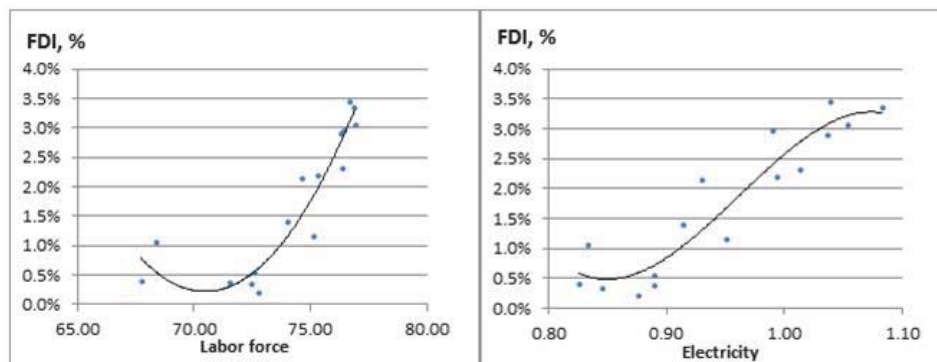
4. Relationship between FDI in Russia in % of world FDI inflows and electricity production in trillion kWh.

$Y = -4.9994x^3 + 14.425x^2 - 13.686x + 4.2859$ , where

Y – Russia's FDI share of world FDI inflows in %.

x – Electricity production in trillion kWh.

$R^2=0.88$ ; t-statistics – 30.8,  $r=0.94$ .



**Figure 2.** Scatter diagrams of relationship between Russia's share of FDI world inflows and Labor force (left side); Electricity production (right side)

Thus, these regression models show strong Russia's FDI share of world inflows on independent variables. According to the values of  $R^2$  and  $r$ , highest dependence of the FDI inflows can be seen on the labor force and GDP values.

## 6. Initial Results and Conclusion

The initial results of analysis show that indeed there are many methods and classifications to describe investment climate and potential of the particular region. There is no unified classification for every country even among developing ones. Most of developing countries could be characterized by very high correlation between their FDI inflows and major economic and investment climate indicators such as average wage, tax rates and "doing business" indicators. There are many ways to make FDI inflows consistently grow by managing these parameters.

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