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Kayam, Saime S. and Hisarciklilar, Mehtap and Yabrukov, Alexandr

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What causes the regional disparity of FDI in Russia?
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Saime S. Kayam[†*], Mehtap Hisarciklilar[†] and Alexandr Yabrukov
[†]*Istanbul Technical University, Faculty of Management, Istanbul, Turkey.*

Abstract

We analyse the determinants of the regional disparity in attracting FDI in Russia using *additions to fixed capital investment by foreign firms* as the measure of FDI. The spatial distribution of FDI is attributed to regional and/or trans-regional factors. Region specific characteristics such as wage, education level, transportation as well as gross regional product, which accounts for market size, in host and alternative regions are considered to analyze the spatial interaction between regions employing spatial econometrics. We find that shocks to FDI levels in proximate regions have no effect on FDI inflows to hosts. However, FDI in a region depends on spatial market size and endowment of natural resources.

JEL classifications: F21, C31, R12
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[*] Corresponding author: kayams@itu.edu.tr

1. Introduction

Russia, stretched across the Eurasian plains and mountains, is the largest country in the world. With its vast natural resources, large market and skilled labour force, it is the perfect location for foreign direct investments (FDI). However, these resources and other features of the Russian Federation are not evenly are not evenly distributed among the republics, *oblasts* and *krais*[1]. Therefore, we observe the agglomeration of multinational enterprises (MNEs) in some regions rather than others. There may be many different reasons for this unequal distribution of FDI among Russian regions. Regional characteristics could play a significant part in this diversity as well as the competition between regions for FDI. Hence, this paper is designed to investigate the causes of the regional disparity in attracting FDI.

Although it is the smallest of the G8 economies, Russian GDP is measured as 1.286 trillion dollars in 2007. However, in the transition from a planned centralized economy to a decentralized liberal system Russia had to undergo many reforms. Despite the fact that it has started far behind, Russia has increased FDI inflows from 2.02 billion dollars in 1995 to 9.42 billion dollars in 2004, with an approximate average of 1 million $ increase per year. In the last couple of years, caused by the developments in the world economy, such as rising oil prices etc., FDI to Russia increased from $14.6 billion in 2005 to $45 billion in 2007. The total amount of FDI inward stock to Russian Federation has reached $271.6 billion by the end of 2006.

[1] *Krai* is mostly translated as province or territory and *oblast* means region.

Table 1. Total Foreign Investments (direct, portfolio and other)

Country of origin	$ Millions	%
Total investments in 2006	55109	100.0
Cyprus	9851	17.9
United Kingdom	7022	12.7
Netherlands	6595	12.0
Luxembourg	5908	10.7
Germany	5002	9.1
France	3039	5.5
Virginian Islands (UK)	2054	3.7
Switzerland	2047	3.7
USA	1640	3.0
Kazakhstan	1116	2.0

Source: Russian Federation Federal State Statistics Service www.gks.ru

Table 1 shows the origins of all types of foreign (direct and portfolio) investments in 2006. Cyprus emerges as the lead investor not only in total foreign investments but also in total FDI stock, constituting approx. 30% of FDI inward stock followed by USA, Germany and the UK. Virgin Islands account for approx 3.2% and the Bahamas make up 1.5% of total FDI (Goskomstat, 2005). However, FDI inflows from Cyprus, Virgin Islands and the Bahamas are considered as the return of FDI outflow from Russia at the beginning of the liberalization period (Bradshaw, 1997; Fabry and Zeghni, 2002). According to the OECD (2004), in the early 1990s, outward FDI from Russia has gone mostly to Cyprus, Virgin Islands, and the Bahamas, followed by the Netherlands, Austria, the UK and the USA. As Bradshaw (1997) mentions, if a country emerges as a leading investor it does not necessarily mean that the citizens of that country are actually investing in Russia.

So what could be the reason for MNEs investing in Russia? MNEs are assumed to have two main motivations for investing in foreign countries, i.e. market-seeking and cost-reducing. The first is referred to as horizontal FDI, where the foreign firms invest in the host country to have easier access to domestic or proximate markets, the first is defined as purely horizontal and the latter as export-platform FDI by Blonigen et al. (2007). The second motivation is called vertical FDI, where the firms invest to use cheaper inputs that the host country offers. Blonigen et al. (2007) and Baltagi et al. (2007) add a complex-

vertical FDI type with which the MNEs separate the production activities and locate in different places[2]. In Russia, we should add resource seeking as another motivation since this country has large reserves of energy generating resources[3].

FDI is usually seen as a substitute for domestic investment by developing countries and therefore sought after to induce economic growth. In a similar fashion, the Russian Federation enacted some reforms to attract FDI and thereby increase GDP overcoming the shortage of domestic capital. These reforms and regulations varied between regions and republics. Unfortunately, preferential treatment of foreign investors, by district governments, through special FDI laws and regulations, such as production-sharing agreements (PSA)[4] and free economic zones (FEZ), have not improved the FDI performance of less developed regions. The efforts failed and the Russian Federation did not fulfil the expectations in terms of FDI inflows that are proportional to its size and to its endowment of human capital and natural resources (Fabry and Zeghni, 2002). Iwasaki and Suganuma (2005) attribute this poor performance to the degradation of the FEZs and to the arduous preconditions asked from foreign investors to be suitable for PSAs.

Table 2. Foreign Direct Investment Stock in Russia, 2006

Total FDI (%)	100.0
Mining and quarrying of energy producing materials	22.9
Manufacture of basic metals and fabricated metal products	15.5
Real estate, renting and business activities	13.1
Financial intermediation	8.1
Wholesale trade; repair of motor vehicles; household goods	6.6
Manufacture of food products, beverages, tobacco	6.1
Manufacture of coke and refined petroleum	6.1
Transport and communication	6.1

Source: Russian Federation Federal State Statistics Service www.gks.ru

[2] See Blonigen (2005) for a survey of the empirical literature on FDI determinants.
[3] Blonigen et al. (2007) mention resource-seeking FDI as part of vertical-complex type.
[4] These agreements provide the investor with a special taxation system to ensure long-term, high-risk, high-cost investments to be made. The investors are supposed to pay its tax royalty as a share of production. These agreements have been usually awarded for exploration and production of various minerals and natural resources such as oil.

The allocation of FDI across sectors is a good indicator of the distribution across Russian regions. Table 2 shows that the FDI inward stock by the end of 2006 has gone mostly to final goods and energy sectors. Among these sectors, oil extraction constitutes 19.9%, iron and steel 7.5%, other metals 7.9%, machinery 3.9% and chemicals 2.2% of FDI inward stock. These figures help to explain why the Sahalinskaya Oblast –being the centre of oil and natural gas extraction- has attracted 29.6% of total FDI. The high share of the trade and food industry (32% in total) evidences that the multinational investors view Russia as a large market rather than a production centre. Hence, they invest in regions with a large and active market, e.g. in Moscow city, which on its own attracted 36.5% of total FDI inflows in 2003. In contrast, the Moskovskaya Oblast[5], which is the industrial region around Moscow, obtained only 10.4%[6] and the second largest city in the Russian Federation, Saint Petersburg could attract only 2.1% of total inflows in the same year. In other words, only some of the 89 regions that form the 7 federal states in Russian Federation can benefit from the externalities generated by FDI because of agglomeration of MNEs. In the mid-transition period of Russia (1995–97), Brock (2005) observes that FDI has provided externalities and induced growth for the local economies by changing the business culture as well as introducing best practices[7]. Relatively developed regions, which have attracted the major part of FDI, became the motor of the whole economy in Russia. Obviously, the uneven distribution of investment across regions leads to uneven development, posing a treat for political and economic stability.

Hence, in this paper we investigate the reasons of regional disparity in FDI inflows to Russian regions in the 1995-2003 periods accounting for the region specific characteristics in both the host and alternative regions, and the spatial interaction between them. The rest of the paper is designed as follows: section 2 gives a brief literature review and introduces the idea of location. Spatial econometrics methodology and the data are explained in section 3

[5] The region administered by the city council.

[6] Moscow city and the surrounding region are treated separately.

[7] According to Yudaeva and Kozlov (2000) as the share of foreigners grow in a company, the firm becomes more productive and as the foreign share increases in an industry, productivity of the medium-sized firms increases. FDI is observed to force local firms to reorganize and restructure their activities.

followed by the results of empirical analysis. Finally, section 5 concludes with some suggestions on how to interpret estimation coefficients and some policy recommendations.

2. Literature

Economic geography and regional development literatures are the main sources of studies on the determinants of regional economic activity. Causes and consequences of regional FDI have been examined more in the recent years following the upsurge in FDI flows around the world in the late 1990s. We concentrate on the literature that addresses interdependence between host destinations using a distinct model, i.e. spatial models.

There are three main strands of literature that address the interaction issue based on gravity models, market potential models and spatial models. The gravity models, which contain specifications similar to Newton's law of gravitational pull, assume that bilateral trade varies together with incomes and inversely with the distance between two economies. In these models, the volume of trade is expected to increase with market size whereas the transportation costs would increase with the distance hence decreasing trade between countries (see Tinbergen, 1962; Pöyhönen, 1963 and Linneman, 1966). Following the success of gravity models in explaining international trade, patterns and determinants of FDI flows in different sets of countries have been examined with these models as well (see Brenton et al., 1999; Buch et al., 2003; Carstensen and Farid, 2004; Ciéslik and Ryan, 2004).

Analogously, market potential models have been used in analysing geographic concentration of economic activity at inter- and intra-national levels (such as Hanson, 2005). These models originate from the seminal paper of Harris (1954) which introduces the *potential index* to measure the accessibility of markets for firms located in a region. Krugman (1992), following Harris, uses the market potential index that is defined as the weighted sum of purchasing powers of all regions where weights depend inversely on distance, to examine agglomeration of firms based on the hypothesis that *firms prefer to locate where the markets are*. Besides its application to economic geography literature,

Altomonte (2002), Head and Mayer (2004), Ciéslik and Ryan (2004) and Carstensen and Toubal (2004) have adopted the market potential idea to investigate the determinants of FDI[8]. Analysing the location choice of FDI firms in various countries, Altomonte (2002) and Head and Mayer (2004) [9] find that the power of a country/region to attract FDI comes from the surrounding countries, i.e. demand matters. Complementary to that finding, Cieslik and Ryan (2004) -comparing the explanatory powers of the gravity and potential models- observe that the economic potential model can explain inflow of Japanese FDI to CEECs better than the gravity equation because it also considers the desire to serve proximate markets by the multinationals. On the other hand, Carstensen and Toubal (2004) find that market access can explain FDI motivation only partially as they analyze the FDI inflows to the CEE region by incorporating interregional distances.

A number of papers, which concentrate on the determinants of FDI, use spatial econometrics models to explain the main factors affect the location choice of MNEs. Some of these studies focus on the regions in a country while others examine an economic region such as the EU or a geographic region such as the Central and Eastern European Countries (CEEC). Coughlin and Segev (2000), who look at the geographic distribution of FDI within China, find that a shock to FDI in one province has a positive effect on FDI in a nearby province[10]. In addition to the size of a province's economy and the infrastructure variables labour supply characteristics are found to be significant. Baltagi et al. (2007), analysing the third country effects on US outward FDI in different industries to various host countries find evidence for spatial correlation in independent

[8] Head and Mayer (2004) looks at determinants of agglomeration for foreign firms whereas Cieslik and Ryan (2004) at the choice of host country for FDI.

[9] Head and Mayer (2004) estimate a location choice model for affiliates of Japanese firms established in 57 regions of 9 countries during the period 1984–1995, which presume that the FDI firms first decide on the nation then on the region, where region choices are nested within nation choices. These 9 countries in their model are: Belgium, France, Germany, Ireland, Italy, the Netherlands, Spain, Portugal and the United Kingdom.

[10] There are many other studies on the regional distribution of FDI in China, such as Wei et al. (1999), Broadman and Sun (1997), Shapiro et al. (2007) but these employ other methods.

variables and error terms, emphasizing complex vertical FDI[11]. Emphasizing that FDI into a particular host country is not independent of FDI into alternative host countries, Blonigen et al. (2007) estimate a model, which differentiates between types of US based FDI (horizontal, export-platform, vertical or vertical-specialization) to OECD countries. They find a significant interdependence between the FDI a host country receives and the FDI inflows to its neighbours, supporting Baltagi et al. (2007).

There are quite a number of studies on regional FDI in Russia -for its total FDI inward stock is actually the sum of the FDI attracted by the regions and as noted by Brock (2005) FDI has played an important role in regional development. Broadman and Recanatini (2001) use market size, climate, education level and local investments to explain the regional FDI and total FDI in Russia, for the period between 1995 and 1999. Cost of labour, transportation infrastructure and investment rating score of the 'Expert Magazine' are the other explanatory variables and they have significant impact on FDI. In addition to these traditional explanatory variables, Iwasaki and Suganuma (2005) emphasize the importance of the stance of local government to attract FDI in the form of FEZs or PSAs when examining the regional distribution of FDI in the regions of Russian Federation [12,13].

In all these and many other studies on Russia, regions are evaluated with respect to host characteristics, however, there is interdependence between regions –especially neighbours- in terms of economic activity. Therefore, the potential of neighbouring regions for FDI and their characteristics should also be taken into consideration while investigating the determinants of regional FDI. Only, Ledyaeva (2007) adopts the spatial economics approach and includes the

[11] Baltagi et al. (2007) classifies FDI as horizontal, vertical, export-platform and complex vertical.

[12] In a study that evaluate the perception of European investors, Ahrend (2000) has come up with a list of factors, which are considered important by the directors of 50 firms engaged in income generating activities in Russia. The survey points at 4 factors that have always been cited at the top in all regions. These are the host country market size, presence of domestic and foreign investments, necessity of local partnership to set up a business and private-ownership of factors of production.

[13] Some of the more traditional variables are the presence of natural resources, market size, social and economic development level, and climate of the region.

market size of other regions into the analysis on distribution of FDI in Russia[14]. For all that, she excludes region specific characteristics and ignores their impact on FDI distribution. Obviously, when there are no borders to cross or economic barriers to overcome, the neighbouring or close by regions have some interaction with each other. Including this interaction into the models increases the explanatory power of any analysis of regional FDI.

The contribution of this paper is two fold. First of all, we use the additions to fixed capital investment by foreign firms as the indicator of FDI rather than the amount of inflows only[15]. This variable includes reinvested profits by foreign firms as FDI. Secondly, we analyse how the target region is affected by FDI flowing into other regions and by the socio-economic characteristics of the regions in Russia. Accordingly, we use a spatial model that we develop for these purposes with both time and cross-section dimensions[16].

3. Methodology and Data

The dependency of economic activity in a region or country on the size of economic activity and other variables of its proximate regions can be best modeled using spatial econometrics, which have become a widely used technique to analyze such a relationship. The essence lies in including the interdependence between alternative hosts or proximate regions into the estimation model with specifically defined weights[17]. The weights are used to position all alternative regions with respect to each other as elements of a symmetric matrix that includes all the regions in rows and in columns, i.e. the weighting matrix (W). In spatial econometrics analysis, the choice of W structure determines the way interaction

[14] She estimates the model for three different periods, i.e. 1996-1998, 1999-2002 and 2003-2005. The variables indicate three-year averages in each period.

[15] Statistical data sometimes include portfolio investment and business loans as well as direct investment in the foreign investment item. Portfolio investment indicates that although the foreigners have some shares in the firm they have no control over its operations. FDI, on the other hand, means that foreign investors have some control in the company. The benchmark share is defined as 25% in Australia, 20% in France, 10% in Russia, USA, Germany and Sweden. UK and Japan do not have such a figure.

[16] Ledyaeva (2007) actually estimates 3 separate cross-sectional models.

[17] The details of this approach can be found in various works of Anselin (1999) and LeSage (1998, 1999).

between two regions is defined. There are a number of alternatives available in terms of defining *W*. First, it is possible to allocate 1 to the neighbors and 0 to all non-neighbor regions, i.e. addressing only neighborhood effects (see Coughlin and Segev, 2000). This type of weighting matrix assumes interaction among only bordering regions causing a bias in favor of neighbors. In order not to exclude proximate regions, which may have more interaction than some neighbors, from the evaluation of FDI determinants, we do not use this structure. Second method constructs the weighting matrix by defining an impact frontier and ignoring the changes further away. The regions within this frontier would be weighted according to the distance from the target region and the sums of columns and rows would still be one (see Blonigen et al., 2007). However, this structure excludes all the far away regions or causes islands to be formed in the Russian case. Additionally, there is no consensus on how to determine the impact frontier. Therefore, in this study we prefer to use the third method and take the distance between district centers to weight the regional features as in many previous studies (Baltagi et al., 2007) and as suggested by Anselin (1999). As a result, we consider all the regions without causing any islands to be formed. The weighting matrix we choose helps us explain FDI with respect to geographic proximity of all feasible (suitable) alternatives.

As for the models, in this study, we use four different specifications to test spatial interaction of a region with others in Russia and employ maximum likelihood estimation techniques[18]. Table 3 gives a summary of the model structures used.

[18] In estimations we make use of LeSage (2006).

Table 3. Summary of model structures used in estimations

Model	Structure
SAR	$y_{it} = \rho \sum_{j=1}^{n} Wy_{jt} + X_{it}\beta + \varepsilon_{it}$
SEM	$y_{it} = X_{it}\beta + \varepsilon_{it},\ \varepsilon_{it} = \lambda \sum_{j=1}^{n} W\varepsilon_{jt} + u_{it}$
DSAR	$y_{it} = \rho \sum_{j=1}^{n} Wy_{jt} + X_{it}\beta_1 + \rho \sum_{j=1}^{n} WX_{jt}\beta_2 + \varepsilon_{it}$
GSEM	$y_{it} = X_{it}\beta_1 + WX_{jt}\beta_2 + \varepsilon_{it},\ \varepsilon_{it} = \lambda \sum_{j=1}^{n} W\varepsilon_{jt} + u_{it}$
Variables and parameters	y dependent variable Wy spatially weighted dependent variable X regional explanatory variables WX spatially weighted explanatory variables ρ spatial dependence parameter

First model is the spatial auto regression (SAR) model. These models establish a direct relationship between the FDI a region gets and FDI received by other regions. As Blonigen et al. (2007) point out these models exhibit whether the location choice of a multinational company was singling out a host (substitution) among many or whether it was complementary, i.e. due to agglomeration. Additionally, the strength of spatial dependence is indicated by the spatial dependence parameter, (ρ). All the terms are given in matrix form. Here, y is the dependent variable, Wy the spatially weighted dependent variable, X shows the regional independent variables matrix, β indicates the coefficients of region's explanatory variables and ε is the error term. This specification allows us to observe whether the foreign direct investments in a region at a given time period have been affected from FDI into other regions or not.

Second one is the spatial error model (SEM). SEM models have spatially correlated error terms or spatial autocorrelation. These models impose a specific structure to the unobserved determinants of FDI, which in traditional models

would be captured by the error term (Blonigen et al., 2007). In this model the error term is different from the SAR specification. Here, we have a spatially autocorrelated error term, ε. λ is the coefficient of weighting matrix and u is the standard error term. With this structure, we expect to see whether FDI to a region is affected from FDI shocks in other regions.

The other two models are actually extensions of the two most extensively used structures expalined above. Third one, called *Durbin-spatial autoregression* (DSAR) model, extends the SAR model by including the spatially weighted explanatory variables, *WX*, and by incorporating the features of other regions in determining the regional FDI. We can observe how FDI to other regions and region-specific characteristics (own and other) affect to the host region FDI inflows. Whereas the fourth, i.e. *general spatial error model* (GSEM), only adds the spatially weighted dependent variables matrix to the right hand side of the SEM model, following Baltagi et al. (2007).

Blonigen et al. (2007) in analyzing the US outward FDI estimate a spatial autoregression (SAR) model. Coughlin and Segev (2000) and Baltagi et al. (2007) both estimate a SEM. The former applies maximum likelihood whereas the latter uses GMM estimator while investigating the presence of spatial effects[19]. Ledyaeva (2007) using cross-section estimations for only three periods, compares the cross-sectional and pooled OLS models with the SAR model to analyse the FDI strategy in different periods, i.e. pre-crisis, recovery and post-crisis periods.

Data

Data used in this study is obtained from the official publication of Goskomstat[20] called "Russian Regions, Social and Economic Indicators" for 2004 and 2005. The Russian Federation has 89 administrative regions of which 21 are republics, 6 krais, 49 states, 10 autonomous regions, 1 autonomous state and 2 federal

[19] Baltagi et al. (2007) estimate two models, i.e. one without any spatial dependence (fixed/random effects model) and one, which considers both spatially weighted dependent variables and a spatial correlated error term (GSEM) to compare.

[20] Statistics Department of the Russian Federation.

cities, i.e. Moscow and St. Petersburg. Some data for autonomous regions are collected as part of their associated states therefore we choose to do the same for all variables. Five regions have no data for foreign investments and 10 have some gaps in the data. Therefore, our dataset covers 64 regions for the 1995-2003 period. All the data are obtained in Ruble as currency. Therefore, all monetary variables had to be converted to real dollar values.

FDI data usually covers only the initial investment made by foreigners however firms usually reinvest part of their profits in the years after establishment. Therefore, they continue to contribute to the capital stock of the economy. Hence, *additions to fixed capital stock by foreign firms*, as the dependent variable, is a better measure for our purposes. We have 576 observations for 64 regions, of these, 18 have zero as the value of additions. These have been included as 0.001 into the dataset[21]. As far as the regional distribution of FDI goes, Russian Federation experiences a high polarization. Cumulatively Moscow City and St. Petersburg City, together with Krasnodar territory, Tyumen region, Moscow region, Tatarstan republic, and Sakhalin region have received the most FDI. Moscow City and St. Petersburg City are the largest cities in Russia and they have federal entity status whereas Moscow oblast is where the industry in Moscow is located. The other four regions have important petroleum and natural gas reserves. They are also the most attractive regions on a yearly basis. Most of the figures for the dependent variable range between zero and 20 million dollars but taking the logarithm of FDI variable ensures we have a normal distribution (see Figure 1)[22].

[21] Since the natural logarithms are taken in the estimations, we actually do not cause a change in the data set apart from manipulating it so that we do not omit the regions with no FDI at a given period.

[22] Also, Blonigen et al. (2007) suggest a log-linear form to get well-behaved residuals.

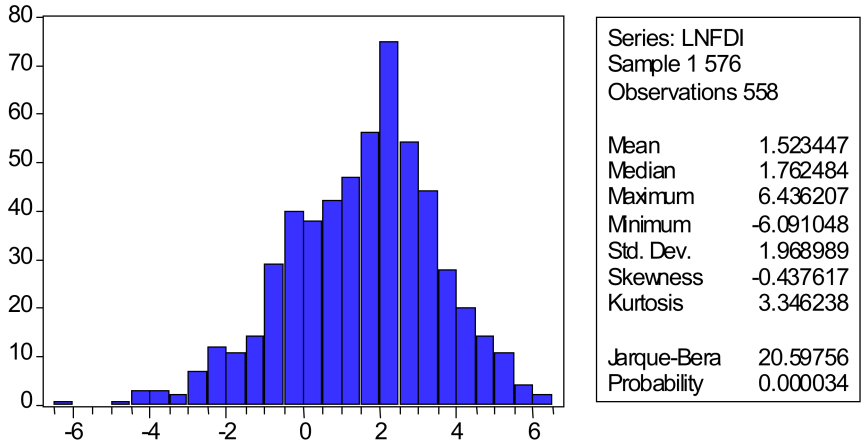

Figure 1. Descriptive statistics for the dependent variable in logs

Gross regional product (GRP) is used to capture the size of the economic activity in each region[23] and account for the market FDI firm is going to supply. An increase in GRP is evaluated as the enlargement of the market and is supposed to have a positive impact on FDI. Therefore, we expect the GRP variable to have a positive sign in the estimations. Iwasaki and Suganuma (2005) and Ledyaeva (2007) apply principle component analysis to determine the market size variable using GRP, total population and population density, however in order to prevent loss of information caused by the principle component analysis, we prefer to use the GRP as it is.

In order to carry the regional differences in the labour market to our estimations we employ three variables. UNEMP shows the *observed unemployment rate* and is expected to capture availability of workers. Human capital is measured as the skill level of the labour force by EDU variable, which consists of the *number of vocational and higher education graduates*. As the skill level increases we claim that the region will attract more FDI therefore the sign of EDU variable is expected to be positive[24]. Iwasaki and Suganuma (2005) take the university enrolment rate as part of the first principle component of urbanization variable. Coughlin and Segev (1999) use illiteracy rate is as a proxy of labour supply characteristics. Broadman and Recanatini (2001) include education level as their explanatory

[23] We could have used GRP per capita to reflect final demand and industry output to capture intermediate demand but these variables are closely correlated therefore we opted for the GRP variable on its own.

[24] Since the literacy rate is quite consistent across regions we preferred not to use it. We use the logarithmic form of this variable.

variables but neither, Iwasaki and Suganuma (2005), nor Ledyaeva (2007) account for education as a proxy of skill level, explicitly. WAGE, which shows the *average regional wage rate*, is included to reflect the labour compensation as a cost variable (again log version is used). While, Broadman and Recanatini (2001) directly include the cost of labour, Coughlin and Segev (1999) use average productivity adjusted nominal wage and overall labour productivity in each province to test for the effects of labour cost on FDI inflows.

Regional transportation cost index (TRANS) shows the cost of transportation within a region. We assume that high regional transportation costs may, *ceteris paribus*, deter foreigners from investing to that region so the expected sign of TRANS variable is negative. In order to reflect the infrastructure of the region we use the number of telephones per 1000 persons (TEL) as another independent variable. Iwasaki and Suganuma (2005) use kilometres of paved roads per person, kilometres of railway per 1000 km^2 and number of telephone units per 1000 people as the elements of the second component of urbanization. Similarly, Coughlin and Segev (1999) also incorporate infrastructure variables such as total length of paved roads per area and total number of staff and workers in airway transportation in each province. Broadman and Recanatini (2001) also include transportation infrastructure in their estimations.

Since extraction of energy producing materials draws a high percentage of FDI inflows to the Russian Federation, we include a dummy variable, which takes 1 if there is some sort of natural gas or petroleum in the region and 0 if not, to incorporate the *presence of natural resources*. RESOURS variable is expected to have a positive parameter sign[25]. This or a similar variable to account for the differences in endowments between regions is widely used in the literature. Iwasaki and Suganuma (2005) use potential rating of natural resources by region as the resource variable. As expected this variable is highly significant in their estimations.

[25] Apart from these variables we used domestic investments, profitability, railway and road density as alternative explanatory variable however they were not significant.

The spatially lagged FDI and spatially weighted dependent variables have unpredictable effects on FDI flows to a host region. *Wy* can have a negative or a positive value depending on whether there is substitution or agglomeration. Similarly, we anticipate most of the *WX* variables to take opposite signs for third country effects (see Table 4).

Table 4. Summary of dependent and independent variables

Variable	**Definition**	**Expected sign**	
		Host	Alternative
FDI	Additions to fixed capital stock by foreign firms	.	-/+
GRP	Gross regional product	+	-
UNEMP	Observed unemployment rate	.	.
EDU	Number of vocational and higher education graduates	+	-
WAGE	Average regional wage rate	-	+
TRANS	Regional transportation cost index	-	+
TEL	Number of telephones per 1000 persons	+	-
RESOURS	Dummy showing presence of natural resources	+	-

Some studies in the literature emphasize the importance of institutional factors, such as 'sound legal and economic environment' mentioned by Carstensen and Toubal (2004) or as decentralization and respective institutional arrangements of Canfei (2006). Chakrabarti (2003) mentions political stability among the key features, which need to be captured in models of location choice of foreign investors. In a study on FDI in Russia, Fabry and Zeghni (2002) find institutional factors to be important in determining total foreign investments, which includes portfolio and direct investments as well as others such as credits. On the other hand, Bevan and Estrin (2004) find 'host country risk' not to be a significant determinant of FDI in European transition economies. The results are mixed and it is difficult to find disaggregated data for institutional factors on Russian regions. Therefore, we implicitly assume that Russian regions are not diverse in terms of risk, stability etc. and only consider the traditional economic factors.

4. Results

Aiming to determine the causes of regional disparity of FDI in Russia, two types of models are employed. Modeling the dependence of FDI in the host province on FDI in other regions using SAR and SEM requires inclusing of the spatial lag dependent variable and the disturbances in the error term as shocks of FDI flows, respectively. As the benchmak cases, the socioeconomic factors that actually characterize an alternative region are ignored in the basic specifications. There we assume that foreign direct investments are only affected from host region features and from FDI into alternative regions either in the form of substitution or agglomeration effects.

Our regressions of both SAR and SEM models show quite similar coefficient estimates (see Table 5). Gross regional product, unemployment, education level, wage rate, number of telephones and presence of natural resources all have significant estimates and all, but only UNEMP, have a positive sign. In contrast to these variables, regional transportation price index and FDI in other regions have no significant impact.

Including the spatial effects of proximate region characteristics to the analysis takes us to DSAR and GSEM models. As we can see from Table 5, the coefficient estimates in these models are quite close to each other, as well. However, UNEMP variable has become insignificant with the inclusion of other region characteristics. Similarly, spatially weighted averages of unemployment, education level and wage rate are also insignificant. On the other hand, spatial market size variable, *W*GRP, takes a negative sign at 1% significance level. Infrastructure variables i.e. TRANS and TEL, of other regions have positive and significant coefficients. As we would expect, the presence of natural resources in other regions has a negative effect on FDI received by the host region. Yet, it is observed that the error terms in these models are far from being normally distributed and they have a significant autocorrelation problem. The error term correlation structure indicates correlation with one-year lag. Consequently, we utilize the AR(1) model is used to get better estimates for both of the spatial

models. As a result, the disturbances are normally distributed and the autocorrelation is insignificant.

Table 5. Causes of the regional disparity of FDI (*dependent variable*)

	SAR	**SEM**	**DSAR**	**GSEM**	**DSAR (AR1)**	**GSEM (AR1)**
LnGRP	0.39*** (2.75)	0.44*** (3.12)	0.71*** (4.63)	0.73*** (4.90)	0.48** (2.23)	0.48** (2.25)
UNEMP	-0.04*** (-2.41)	-0.03** (-2.12)	-	-	-	-
LnEDU	1.07*** (5.68)	1.01*** (5.43)	0.82*** (4.19)	0.79*** (4.16)	1.04*** (3.76)	1.03*** (3.79)
LnWAGE	0.39*** (2.38)	0.32** (1.98))	0.55*** (3.30)	0.54*** (3.33)	0.34* (1.72)	0.34* (1.79)
TEL	2.90*** (13.39)	2.89*** (13.27)	1.58*** (5.93)	1.60*** (6.14)	2.59*** (8.39)	2.60*** (8.61)
RESOURS	0.84*** (6.85)	0.83*** (6.72)	0.82*** (6.30)	0.81*** (6.27)	0.86*** (3.90)	0.87*** (3.93)
*W*LnGRP			-0.55*** (-5.60)	-0.56*** (-6.20)	-0.25*** (-3.37)	-0.26*** (-3.55)
*W*UNEMP			-	-	-	-
*W*LnEDU			-	-	-	-
*W*LnWAGE			-	-	-	-
*W*TRANS			0.13*** (3.03)	0.12*** (3.03)	-	-
*W*LnTEL			0.40*** (2.74)	0.42*** (3.09)	-	-
*W*RESOURS			-0.47** (-1.97)	-0.49** (-2.912)	-0.68* (-1.67)	-0.73* (-1.84)
*W*LnFDI	*insignificant*		*insignificant*		*insignificant*	
*W*ε		*insignificant*		*insignificant*		*insignificant*

Note: ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively.

When corrected for autocorrelation, the estimation results obviously change but again the coefficient values are very close to their respective counterparts in the uncorrected models. Host's gross regional product (GRP) has a positive and significant effect on FDI. As in SAR/DSAR and SEM/GSEM models, in addition to the presence of resources, factors such as education and wage level, and number of telephones per 1000 persons are influential in determining the FDI inflows. All these variables have positive and significant coefficients. A one per cent increase in GRP increases FDI by 0.48 %. Contrary

to our expectations, an increase in the wage level increases FDI into the host region. This result suggests that wage level is, in fact, a proxy for income and thus accounts for consumption level. For that reason, an increase in the wage level increases the attractiveness of the region for foreign investors. As expected, the presence of oil and natural gas reserves causes FDI to be approximately 2.4 times more in the host region[26]. Unexpectedly, apart from regional gross product and presence of natural resources, spatially weighted socioeconomic characteristics of alternative host regions show no significant effect on FDI flows. In contrast to the own GRP, the average GRP of other regions is inversely related to FDI, i.e. if *W*GRP increases by 1% then FDI in the host region is expected to decrease by 0.25%. In other words, regions are competing with each other to attract FDI and those with greater GRP can divert the FDI that might go to proximate regions. Similarly, the presence of natural resources in some regions actually prevents others from receiving FDI. The spatial dependence parameters, whether representing spatial lag or spatial shock are both insignificant meaning that FDI to a region is not influenced from FDI to the others.

All of these results actually point to the same fact that FDI flows into Russian regions are diversified as either market oriented or resource seeking. Regions with large markets attract FDI, which is named as "purely horizontal" by Blonigen et al. (2007) and regions, which have oil and/or natural gas, attract foreign investors that have obtained extraction rights from local and federal governments. Similar to Blonigen et al. (2007) we see that including spatially dependent errors does not affect point estimates and their significance levels. Nevertheless, we find no spatial dependence.

[26] Calculated using inverse log.

5. Conclusion

In our quest for the causes of regional diversity of FDI in Russia, unlike Ledyaeva (2007) we did not find any evidence for vertical FDI or vertical specialization with agglomeration. However, interpreting the signs of the parameter estimates for the spatial lag and spatially weighted market size variables, to differentiate between pure horizontal, regional-trade platform, pure vertical and vertical specialization with agglomeration can be misleading[27]. Our findings indicate that it is not necessary to have the spatially weighted market variable to be zero for the type of FDI to be purely horizontal. Following Blonigen et al. (2007), we can interpret our findings on regional diversity of FDI in Russia as follows: Our preferred models or statistically better models are the autocorrelation corrected models DSAR AR(1) and GSEM AR(1). Blonigen et al. (2007) use the coefficient estimates to differentiate between motives for FDI. Using SAR model, they claim that if the FDI motivation is purely horizontal, i.e. market seeking, then the spatial lag variable and the spatially weighted market potential variable will be zero. The signs of these variables are expected to be – and +, respectively, for export-platform FDI; – and zero for pure vertical; + and + for vertical specialization with agglomeration. We have found that the spatial lag variable, i.e. *WFDI*, is statistically zero and the spatially weighted market size variable is negative in both models. This shows that FDI in other regions do not have any impact on FDI in region *i* however, if other regions have higher market potential, then FDI in region *i* will decrease. In other words, FDI in Russia is located with respect to the market potential of the regions.

Consequently, we propose that in order to classify FDI motivation as "pure horizontal" the SAR model should reveal an insignificant spatial lag variable and a non-positive spatially weighted market potential variable but not zero as suggested by Blonigen et al. (2007). The other variable which shows a spatial dependence is the resource variable. We get a negative sign for the spatially weighted resource variable meaning that if there are more resources in

[27] Blonigen et al. (2007) emphasize that the spatial interdependence is sensitive to the sample of countries therefore "tying such results back to motivations of FDI is a difficult task and depends crucially on the sample chosen" (p. 1306).

alternative host regions or if there are more regions with resources then FDI to region *i* will be negatively affected.

In conclusion, regional diversity of FDI in Russia is the result of variations in market size and resource endowments. Given the market size in each region, favourable factors of production increases the FDI inflows but have no effect on FDI received by proximate regions. Regions rich in endowment of natural resources draw FDI flows from other regions. Given everything else, a 1% increase in the spatially weighted market size of other regions will affect the FDI in the host region by half the change caused as a result of an increase in its own GRP, but of course, negatively. Although there is dependence of FDI in a region on market size and endowment level of other regions, the FDI decision does not lead to a zero-sum game for Russian regions. The high but unexploited FDI potential of Russian regions create this result, which finds its roots in the theoretical model of Altomonte (2002). The dynamic nature of integration causes positive profits in a region/country, which attract multinational enterprises until these profits are eroded because of fierce competition and exploitation of resources leading to a new equilibrium with a higher foreign capital stock.

Since foreign investors come to Russia with quite limited motivations, i.e. market or resource, and this fact restricts the manoeuvre area for local authorities to develop strategies that would attract more FDI. Presence of resources has to be taken as given, you either have it or not. It's not possible to transfer natural resources from one region to another. Therefore, any strategy to improve FDI flows into Russian regions should emphasize the opportunities each region can offer to foreign investors. For some regions it could be closeness to Central Asian Republics, for others it could be access to international transportation corridors and ports, etc.

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