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ABSTRACT

Barro and Sala-I-Martin empirical framework of neoclassical Solow-Swan model is specified to determine the FDI impact on per capita growth in 74 Russian regions during period of 1996-2003. Arellano-Bond GMM-DIFF methodology developed for dynamic panel data models is used in estimations. Results imply that in general FDI (or related investment components) do not contribute significantly to economic growth in Russia in the analyzed period. Regional growth in years 1996-2003 is explained by initial level of region's economic development, year 1998 financial crisis, domestic investments, and exports. However some evidence of positive aggregate FDI effects in higher-income regions is relevant. Natural resources and exports have opposite growth impacts in low and high-income regions. In high-income regions export variable is insignificant while resource variable is growth inducing. We found also convergence between poor and rich regions in Russia. However FDI seems not to play any significant role in recent growth convergence process among Russian regions.

Key words: Foreign Direct Investment (FDI), Russian regional economy, and economic growth
JEL Classification: E22, F21, P27

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1. Introduction

In general foreign financing is considered to be an important engine of economic growth as it helps to cover the gap between the actual investment in economy and the investment that the economy needs to sustain economic growth. A huge literature exists concerning different effects of foreign investment on economic development in a recipient economy. Some of this literature focuses on the foreign direct investment's (FDI) impact on economic growth. Currently FDI sustains the most dynamic development in the world economy in comparison with other forms of foreign financing. Most theoretical and empirical findings (see Section 2) imply that FDI has a strong positive growth impact on the recipient economy. However, Russian economy is a unique case, not because it is a transition economy and has a rather large territory, but because during last 15 years the country has not managed to attract significant amounts of FDI (Ledyaeva and Linden 2006). Typically investment risks are so high in Russia that only high profits in export oriented extractive industries (e.g. fuel industry) have attracted foreign investors.

On the general level export oriented FDI into resource industries may have both positive and negative effects on economic growth. Positive effects may be due to technological spillover effects, employment effects, and productivity improvements. Negative effects from resource FDI may occur if export of resources retards the development of domestic industries. Also repatriation of profits from resource export to the countries of origin of foreign investors negatively influences growth perspectives in the host economy.

FDI into other industries in Russia have been rather low. They have been mostly concentrated in trade, food, catering, beverages, and tobacco industries. Note that all these industries have the market structure of monopolistic competition. Markusen and Venables (2002) developed an influential model of FDI effects on domestic firms' performance with monopolistic competition. Barrios, Görg, and Strobl (2005) made further developments to this model and tested it empirically. According to their findings when FDI amounts are low, the negative competition effects from FDI for development of domestic firms are larger than positive linkages effects.

For Russian economy the question concerning aggregate FDI impact on economic growth remains still an open question. This paper attempts to find some answers. To the best of our knowledge there isn't any study on aggregate FDI effects on economic growth in Russia. This study is based on the empirical framework of the neoclassical Solow-Swan model suggested by Barro and Sala-I-Martin (1995). GMM-DIFF methodology developed by Arellano and Bond (1991) for dynamic panel data models is used to control for endogeneity problems found in growth empirics. Following the simple idea of Blomström et al. (1994, p.17) that "the higher income developing countries are (…) the likeliest candidates for spillovers as they have local firms that are advanced enough to learn from the foreigners", we also divide the sample of Russian regions into two sub-samples of high and low income regions.

The novelty of our study is also that we use Oaxaca-Blinder decomposition methodology to examine to which extent the differences in growth rates between the sub-samples can be explained by the differences in the specified factors of economic growth. According to neoclassical theory lower-income countries tend to grow faster than higher-income countries. Oaxaca-Blinder decomposition helps us to find some more evidence on the factors of convergence between lower-income and higher-income regions in present day Russia.

The reminder of the paper is constructed as follows. Section 2 reviews theoretical and empirical issues on the topic, Section 3 describes data, empirical model and its theoretical foundations, Section 4 concerns the methodology used in the study, Sections 5 summarizes empirical results, and Section 6 concludes the paper.

2. FDI and economic growth: some theoretical and empirical issues

2.1. Theoretical issues

Dunning and Narula (1996) were among the first to develop a theoretical model that outlines the relationship between net FDI position of a host country and the country's economic development. According to their theory of "Investment Development Path", FDI transfers new technologies and capital sustaining the host countries positive economic development. Theory of endogenous economic growth (see Jones 1998) gave a rise to explanation of positive role of FDI in economic development through the existence of positive externalities (FDI spillovers).

One of the most important features of neoclassical growth theory is the existence of diminishing returns on capital formation. Thus, investment may stimulate economic growth only in short-term period while the economy is shifting from one short-term equilibrium to another. The only source of long-term economic growth is technological progress, which is considered to be independent from investment activities. However in endogenous growth theory, the diminishing returns of investment can be avoided if there are positive externalities associated with investments. For example technological spillovers occur when a technological knowledge obtained through investment in one company stimulates technological development in other companies. Therefore total return on investment will be higher and marginal productivity of capital will not obligatory decrease with the increase of capital to output ratio (Oxelheim 1996). If investment brings enough new knowledge and technologies they can lead to the long-term economic growth. As typically FDI brings new technologies and knowledge, in accordance with endogenous growth theory, it can be viewed as a catalyst of long-term economic growth in a host economy.

Borensztein, Gregorio and Lee (1998) introduced a theoretical model for an economy where technological progress is a result of capital deepening in the form of an increase in the number of varieties of capital goods available. Their model shows that FDI reduces the costs of introducing new varieties of capital goods, thus increasing the rate at which new capital goods are introduced and, furthermore, the effect of FDI on the growth rate of the economy is positively associated with the level of human capital. The hypothesis is supported by the empirical study. Gries (2002) suggests a model for a small technologically backward economy integrated into world markets. Gries concludes that the human capital endowment but not FDI is the critical factor for the success of technological upgrading and the final technological position. FDI can only accelerate technological growth as long as the economy converges to steady state.

Markusen and Venables (1999) developed a model that obtained the following effects of inward FDI (i.e. multinational firms entry) on the industry's development with monopolistic competition: 1) competition effect in the product and factor markets tends to reduce profits of local firms and forces them out of the market (so multinational firms substitute domestic firms), and 2) linkage effects to supplier industries that reduce input costs and raise profits (encouraging the entry of new domestic firms). Barrios, Görg, and Strobl (2005) allow in above framework the coexistence of domestic firms and foreign multinationals. The model implies a U-shaped curve representing the potential effect of FDI on the number of local firms in the host country.

2.2. Empirical issues

A large number of empirical studies have been suggested to test the theoretical propositions concerning FDI role in the host economies growth on aggregate macro-level. Different approaches are used in order to estimate FDI impact on economic growth. Some of them are summarized in Table 1. The review of empirical literature on the topic allows us to distinguish three main approaches in the estimation of FDI impact on economic growth. First is aggregate production function approach, second is the "core variable" approach and the third is dynamic panel data approach. The first two approaches are commonly used with cross-sectional or time-series data. Because our empirical study is based on the panel data, dynamic panel data approach is used here.

Table 1. Summary of empirical studies on FDI impact on economic growth: some recent developments

Authors	Model and measure of FDI impact	Data type	Estimation method	Main results concerning FDI impact
Balasubramanyam, Salisu and Sapsford (1996)	Aggregate production function approach. The measure of FDI impact is FDI as a percentage of GDP	Cross-sectional data set on 46 countries, annual average over the period of 1985 to 1997	OLS and GIVE	Growth enhancing effects of FDI are stronger in EP countries than in IS countries
Bende-Nabende and Ford (1998)	A simultaneous equation model founded on a supply side approach to growth. The measure of FDI impact: the difference operator of FDI flow	Time series data for Taiwan over the period of 1959-1995	3SLS estimators	FDI promotes growth
Soto (2000)	Dynamic approach with control variables suggested by Barro and Sala-I-Martin (1995). The measure of FDI impact is FDI as a percenttage of GDP	Panel data on 44 countries over the period 1986 to 1997	GMM-DIFF estimation	FDI presents positive and significant correlation with growth
Akinlo (2004)	Aggregate production function approach. The measure of FDI impact is the difference operator of foreign capital stock	Time-series data for Nigeria over the period of 1970-2001	OLS with Error Correction Model	Extractive FDI is not to be growth enhancing as much as manufacturing FDI

Alfaro, Chanda, Kalelmi-Ozcan, Sayek (2004)	Economic growth variable is regressed on the FDI indicator and the core variables. The measure of FDI impact is FDI as a percentage of GDP	Cross-sectional data of 71 countries, annual average over the period of 1975 to 1995	OLS estimation	FDI alone plays ambiguous role in contributing to economic growth. However, count-ries with well-developed financial markets gain significantly from FDI
Durham (2004)	Economic growth variable is regressed on the FDI lows indicator and the set of control variables. The mea-sure of FDI impact: lagged FDI flow	Cross-sectional data set on 80 countries from 1979 through 1998	Extreme bound analysis	The results suggest that lagged FDI do not have direct, unmitigated posi-tive effects on growth.
Li and Liu (2005)	Economic growth variable is regressed on the “core explanatory variables” and FDI measure. The measure of FDI impact: FDI as a percentage of GDP	Panel data set of 84 countries over the period 1970-1999	Random/Fixed effects estimation	A strong complementary connection between FDI and economic growth exists in both developed and developing countries
Laureti and Postig-lione 2005)	Soto framework above. The measure of FDI impact: FDI as a percentage of GDP	Panel data set for 11 MED countries over the period of 1990-2000	GMM-DIFF estimation	FDI variable is poorly significant in explaining growth

3. Empirical model and data

3.1. Theoretical background

Estimated model is derived from growth theory. The most basic version of neoclassical Solow and Swan model (1956) establishes that

$$Y(t) = F(K(t), L(t), t) \qquad (1)$$

$$\dot{k} = s \cdot f(k(t)) - n \cdot k(t) \qquad (2)$$

where

Y(t) is total output of production at time t,

F(.) is a first degree homogeneous production function

K(t) is the stock of physical capital at time t

L(t) is the labor force at time t

t reflects the effects of technological progress

k(t)=K(t)/L(t) is capital per capita at time t

$\dot{k} = k(t)/dt$ is the derivative of *k*(t) with respect to time *s* is a constant saving rate

f(k(t)) is production per capita, and

n is the population's growth rate.

It can be shown that this setting leads to the following per capita production growth rate γ_t,

$$\gamma_t = -\phi(k(t))y(t) + \phi(k(t))y^* \text{ , where } \gamma_t \equiv \frac{\dot{y}}{y(t)} \qquad (3)$$

y(t) is output per capita at date t. The steady state *y** depends on a number of variables, which include the constant saving rate s and the population's growth rate *n*. The form of the function $\phi(.)$ depends on the production function *F (.)* and on the parameters of the equation system (1) - (2).

In the special case of $F(.)$ is the Cobb-Douglas function. Now $\phi(k)$ is equal to $\phi(1-\theta)$, where θ is the share of capital in total production. In that case, (3) is a differential equation with solution:

$$y(t) = e^{-\lambda t} y(0) + (1 - e^{-\lambda t}) y^* \qquad (4),$$

where $\lambda = \phi(1-\theta)$. λ is the convergence speed parameter. For a given steady state, the higher the parameter λ is the faster the economy will converge towards its steady state level. If λ is 0, there is no convergence and the economy will remain stuck in its initial output level y (0). If λ tends to infinity the economy reaches its steady state instantaneously.

In order to estimate the described scheme in panel data regressions we use the empirical framework suggested by Barro and Sala-I-Martin (2004). The framework relates the real per capita growth rate to initial levels of state variables, such as the stock of physical capital and the stock of human capital, and to control variables. The control variables determine the steady-state level of output in the Solow-Swan model. Following Barro and Sala-I-Martin we assume that a higher level of initial per capita GDP reflects a greater stock of physical capital per capita.

Following Soto (2000) we also assume that the initial stock of human capital is reflected by the lagged value of per capita output level in the short-run period. The Solow-Sawn model predicts that for given values of the control variables, an equiproportionate increase in initial levels of state variables would reduce growth rate. Thus we can write the following model of output per capita growth rate for our panel data set:

$$\frac{y_{it} - y_{i,t-1}}{y_{i,t-1}} = ay_{i,t-1} + X_{it}\beta + v_i + \tau_t + \varepsilon_{it} \qquad (5),$$

where $y_{i,t}$ is per capita gross regional output or product (GRP) in region *i* (*i=1,…,74*) [1] in period *t* (*t=1996,…,2003*), $y_{i,t-1}$ is (initial) per capita GRP level in region *i* in period *t-1*, a is a negative parameter reflecting the convergence speed, $X_{i,t}$ is a row vector of control variables in region *i* during period *t* with associated parameters β, v_i is a region specific effect, τ_t is a period-specific effect common to all regions, and ε_{it} is the model's error term.

If we assume that $\frac{y_{it} - y_{i,t-1}}{y_{i,t-1}} \approx \ln(y_{it} / y_{i,t-1})$ then we can approximate the equation (5) in the following way

$$\ln(y_{it} / y_{i,t-1}) = a \ln y_{i,t-1} + \ln X_{it}\beta + v_i + \tau_t + \varepsilon_{it}. \qquad (6)$$

Removing $lny_{i,t-1}$ from the right-hand side to the left-hand side we get the following dynamic panel data model:

$$\ln y_{it} = (a+1)\ln y_{i,t-1} + \ln X_{it}\beta + v_i + \tau_t + \varepsilon_{it} \qquad (7)$$

[1] Actually there are 89 regions in Russia. We exclude from the analysis the autonomous territories, which are included in other regions. These are Neneckij, Komi-Permyatckij, Hanty-Mansijskij, Yamalo-Neneckij, Dolgano-Neneckij, Evenkijskij, Ust-Ordynskij and Aginskij Buryatskij, and Koryakskij. Regions for which most data is missing, namely Ingushetiya, Chechnya, Kalmykiya, Alaniya, Mari-el and Chukotka, are excluded also.

Among the possible control variables suggested by Barro and Sala-I-Martin include measures of market distortions, domestic investment, indicators of the degree of openness of economy, financial development and political instability. Following Soto (2000) it is assumed that the variation of the measures of market distortions, financial development and political instability is small during the relatively short time span. Thus the effects of these variables will not be revealed in the time dimension, but in the cross-region dimension. However these effects will be embodied in the country-specific effect, which disappears after using difference variable estimation methodology.

We use four control variables, which can be viewed as important factors of Russian economy's regional development in the analyzed period. First of all we include dummy variable for the year of 1998 to control for the major financial crisis that happened in Russia. The second variable is natural logarithm of per capita investment into physical capital, $ln(I/N)_{i,t}$, in million dollars in the prices of the year of 2000[2]. According to the existing theory and most empirical findings we expect it to be positively related to the dependent variable. The fourth variable is natural logarithm of per capita export, $ln(Exp/N)_{i,t}$, in million dollars in the prices of the year of 2000. This variable was included to predict positive contribution of the degree of openness of economy to economic growth. The last variable, natural logarithm of resource index, $ln(NR/N)_{i,t}$, (for calculation details of the Index, see Appendix 1), was included because of the high dependence of Russian economy on natural resources. In accordance with aggregate production function approach in the short run natural resources stock is positively related to economic growth as it treated as an additional production input. As we operate with a short run period of only 8 years (1996-2003) of present transitory phase of Russian economy we expect this variable have some importance in the Russian regional growth process.

In order to answer the main question of this paper we include FDI indicator into the set of control variables. Foreign portfolio investment (*FPI*) and foreign credits (*FC*) measures are also added into estimation to compare different foreign financing forms` impacts on growth. We also use aggregate foreign financing variable (*FF*) as a sum of FDI, *FPI* and *FC* in a separate

[2] The transformation was made with the use of the USA deflator, which is equal 100 in the year of 2000.

specification. Therefore we have two specifications of model (6): one with aggregate foreign financing variable and the other with three variables of foreign financing forms: *FDI*, *FPI* and *FC*. All variables are in per capita terms, in million dollars in the prices of the year of 2000. Their description is represented in Table 2. The source of all data used is Russia's regions yearbooks issued by Goskomstat on the yearly basis.

Table 2. Indicators of FDI capital inflow*

Variable	Description
$ln(FF/N)_{i,t}$	Natural logarithm of per capita aggregate foreign financing
$ln(FDI/N)_{i,t}$	Natural logarithm of per capita foreign direct investment
$ln(FPI/N)_{i,t}$	Natural logarithm of per capita foreign portfolio investment
$ln(FC/N)_{i,t}$	Natural logarithm of per capita other foreign investment (except FDI and FPI) [1)]

*) all the variables are in region i =1,…,74 in period t =1996,…,2003

1) This category includes trade credits, credits of foreign governments, credits of international financial organizations and other types of foreign credits

4. Econometric Methods

Empirical panel data studies on growth are generally carried out using periods of around 30 years with five-year average observations (Barro and Lee 1994, Caselli, Esquivel and Lefort 1996). Because of relatively small transition period of Russian economy (15 years) with the fact that capital inflows into Russia have become registered by state statistical authorities only since 1995, and as the data for all the other variables altogether is available only since 1996, our time period is limited to 8 years (1996-2003). Because of the short length of the sample annual data instead of five-year data is used.

The OLS estimation of panel data model with lagged dependent variable in the set of regressors produces biased coefficient estimate results in small samples. The basic problem of using OLS is that the lagged dependent variable is correlated with the error term as the dependent variable lny_{it} is a function of v_i and it immediately follows that $lny_{i,t-1}$ is also a function of v_i. The fixed effect (FEM) and random effect (REM) estimators are also biased and inconsistent unless the number of time periods is large (for details, see e.g. Baltagi 2002, pp. 129-131).

In order to cope with the mentioned problems estimators based on General Method of Moments (GMM) are employed which are consistent for $N \to \infty$ with fixed *T*. We exploit the GMM-DIFF procedure of Arellano and Bond (1991), which suggests to first difference the model and to use lags of the dependent and explanatory variables as instruments for the lagged dependent variable as a regressor. First differencing the dynamic model (7) we get

$$\Delta \ln y_{it} = (a+1)\Delta \ln y_{i,t-1} + \Delta \ln X_{it}\beta + \Delta v_i + \Delta \tau_t + \Delta \varepsilon_{it} \qquad (8),$$

where $\Delta v_i = 0$, $\Delta \tau_t = \tau$ (constant), and Δ denotes first difference. As the Arellano-Bond GMM-DIFF estimation results are identical for both specifications (6) and (7) we report only results of model (6).

In general the GMM estimator could be viewed as a simultaneous estimation of a system of equations, one for each year, using different instruments in each equation and restricting the parameters to be equal across equations. First-differencing the equations removes the individual effects v_i, thus eliminating a potential source of omitted variables bias estimation, and secures against of the problems of series non-stationary. Note also that one of the advantages of using a dynamic model is that both short run and long run elasticities can be obtained.

As linear GMM estimators, the Arellano-Bond estimators have one- and two-step variants. Bond (2002, p.9-10) pointed out: "…a lot of applied work using these GMM estimators has focused on results for the one-step estimator than the two-step estimator. This is partly because simulation studies have suggested very modest efficiency gains from using the two-step version, even in the presence of considerable heteroskedasticity… Simulation studies have shown that the asymptotic standard errors tend to be much too small, or the asymptotic t-ratios much too big, for the two-step estimator, in sample size where the equivalent tests based on the one-step estimator are quite accurate. Windmeijer (2000) provides a formal analysis of this issue, and proposes a finite-sample correction for the asymptotic variance of the two-step GMM estimator which is potentially very useful in this class of models." In our study we report two-step variants of estimators (we also have made one-step estimation but as the results are very similar we report only two-step robust estimators). They are obtained using a finite-sample correction to the two-step covariance matrix derived by Windmeijer (2005).

The GMM estimators have the further advantage that they can treat the set of explanatory variables as strictly exogenous, predetermined and endogenous. If we assume that explanatory variables (X_{nt}) are strictly exogenous (i.e. that $E(X_{nt}\xi_{ns})=0$ for all t, s = 1, 2, …, T) then current and all the lagged X_{it} are valid instruments for the lagged dependent variable as a regressor. If X_{nt} are assumed to be predetermined ($E(X_{nt}\xi_{nt})=0$ for all $t \le s$), then only $\left[X_{i1}, X_{i2}, ... X_{i,s-1}\right]$ are valid instruments. And, finally, if X_{it} are allowed to be endogenous ($E(X_{nt}\xi_{nt})=0$ for $t < s$) then only $\left[X_{i1}, X_{i2}, ... X_{i,s-2}\right]$ are valid instruments. For further details, see e.g. Bond (2002) and Baltagi (2002, p. 129-136).

5. Results

5.1 Full sample results

The GMM-DIFF robust two-step estimation results are represented in Table 3. We report here the results under two assumptions: 1) the explanatory variables are strictly exogenous, and 2) the explanatory variables are endogenous. The correlation matrix of variables is represented in Appendix 2. Two statistics evaluate the validity of the instruments used. The Hansen statistic of over-identifying restrictions tests the hypothesis that the instruments are not correlated with the residuals. The hypothesis is essential for the consistency of the estimators. Arellano-Bond methodology assumes also that there is no second order autocorrelation in the first difference errors. Arellano and Bond (1991) suggest a test for this. For all the estimated specification we can reject the hypotheses that instruments are not valid (i.e. they correlate with residuals). No second order autocorrelation in the first difference residuals was found.

The calculated parameters a are negative, which shows conditional convergence. The convergence is conditional as it predicts higher growth in response to lower starting GRP per capita

Table 3. The GMM-DIFF two-step estimation results [2]. Dependent variable: GRP per capita growth rate in a region i (i=1,…,74) in a period t (t=1996,…,2003)

Explanatory variables, X_{it}	Panel OLS [1]		X_{it} – strictly exogenous		X_{it} – endogenous	
	Aggregate foreign investment	Disaggregate foreign investment	Aggregate foreign investment	Disaggregate foreign investment	Aggregate foreign investment	Disaggregate foreign investment
Constant	0.211* (1.84)	0.30*** (2.65)				
$lny_{i,t-1}$, a	-0.473*** (-19.69)	-0.468*** (-19.49)	-0.656*** (-18.73)	-0.662*** (-18.01)	-0.732*** (-15.63)	-0.736*** (-17.34)
D_{1998}	-0.206*** (-8.97)	-0.203*** (-8.8)	-0.088*** (-5.2)	-0.09*** (-5.71)	-0.052** (-2.49)	-0.045** (-2.39)
$ln(I/N)_{i,t}$	0.361*** (17.65)	0.365*** (18.21)	0.607*** (22.02)	0.596*** (22.38)	0.732*** (20.4)	0.708*** (21.06)
$ln(Exp/N)_{i,t}$	0.036*** (4.13)	0.034*** (3.69)	0.042** (2.3)	0.048*** (2.99)	0.074* (1.91)	0.092*** (2.64)
$ln(NR/N)_{i,t}$	-0.003 (-0.58)	-0.002 (-0.44)	-0.002 (-0.87)	-0.004* (-1.78)	-0.007* (-1.71)	-0.006 (-1.37)
$ln(FF/N)_{i.t}$	-0.001 (-0.55)		-0.001 (-0.94)		0.001 (0.52)	
$ln(FDI/N)_{i,t}$		-0.0002 (-0.3)		0.0004 (0.43)		0.00001 (0.01)
$ln(FPI/N)_{i,t}$		0.001*** (3.45)		0.0003 (0.66)		-0.0001 (-0.07)
$ln(FC/N)_{i,t}$		-0.001** (-2.54)		-0.001** (-2.48)		-0.003* (-2.05)
Number of obs.	508	508	429	429	429	429
Adjusted R^2	0.68	0.69				
Jarque-Bera N-test (p-value)	32.3 (0.00)	31.8 (0.00)				
White's test (p-value) [3]	70.44 (0.00)	90.14 (0.00)				
M1 (p-value) [4]			-4.05 (0.00)	-3.92 (0.00)	-3.62 (0.00)	-3.42 (0.00)
M2 (p-value) [5]			-1.47 (0.14)	-1.45 (0.15)	-1.40 (0.16)	-1.22 (0.22)
Hansen test (p-value) [6]			67.17 (0.57)	71.26 (0.97)	49.7 (0.68)	60.3 (0.89)
Instrument number			57 [7]	74 [7]	44 [8]	62 [8]

Notes: z-statistics in parentheses (for OLS – t-statistics); *, **, *** denote 10, 5 and 1 % significance, respectively.
1) OLS: Heteroskedasticity consistent standard errors.
2) Estimated with a finite-sample correction to the two-step covariance matrix derived by Windmejer (2005).
3) White's heteroskedasticity test, H_0: There is no heteroskedasticity in the residuals.
4) Arellano – Bond test of first-order autocorrelation, H_0: There is no first order-autocorrelation.
5) Arellano – Bond test of second-order autocorrelation, H_0: There is no second order autocorrelation.
6) Hansen test of overidentified restrictions: H_0: Instruments do not correlate with residuals.
7) Dependent variable lagged 2 periods. Explanatory variables in current period and lagged 1 and 2 periods.
8) Dependent variable lagged 2 periods. Explanatory variables lagged 2 and 3 periods.

when the other explanatory variables are held constant. Dummy variable for financial crisis is negatively related to economic growth in Russian regions as expected.

From the results we also conclude that the most important factor of economic growth in Russian regions in the analysed period was domestic investment, $ln(I / N)$. A typical result found in theoretical and empirical literature. Export variable, $ln(Exp / N)$, also exhibits positive and significant impact on economic growth but still the magnitude of the coefficient is considerably smaller than that of domestic investment. Foreign credit variable is surprisingly negatively related to economic growth. It may indicate that regional authorities do not use foreign credits effectively. However positive contribution of foreign credits variable to regional economic development may appear with a considerable time lag, as foreign credits are usually used for infrastructure's development and social programs. Moreover regions with lower economic growth tend to take more loans and credits in order to improve their development situation. Thus negative relationship between foreign credits and economic growth may reflect this tendency. All the other variables do not show any evident statistical relationship with the dependent variable.

Foreign investment (both direct and portfolio) seems not to be important for Russian economic development in the analysed period. The result can be due to their small amounts. The insignificance of foreign direct investment may be explained also by their inefficient industrial distribution as it was pointed out above. Natural resources itself do not enhance economic growth necessary in the short-run. But still domestic investment into resource industries may be rather productive, especially if they are associated with export. Thus resources may positively influence economic growth through investment and export variables. It is well known that crude oil dominates the export in Russia. Taking into account the tendency of oil world price growth in the analysed period, it is possible to suggest that oil resources availability is an important factor of short-run economic growth in Russia. To test this hypothesis we substitute Resource Index by oil variable in the estimation of specification with disaggregate foreign investment. The oil variable is calculated as follows:

$$OilR_{it} = \frac{Oil_{it}}{\overline{Oil_t}} \quad (9),$$

where Oil_{it} is the crude oil production including gas condensate per capita in thousands of tones in a region *i* (i=1,…,74) in time *t* (1997,…,2003). $\overline{Oil}_t$ is the average value of the indicator for the Russian regions in year t. As the estimated coefficients of all the other explanatory variables including the lagged dependent variable do not change considerably we report here only the coefficients for the oil variable. To show the robustness of the results we report both one-step and two-step estimators under the three assumptions, namely if the explanatory variables are treated as strictly exogenous, predetermined and endogenous. For all the estimated specifications we can reject the hypotheses that instruments are not valid (i.e. they correlate with residuals). No second order autocorrelation in the first difference residuals were found. The results are represented in Table 4.

Table 4. The GMM-DIFF one-step and two-step estimation results for the oil variable. Dependent variable: GRP per capita growth rate in a region i (i=1,…,74) in a period t (t=1996,…,2003)

Explanatory variables, X_{it}	Panel OLS [1]	X_{it} – strictly exogenous		X_{it} – predetermined		X_{it} – endogenous	
		One-step	Two-step [2]	One-step	Two-step [2]	One-step	Two-step [2]
$ln(OilR/N)_{it}$	-0.001*** (-3.15)	0.002 (1.28)	0.002 (1.28)	0.007 (1.12)	0.006 (1.00)	0.012 (1.41)	0.011 (1.21)

Notes: z-statistics in parentheses (for OLS – t-statistics); *, **, *** denote 10, 5 and 1 % significance, respectively.
1) OLS – Heteroskedasticity consistent standard errors.
2) Estimated with a finite-sample correction to the two-step covariance matrix derived by Windmejer (2005).

From the results we conclude that there is no evidence that oil availability in a region contributes significantly to economic growth across Russian regions. But again oil production may positively influences economic growth in Russia through domestic investment and export's variables. Note that the *corr[ln(EXP/N), ln(NR/N)] = 0.313* and *corr[ln(EXP/N), ln(OILR/N)] = 0.175* (see App. 2). Thus if oil prices, not oil production volume, dominate the natural resource growth effects, the results above is partly understood.

5.2 High-income regions versus low-income regions: Depends FDI impact on economic growth on absorptive capacity in Russian regions?

Durham (2004, p.3) notes that "more extensive studies with augmented growth specifications generally do not report significant unqualified statistical relations between FDI flows and real variables. Rather, studies suggest that whether FDI enhances growth is contingent on additional factors within the host country." These factors include financial development, legislation, property rights, human capital availability, etc. and form the countries absorptive capacity for foreign investment. Durham himself emphasizes the importance of institutional and financial factors. Keller (1996) emphasizes the role of labor force skills and trade liberalization in determining the absorptive capacity for technology implementation. Krogstrup and Matar (2005) look at FDI and growth through absorptive capacity in the Arab world on four different aspects of absorptive capacity: the technological gap, the level of workforce education, financial development and institutional quality. The results turn out to be highly sensitive to the specific measure of absorptive capacity used. But still there is no consensus in a literature on the exact combination of determinants of absorptive capacity.

We follow the simple logic of Blomström et al (1994, p.16) who point out that the lagging countries "gain relatively little from contacts with foreign firms because there is so little local infrastructure for absorbing foreign influences and that the proposition is difficult to test because it is not clear what characteristics of a country would place it inside or outside the lagging countries". They divided the targeted countries (in their case developing countries) into higher- and lower-income countries. Similarly we divide Russian regions into two sub-samples on the basis of the average GRP per capita over the regions in the period of 1996-2003. First sub-sample of higher-income regions consists of regions with higher than average GRP per capita value, and second sub-sample corresponds to lower-income regions.

Taking into account the fact that Russian economy relies significantly on natural resources, the division into rich and poor regions may be highly influenced by resources availability in the regions. Then this division may not be a good indicator of absorptive capacity. In order to account for this problem we divided all the regions included in the estimation also into two groups: resource abundant and resource scarce regions. Resource abundant regions have Resource Index variable higher than the mean value for the analyzed period. All other regions are resource scarce regions. According to our calculations there are 17 resource abundant regions. 10 of them are in higher-income regions group (25.6%) and 7 of them are in lower-income regions group (20%). If to divide the regions into groups with oil production and non-production the picture is almost the same. There are 28 regions, which have oil production in the analyzed period. 16 of them are rich region (41%) and 12 are poor regions (34%). Thus both in absolute and in percentage values rich regions are more resource abundant and oil based regions. However the evidence is not strong. Therefore we assume that resource availability do not necessarily interfere significantly the estimation results.

While analyzing the sub-samples we use only the specification with disaggregate foreign financing (with FDI, FPI and FC variables). In order to show the robustness of results we report here both one-step and robust two-step GMM-DIFF estimators under the three assumptions that explanatory variables are strictly exogenous, predetermined and endogenous. The estimation results are represented in Tables 5 and 6.

The results show some evidence that richer regions gain from foreign direct investments as the FDI coefficients turn out to be positive and significant in three cases from six (see Table 4). We also conclude that financial crisis in the year of 1998 was more harmful for poor regions than for rich ones. The other interesting result is that export variable turns out to be insignificant in relatively richer regions but it is significant with positive sign in relatively poorer regions (in three cases from six). Contrarily, resource variable is significant with positive sign in richer regions (in three cases from six) but insignificant or even significant with negative sign (in three cases from six) in poorer regions. The result may indicate that resource export is beneficial for (short-run) economic growth only up till some threshold level of regional economic development. After this threshold it may become even harmful, as an economy needs resources for the development of its own industries.

Table 5. The GMM-DIFF estimation results for the sub-sample of higher-income regions. Dependent variable is GRP per capita growth rate in a high income region i (i=1,…,39) in a period t (t=1996,…,2003)

Explanatory variables, X	Panel OLS [1)]	X – strictly exogenous		X - predetermined		X – endogenous	
		A-B GMM-DIFF one-step	A-B GMM-DIFF two-step [2)]	A-B GMM-DIFF one-step	A-B GMM-DIFF two-step [2)]	A-B GMM-DIFF one-step	A-B GMM-DIFF two-step [2)]
Constant	0.51*** (3.6)						
$lny_{i,t-1}$, a	-0.450*** (-13.9)	-0.702*** (-10.14)	-0.705*** (-10.5)	-0.729*** (-12.33)	-0.698*** (-9.01)	-0.825*** (-11.51)	-0.836*** (-11)
D_{1998}	-0.201*** (-6.22)	-0.062* (-1.7)	-0.062* (-1.95)	-0.043 (-1.61)	-0.043 (-1.26)	-0.02 (-0.7)	-0.011 (-0.33)
$ln(I / N)_{i,t}$	0.358*** (13.73)	0.595*** (12.56)	0.598*** (13.94)	0.652*** (12.65)	0.646*** (11.82)	0.748*** (8.87)	0.751*** (9.65)
$ln(Exp / N)_{i,t}$	0.054 (3.17)	0.045 (1.01)	0.044 (1.08)	0.099 (1.32)	0.126 (1.47)	0.001 (0)	0.021 (0.16)
$ln(NR/N)_{i,t}$	-0.017** (-1.91)	0.03 (0.67)	0.029 (0.67)	0.22** (2.28)	0.224* (1.69)	0.181*** (2.83)	0.142* (1.8)
$ln(FDI/N)_{i,t}$	0.001 (0.96)	0.005* (1.9)	0.005** (2.06)	0.005 (1.63)	0.005 (1.4)	0.006* (1.88)	0.006 (1.47)
$ln(FP/N)I_{i,t}$	0.001** (2.33)	0.0003 (0.19)	0.0004 (0.33)	0.002 (0.94)	0.002 (0.83)	-0.002 (-0.79)	-0.002 (-0.86)
$ln(FC/N)_{i,t}$	-0.002** (-2.49)	-0.009*** (-3.76)	-0.009*** (-3.68)	-0.003 (-1.44)	-0.005* (-1.87)	-0.002 (-0.46)	-0.001 (-0.12)
Number of obs.	269	228	228	228	228	228	228
Adjusted R^2	0.690						
Jarque-Bera N-test (p-value)	17.2 (0.00)						
White's test (p-value) [3)]	64.7 (0.02)						
M1 (p-value) [4)]		-2.77 (0.01)	-2.73 (0.01)	-2.61(0.01)	-2.26 (0.02)	-2.44 (0.02)	-2.24 (0.03)
M2 (p-value) [5)]		-1.30 (0.19)	-1.28(0.20)	-1.35 (0.18)	-1.25 (0.21)	-1.43 (0.15)	-1.53 (0.13)
Hansen test (p-value) [6)]		34.35 (0.64)		32.58 (0.49)		23.26 (0.72)	
Instrument number		36 [7)]		31 [8)]		27 [9)]	

Notes: z-statistics in parentheses (for OLS – t-statistics); *, **, *** denote 10, 5 and 1 % significance, respectively.
1) OLS – Heteroskedasticity consistent standard errors.
2) Estimated with a finite-sample correction to the two-step covariance matrix derived by Windmejer (2005).
3) White's heteroskedasticity test, H_0: There is no heteroskedasticity in the residuals.
4) Arellano – Bond test of first-order autocorrelation, H_0: There is no first order-autocorrelation.
5) Arellano – Bond test of second-order autocorrelation, H_0: There is no second order autocorrelation.
6) Hansen test of overidentified restrictions: H_0: Instruments do not correlate with residuals.
7) Dependent variable lagged 2 periods. Explanatory variables in current period and lagged 1 period (in instrument list FF=FDI+FPI+FC is used in order to keep the number of instruments reasonably small (the "rule of thumb" is that number of groups (35)$\geq$number of instruments)).
8) Dependent variable lagged 2 periods. Explanatory variables lagged 1 period (the same as for (7)).
9) Dependent variable lagged 2 periods. Explanatory variables lagged 2 period (the same as for (7)).

Table 6. The GMM-DIFF estimation results for the sub-sample of lower-income regions. Dependent variable is GRP per capita growth rate in a low income region i (i=1,…,35) in a period t (t=1996,…,2003)

Explanatory variables, X	Panel OLS [1)]	X – strictly exogenous		X - predetermined		X – endogenous	
		A-B GMM-DIFF one-step	A-B GMM-DIFF two-step [2)]	A-B GMM-DIFF one-step	A-B GMM-DIFF two-step [2)]	A-B GMM-DIFF one-step	A-B GMM-DIFF two-step [2)]
Constant	0.115 (0.58)						
$lny_{i,t-1}$, a	-0.491*** (-13.27)	-0.616*** (-15.17)	-0.633*** (-12.78)	-0.621*** (-11.08)	-0.642*** (-8.37)	-0.682*** (-12.75)	-0.722*** (-10.21)
D_{1998}	-0.206*** (-5.94)	-0.102*** (-4.57)	-0.111*** (-4.27)	-0.093*** (-3.47)	-0.108*** (-3.08)	-0.063** (-2.29)	-0.081** (-2.08)
$ln(I/N)_{i,t}$	0.378*** (12.05)	0.618*** (19.69)	0.629*** (15.52)	0.671*** (14.07)	0.682*** (11.58)	0.710*** (16.79)	0.73*** (12.31)
$ln(Exp/N)_{i,t}$	0.020* (1.67)	0.038 (1.45)	0.036 (1.19)	0.075* (2)	0.084 (1.57)	0.099*** (2.77)	0.103** (2.25)
$ln(NR/N)_{i,t}$	0.0002 (0.04)	-0.0004 (-0.12)	-0.002 (-0.46)	-0.005 (-1.01)	-0.006 (-1.29)	-0.008*** (-2.72)	-0.009*** (-2.81)
$ln(FDI/N)_{i,t}$	-0.001 (-1.1)	-0.003 (-1.52)	-0.003 (-1.34)	0.001 (0.5)	0.002 (0.71)	0.0004 (0.19)	0.001 (0.41)
$ln(FPI/N_{i,t}$	0.001* (1.93)	0.001 (0.99)	0.002 (1.45)	0.002 (1.23)	0.002 (1.1)	0.001 (0.65)	0.001 (0.67)
$ln(FC/N)_{i,t}$	-0.001 (-1.3)	0.0002 (0.08)	0.001 (0.17)	0.0003 (0.1)	0.002 (0.65)	-0.002 (-0.57)	-0.002 (-0.52)
Number of obs.	239	201	201	201	201	201	201
Adjusted R^2	0.702						
Jarque-Bera N-test (p-value)	19.6 (0.00)						
White's HT-test (p-value) [3)]	55.8 (0.10)						
M1 (p-value) [4)]		-3.34 (0.00)	-3.32 (0.00)	-2.89 (0.00)	-3.01 (0.00)	-2.70 (0.01)	-2.64 (0.01)
M2 (p-value) [5)]		-0.01 (0.99)	0.31 (0.76)	0.59 (0.56)	0.77 (0.44)	0.60 (0.55)	0.73 (0.46)
Hansen test (p-value) [6)]		31.27 (0.77)		27.11 (0.75)		21.27 (0.81)	
Number of instruments		36 [7)]	35 [7)]	31 [8)]	31 [8)]	27 [9)]	27 [9)]

Notes: see Table 5.

5.3. Oaxaca-Blinder decomposition of economic growth difference

We use the Oaxaca-Blinder decomposition approach (Wei 2005, Blinder 1973, Oaxaca 1973) to examine the contribution of used control factors to the difference in GRP per capita growth between the two sub-samples. As predicted by neoclassical growth theory poor countries (regions in our case) tend to grow faster than richer ones. In Russian regions for the analysed period this proposition is true (see Table 7). The result gives us a motivation to use Oaxaca–Blinder method in details in analyzing the factors determining convergence.

Table 7. Growth rates difference between lower-income and higher-income regions

Mean of lower-income regions growth rates in the period of 1997-2003[3] (1)	-0.027
Mean of higher-income regions growth rates in the period of 1997-2003 (2)	-0.030
Difference (1-2)	0.003

As long as the expected means of the error terms in the regressions are both zeros, the total estimated difference in average GRP per capita growth between the sub-samples can be represented by

$$\overline{ln(y_{it} / y_{i,t-1})_{li}} - \overline{ln(y_{it} / y_{i,t-1})_{hi}} = \hat{\beta}`_l \overline{lnX_{li}} - \hat{\beta}`_h \overline{lnX_{hi}} , \qquad (10)$$

where $\hat{\beta}`_h$ and $\hat{\beta}`_l$ represent, respectively the estimated panel OLS[4] coefficients of regressions for higher-income and lower-income regions sub-samples (including constant). $\overline{lnX_{hi}}$ and $\overline{lnX_{li}}$ represent, respectively the averages of modeled factors of economic growth of both sub-samples. The total estimated difference or gap can be further decomposed into the following three components:

$$\overline{ln(y_{it} / y_{i,t-1})_{li}} - \overline{ln(y_{it} / y_{i,t-1})_{hi}} =$$

$$\hat{\beta}`_h(\overline{lnX_{li}} - \overline{lnX_{hi}}) + (\hat{\beta}`_l - \hat{\beta}`_h)\overline{lnX_{hi}} + (\hat{\beta}`_l - \hat{\beta}`_h)(\overline{lnX_{li}} - \overline{lnX_{hi}}) \qquad (11)$$

$$= E + C + CE$$

[3] Period after adjustment.
[4] Oaxaca-Blinder decomposition was originally derived for classical OLS regression (see Yun 2004). GMM approach allows in theory for decomposition but practical problems are great. We are currently working on the issue.

The first component on the right-hand side (E) is the portion of the gap due to difference in structural and control factors. The second coefficient component C is attributable to differences unexplained by these factors. CE is the interaction factor between these components. Note that method gives also detailed decomposition results for individual regressors (specified factors of economic growth).

5.4. Difference in growth rates between higher-income and lower- income Russian regions: factors of convergence

Table 8 reports the (predicted) difference decomposition of growth rates between lower-income and higher-income regions[5] from estimated panel OLS models. Since the results are based on pooled panel OLS estimation the conclusions are rather preliminary and approximate. But still as the relative importance of specified factors is similar in all estimations in Tables 5) and 6) the drawn conclusions can be useful.

The mean predictions between the sub-samples do not differ from each other significantly. There is no much evidence of the convergence process between higher-income and lower-income Russian regions based on the estimated OLS models. Still the results in Table 8 evoke some interest. The greater is the initial GRP per capita difference the larger is the per capita growth difference. This fact goes along with convergence proposition of neoclassical growth theory. Smaller amounts of domestic investment and export in poor regions in comparison with rich regions retard convergence process as expected. The same concerns foreign portfolio investment ($ln(FPI/N)_{it}$). We also conclude that smaller resource availability helps poor regions to convergence with rich regions. The same conclusion can be made for foreign credit variable.

Table 8. Predicted growth rates and decomposition of growth rates differences between lower-income and higher-income regions for the period of 1997-2003

Mean predictions and predicted gap

Mean prediction for lower-income regions	-0.023
Mean prediction for higher-income regions	-0.031
Predicted gap	0.0086 (0.33)

[5] Mean values of the explanatory variables for the period of 1997-2003 for both sub-samples used in calculations are represented in Appendix 3.

Detailed linear decomposition results

	Total	Factors	Coefficients	Interaction
$lny_{i,t-1}$	0.453	0.176*** (7.19)	0.261 (0.86)	0.016 (0.85)
D_{1998}	0.0008	0.002 (0.24)	-0.001 (-0.1)	0.000 (0.02)
$ln(I/N)_{i,t}$	-0.317	-0.151*** (-6.62)	-0.158 (-0.54)	-0.008 (-0.54)
$ln(Exp/N)_{i,t}$	0.265	-0.029*** (-3.13)	0.275* (1.91)	0.018* (1.74)
$ln(NR/N)_{i,t}$	-0.019	0.012* (1.68)	-0.019* (-1.87)	-0.012 (-1.57)
$ln(FDI/N)_{i,t}$	0.036	-0.005 (-1.07)	0.033 (1.64)	0.008 (1.4)
$ln(FPI/N_{i,t}$	-0.004	-0.007* (-1.86)	0.003 (0.09)	0.0004 (0.09)
$ln(FC/N)_{i,t}$	-0.014	0.011** (2.05)	-0.019 (-1.11)	-0.006 (-1.02)
Constant			-0.391 (-1.59)	
Total	0.0086	0.008 (0.35)	-0.016 (-0.88)	0.016 (1.16)

Notes: z - statistics in parenthesis; *, **, *** denote 10, 5 and 1 % significance, respectively; the variances/standard errors of the components are computed according to the method detailed in Jann (2005).

Coefficients decomposition shows the unexplained growth difference effects. They mainly operate via export variable influencing positively convergence process.[6] The result is expected as we found that in lower-income regions there is much more statistical evidence of export led growth. The opposite result is obtained for resource variable. The interaction decomposition result shows that export variable is only significant one. These results show neatly once again that export and resource variable play different roles in high and low-income regions. However we do not put too much weight on these preliminary OB results as they are based on biased estimates and predicted growth difference is much larger than the actual one.

[6] Note that $(\hat{\beta}`_l - \hat{\beta}`_h)\overline{lnX_{hi}}$ corresponds to growth differences unexplainable by structural factors, i.e. difference due to (unobserved) group differences.

6. Conclusions

In recent years many empirical studies have been developed to investigate the role of FDI in economic growth. Most of them conclude that FDI does contribute positively to economic growth if the level of absorptive capacity is high enough. In this paper we examine FDI impact on short-run economic growth in Russian regions in transition period (1996-2003). We use Barro and Sala-I-Martin empirical framework of neoclassical Solow-Swan model and advanced Arellano-Bond estimation method developed for dynamic panel data. Results imply that FDI is hardly a significant factor in explaining economic growth in Russia on regional level. Taking into account existent theories and previous empirical findings concerning FDI impact on economic growth in other countries the result is unexpected. However the low amounts of FDI in Russian economy and their ineffective industrial structure may help to explain it. As for the other specified factors of economic growth, domestic investment and export are the most important ones in stimulating economic growth in Russia. Among the other specified control variables natural resources availability surprisingly does not contribute significantly to short-run economic growth in Russian regions though Russian economy is traditionally considered to rely highly on natural resources. The same result was found when we substituted natural resources variable by oil variable. One of the possible explanations is that natural resources (and especially oil resources) influence short-run economic growth not directly but through domestic investment and export variables.

We also divided the sample into two sub-samples - higher-income regions and lower-income regions - suggesting that GRP per capita level reflects absorptive capacity of a region. The results imply that higher-income regions tend to gain positive, albeit small, effects from FDI while FDI impact on economic growth in lower-income regions still remains insignificant. In general the obtained results enabled us to conclude that further research is needed to determine the factors of absorptive capacity among different regions with respect to FDI in Russia.

We also found that in higher-income regions export variable becomes insignificant while resource variable turns out to be positive and significant. For the lower income regions the situation is opposite: resource variable tends to be insignificant and export variable tends to be positive and significant. The possible explanation is that export of natural resources (if we make a reasonable assumption that most part of Russian export is resource export) is positively related to economic growth only up till some threshold of GRP per capita level. An interesting result here is also that financial crisis in 1998 was more harmful for lower-income regions than for higher-income ones.

The growth convergence between poor and rich regions in Russia was found in the analyzed period. However FDI does not play any significant role in this convergence process. Some preliminary results on Oaxaca-Blinder (OB) decomposition of growth rates difference between higher-income and lower-income regions were also provided. OB analysis entailed some evidence on the relative magnitude of different factors of convergence across Russian regions, e.g. initial GRP per capita plays a major role here along with domestic investments and exports.

Appendix 1

The resource Index has been calculated using the following formula of integrated coefficient:

$$Resource\ index_{it} = \frac{1}{m}\sum_{j=1}^{m}\left[100*\left(\frac{F_{j,it}}{\overline{\overline{F_{jt}}}}\right)\right],$$

where *i=1,…,74* in period *t=1997,…,2003.* $F_{j,it}$ is the actual resource indicator j for a region i in period t, $\overline{F_{jt}}$ is the sample mean of the indicator in period t (in our case the mean value for Russian regions, which is $\overline{F_{jt}} = \frac{1}{n}\sum_{i=1}^{n} F_{ijt}$, where n is the number of Russian regions involved in the computation(74)), m is the number of indicators included in the index computation (adopted from Ndikumana , 2000). Indicators, included in the computation of the resource index are represented in Table A1.1.

Table A1.1. Indicators included into the Resource index’s calculation

N	Indicator
1	Electricity production per capita, kilowatt - hour
2	Oil digging including gas condensate ¨per capita, thousands of tones
3	Natural gas digging per capita, millions cubic meters
4	Coal digging per capita, thousands of tones
5	Black metals production per capita, thousands of tones

Appendix 2

Table A2.1. Correlation matrix of the dependent and explanatory variables involved in the estimation

	ln(GRP/N)	D1998	ln(I/N)	ln(EXP/N)	ln(NR/N)	ln(OILR/N)	ln(FDI/N)	ln(FPI/N)
ln(GRP/N)	1							
D1998	0.006	1						
ln(I/N)	0.889	-0.045	1					
ln(EXP/N)	0.670	-0.055	0.607	1				
ln(NR/N)	0.295	-0.031	0.322	0.312	1			
ln(OILR/N)	0.158	-0.006	0.239	0.175	0.156	1		
ln(FDI/N)	0.889	-0.045	0.316	0.607	0.322	0.239	1	
ln(FPI/N)	0.159	-0.092	0.109	0.307	0.090	-0.021	0.109	1
ln(FC/N)	0.353	-0.018	0.360	0.476	0.283	0.115	0.360	0.343

Appendix 3

Table A3.1. Mean values of the explanatory variables for the period of 1997-2003 for higher-income and lower-income regions sub-samples

Variable	Lower-income regions	Higher-income regions
ln(I/N)	-8.595	-8.173
ln(EXP/N)	-8.722	-8.186
ln(NR/N)	-1.782	-1.097
ln(FDI/N)	-17.294	-13.918
ln(FPI/N)	-48.098	-41.449
ln(FC/N)	-24.777	-18.807

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