

Revisiting the Nexus of Infrastructure and FDI: The Case of Transition Economies

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Abstract: FDI plays a crucial role in the economic development of countries which are suffering from lack of financial resource, advanced technology and skill. Countries compete with each other to attract more FDI. FDI may prefer to enter into those countries which have advanced and widespread infrastructure network. Hence in this study we investigate the association between infrastructure and FDI in the context of transition economies by using six distinct infrastructure proxies. The data used in the analyses are unbalanced data covering 25 countries for the years between 1990 and 2014. The estimation results of the study show that infrastructure has a positive statistically significant impact on FDI inflows. This finding remains valid across six different infrastructure indicators and shows that infrastructure level of a country is quite important in the determination of amount of FDI that it attracts.

Keywords: Infrastructure, Foreign Direct Investment, Transition Economies

JEL codes: O18, F22, P29

1. Introduction

FDI has often been seen as one of the main determinants of economic growth in developing countries. Its capability in the elimination of lack of financial resources, technology, and skills in an economy has captured the interest of researchers and policy makers in developing economies (Khadaroo and Seetanah, 2009). FDI is defined as a driving force of economic growth. Therefore, it may have a crucial role in the process of economic development, especially developing economies. For example, it is believed that FDI inflows provide new employment, capital investment and advanced technology transfer. It is thus no surprise that economies make an effort to attract more FDI inflows (Ngowi, 2005: 145). In this regard, FDI inflows have become an important economic development tool for economies. The understanding of that how economies should attract more FDI inflows is crucial for policy makers and researchers around the world (Loewendahl, 2010: 389).

The explanations mentioned above on FDI inflows are valid not only for developing countries, but also transition economies as well. Transition economies have seen that foreign trade including FDI inflows is closely connected with EU membership, which became as a main determinant of their economic goal. The realization of this goal means a reduction in the economic gap between transition economies

and their advanced West European neighbors (Winiecki, 2002: 118). Additionally, although the limited number of domestic private exporters in transition economies handled economic difficulties they faced, they did not have strong enterprises to generate their own innovation and to compete successfully in the international area. Thus, they were lack of access to international networks and financial resources for investment (Myant and Drahokoupil, 2011: 304). These economies thus eventually preferred to attract foreign investors on the host country's domestic market to close the gap. In this regard, as we have mentioned above, FDI inflows have become an important economic development tool for them. There are a number of studies in literature analyzing the effects and determinants of FDI (Estrin and Uvalic, 2014; Iwasaki and Tokunaga, 2014).

Transition economies confronted with serious challenges due to the lack of physical and institutional infrastructure. The low and inadequate level of public sector in physical infrastructure framework has caused very high transaction costs and reduced competition. In this process, domestic enterprises are damaged because of decreasing competition level and increasing costs arising from the interruption of infrastructure services (Vagliasindi, 2004: 303). On the other hand, multinational companies are encouraged to attract developed infrastructure from abroad (Shah, 2014: 4). Empirical evidences

concerning the impact of infrastructure on FDI inflows are a considerable amount. For example, Kinoshita and Campos (2003) observe this relationship in 25 transition economies for the period 1990-1998. The results of study show that countries with higher quality infrastructure attract more foreign direct investments (see also Botric and Skuflic, 2006; Bellak, Leibrecht and Damijan, 2009).

The aim of this study is to investigate the link between infrastructure and FDI within the context of transition economies by using six different infrastructure proxies. Also, this study contributes to the literature by adding almost all types of infrastructure variables into the model. An unbalanced panel data is used in empirical analyses and the sample contains 25 transition economies for the period between 1990 and 2014. The finding of the study implies that there is a statistically significant association between six distinct infrastructure indicators and FDI inflows. This reveals that transition economies with higher infrastructure level are able to attract more FDI inflows.

The rest of the study is organized as follows. A brief review of the theoretical and empirical literature review of our hypothesis is presented in Section 2. In Section 3, we describe the data and methodology. The next section presents the estimation results. Finally, the last section concludes.

2. FDI and Infrastructure: A Brief Review of Theoretical and Empirical Literature Review

Foreign investment may support greater economic development level by increasing the host country's resources and by providing new capital. Also, it can take different forms of flows, such as official and non-official inflows. Additionally, FDI and portfolio investments are the form of official inflows (Kehal, Samtani and Sawhney, 2004: 1). FDI means an important topic of economic development through output and trade because it provides a number of significant contributions to economic development in terms of total investment and employment level in developing countries (Farole and Winkler, 2014: 1). Traditional literature shows that there are many studies analyzing the effect of FDI (Lutz and Talavera, 2003; Tondl and Fornero, 2010; Hanousek, Kocenda and Maurel, 2011; Unver and Erdogan, 2015; Magombeyi & Odhiambo, 2017). Ndikumana and Verick (2008) have analyzed the

relationship between FDI and domestic investment in Sub-Saharan Africa economies. Their results indicate that a higher level of FDI inflows leads to higher growth in the domestic investment. Also, Waldkirch, Nunnenkamp and Bremont (2009) have analyzed the relationship between FDI and employment level and found a statistically significant and positive effect for Mexico. In addition to domestic investment and employment effects of FDI, according to Adams (2009) results, high economic growth rates in Sub-Saharan region could be caused by FDI. More specifically, the effects of FDI in transition economies have been analyzed in many studies in literature (Johnson, 2006; Tvaronavičiene and Grybaite, 2007; Gorodnichenko, Svejnar and Terrell, 2014). For example, Silajdzic and Mehic (2015) sought to reveal the effect of FDI on economic growth in 10 transition economies. The results of their analysis showed that FDI inflows have a positive and statistically significant impact on economic growth.

After the collapse of Socialism, transition economies radically tended to change their economic system. Their main aim was to create a market system similar to the advanced capitalist economies at the end of this process of changing (Myant and Drahokoupil, 2011: 83). Also, in this process, host governments of transition economies should provide a noninflationary economic environment with strong infrastructure to encourage both domestic and foreign investors (Moran, 1998: 29). In this regard, the radical transformation in transition economies has increased attention to FDI inflows among both countries and firms in this region. Furthermore, they try to find a way to decrease the costs of foreign investors in the privatization process because FDI is an important source of substantial net capital inflows (Blanchard, Froot and Sachs, 1994: 17). Therefore, it is important to know which factors are crucial in attracting FDI into transition economies. As a results, there are many studies about the determinants of FDI in the literature (Cheng, 2006; Ang, 2008; Erdogan and Unver, 2015; Tokunaga and Iwasaki, 2017). Besides the well-known ones, another important determinant of FDI is infrastructure level of a country.

Although there are many different types of infrastructure, there is a consensus on its type in the literature and it generally consists of high ways, other transportation facilities, water and sewer lines, and communications system (Gramlich, 1994: 1177). In this regard, governments through

improved public infrastructure may encourage economic growth (Sanchez-Robles, 1998: 98). There is an increase in both empirical and theoretical literature analyzing the effects of different infrastructure variables on economic growth (Hulten, 1996; Canning and Pedroni, 2004; Sridhar and Sridhar, 2007; Canning and Pedroni, 2008). On the other hand, infrastructure investments are one of the major determinants of FDI. Economies desiring to attract FDI from abroad have adopted policies improving their infrastructure investments. Otherwise, weak infrastructure or nonexistent public services will cause an increase on the costs of domestic and foreign firms, and thus decreasing FDI enters (Khadaroo and Seetana, 2009: 366). There are studies in the literature that empirically analyzed how infrastructure level in a country affects FDI enters (e.g., Asiedu, 2002; Sekkat and Veganzones-Varoudakis, 2007; Rehman, Ilyas, Alam and Akram, 2011).

3. Data and Methodology

In this study we investigate the effect of infrastructure level of a country on foreign direct investment (FDI) level in that particular country by using six infrastructure indicators. The sample covers transition countries for the period between 1990 and 2014 with an unbalanced data.

In order to test our research hypothesis, we estimated the following multivariate fixed effect model (FEM);

$$FDI_{it} = \beta_{0i} + \beta_1 INFRA_{it} + \beta_2 OPEN_{it} + \beta_3 CREDIT_{it} + \beta_4 POPGRO_{it} + \beta_5 INFLATION_{it} + u_{it} \quad (1)$$

and the following multivariate random effect models (REM);

$$FDI_{it} = \beta_0 + \beta_1 INFRA_{it} + \beta_2 OPEN_{it} + \beta_3 CREDIT_{it} + \beta_4 POPGRO_{it} + \beta_5 INFLATION_{it} + \eta_i + u_{it} \quad (2)$$

where it subscript stands for the i-th country's observation value at time t for the particular variable. β_{0i} represents country specific factors not considered in the regression, which may differ across countries but not within the country and is time invariant. η_i is a stochastic term, which is constant through the time and characterizes the country specific factors not considered in the regression. u_{it} is error term of the regression and independently and identically distributed across countries and years.

Our dependent variable is FDI. Six infrastructure variables are RAILTRANS, AIRTRANS, CELLPHONE, FIXEDPHONE, FXBROADBAND, and CONNECTINDX. One out of six is about railways (i.e., RAILTRANS), three out of six of them are about communication (i.e., CELLPHONE, FIXEDPHONE, and FXBROADBAND). We also introduced four more determinants peculiar to the FDI into our models. The list of dependent and independent variables, their definitions, and the data sources are given in Table 1 below.

Table 1: List of Dependent and Independent Variables

Variables	Definition	Source
FDI	Foreign direct investment (US Dollars at current prices and current exchange rates in millions)	UNCTAD
CELLPHONE	Mobile cellular subscriptions (per 100 people)	WDI
RAILTRANS	Railways, goods transported (million ton-km)	WDI
AIRTRANS	Air transport, freight (million ton-km)	WDI
FIXEDPHONE	Fixed telephone subscriptions (per 100 people)	WDI
FXBROADBAND	Fixed broadband subscriptions (per 100 people)	WDI
CONNECTINDX	Liner shipping connectivity index (maximum value in 2004 = 100)	WDI
OPEN	Trade (% of GDP)	WDI
CREDIT	Domestic credit to private sector (% of GDP)	WDI
POPGRO	Population growth (annual %)	WDI
INFLATION	Inflation, GDP deflator (annual %)	WDI

It is thought that the increasing availability of infrastructure decreases firm's costs and thus the competitiveness of host country will be higher to attract FDI (Banga, 2003: 13). Therefore, the

expected association between six proxies of infrastructure and FDI is positive. Countries having better infrastructure are anticipated to attract more FDI.

OPEN reflects the degree of openness of an economy. It is measured as percentage ratio of trade in GDP. As openness degree of an economy increases, more FDI is prone to enter that economy. Government interventions in economy are seen as a risky situation for the future profitability of investment by domestic and foreign investors. Hence, FDI enters will be attracted by trade openness (Büthe and Milner, 2008: 741-742). Generally, the effect of trade openness on FDI varies by the type of investment. For example, in the export-oriented investment, foreign firms may decide to enter in a more open economy since countries having trade openness have lower transaction costs related to exporting (Asiedu, 2002: 111). Thus, we expect to have a positive relationship between OPEN and FDI.

CREDIT reflects the share of private sector in an economy. Economies with higher share of private sector and thus lower state sector attract more FDI. On the other hand, domestic credit to the private sector is a proxy for financial development, which is an engine of economic growth. Therefore, credits to private sector play an important role in the entries of FDI. From that perspective, financing opportunities for foreign firms in a country will encourage their activities during setting up, operation and expansion and hence attracting FDI enters (Kinda, 2010: 502). Therefore, we expect to have a positive relationship between CREDIT and FDI.

POPGRO is population growth rate and reflects size of the domestic market and economy. FDI prefers those countries in which market size is larger (Petri, 2012: 207; Erdogan and Unver, 2015: 85). Therefore, we expect to have a positive relationship between POPGRO and FDI.

INFLATION reflects the three things; namely degree of uncertainty in an economy, political instability, and economic instability. FDI does not prefer to invest in an atmosphere in which there exists higher uncertainty and less political and economic stability. In this regard, foreign investors prefer to enter countries with a lesser degree of uncertainty that reflect more stable economies (Vijayakumar, Sridharan and Rao, 2010: 5). Hence, we expect to have a negative relationship between INFLATION and FDI.

4. Estimation Results

The results of multivariate estimations are reported in Table 2 for six different infrastructure indicators. Hausman test is used for the selection between fixed effect model (FEM) and random effect model (REM), and decision is made at 5% significance level. According to Hausman test, selected models are reported at the bottom of each table.

Table 2: Multivariate Estimation Results

INFRA Proxies =>	RAILTRANS Model 1	AIRTRANS Model 2	CELLPHONE Model 3	FIXEDPHONE Model 4	FXBROADBAND Model 5	CONNECTINDX Model 6
CONSTANT	-3994.96	92.98678	3924.662	-2586.868	6774.07	6504.471
Std. Error	839.331	899.1597	1422.193	1728.039	2755.53	6935.267
Prob.	0.0000	0.9177	0.006	0.1350	0.0145	0.3503
INFRA	0.0478	12.81528	51.33355	203.0957	92.7467	292.9698
Std. Error	0.0017	0.554547	6.061361	44.51795	53.51704	151.2537
Prob.	0.0000	0.0000	0.0000	0.0000	0.0145	0.0553
OPEN	14.1564	2.934904	-45.9377	-12.15637	-51.4324	-47.8675
Std. Error	8.2790	8.242512	11.81655	11.6216	22.57668	48.83187
Prob.	0.0880	0.7219	0.0001	0.2961	0.0234	0.3291
CREDIT	16.1323	38.9800	6.19785	56.57617	32.7588	14.0597
Std. Error	9.5690	10.28844	15.68906	14.56637	23.6625	46.32331
Prob.	0.0925	0.0002	0.6930	0.0001	0.1672	0.7621
POPGRO	385.115	444.1584	-47.4239	792.7932	1393.30	1606.188
Std. Error	330.9683	284.7197	438.2444	443.1706	895.9532	2216.921
Prob.	0.2452	0.1194	0.9139	0.0742	0.121	0.4703
INFLATION	-1.4242	-1.35805	-0.14990	-0.31780	42.5832	232.9806

Std. Error	0.5268	0.781559	0.769552	0.807748	43.0086	157.2863
Prob.	0.0071	0.0829	0.8456	0.6942	0.3229	0.1414
Num. Of Countries	25	25	25	25	25	11
Num. Of Obs.	464	482	506	505	309	117
R-Squared	0.8132	0.561842	0.187096	0.1068	0.0475	0.0690
F-statistic	65.1908	122.0732	23.01578	11.9403	3.0246	1.6474
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0111	0.1534
Hausman Statistic	322.7393	7.736299	2.647045	11.0586	4.5008	3.9721
Prob(Hausman-stat.)	0.0000	0.1714	0.7542	0.0502	0.4798	0.5534
Selected Model	FEM	REM	REM	REM	REM	REM

As seen from Table 2, multivariate estimation results indicate the following interpretations;

1.) Estimation results using RAILTRANS as independent variable in Model 1 indicates that:

The coefficient of RAILTRANS variable is highly statistically significant and takes the expected positive sign, indicating that infrastructure in the form of goods transported via railways leads to an increase in FDI level in transition economies.

2.) Estimation results using AIRTRANS as independent variable in Model 2 indicates that:

The coefficient of AIRTRANS variable is highly statistically significant and takes the expected positive sign, implying that infrastructure in the form of freight via airways raises FDI level in transition economies.

3.) Estimation results using CELLPHONE as independent variable in Model 3 indicates that:

The coefficient of CELLPHONE variable is highly statistically significant and takes the expected positive sign, implying that infrastructure in the form of mobile cellular subscriptions causes to an increase in FDI level in transition economies.

4.) Estimation results using FIXEDPHONE as independent variable in Model 4 indicates that:

The coefficient of FIXEDPHONE variable is highly statistically significant and takes the expected positive sign, implying that infrastructure in the form of fixed telephone subscriptions increases FDI level in transition economies.

5.) Estimation results using FXBROADBAND as independent variable in Model 5 indicates that:

The coefficient of FXBROADBAND variable is statistically significant and takes the expected positive sign, implying that infrastructure in the

form of fixed broadband subscriptions leads to a rise in FDI level in transition economies.

6.) Estimation results using CONNECTINDX as independent variable in Model 6 indicates that:

The coefficient of CONNECTINDX variable is statistically significant at %10 significance level and takes the expected positive sign, implying that infrastructure in the form of liner shipping connectivity index raises FDI level in transition economies.

In regard to other control variables in the model, the estimated coefficient of OPEN variable takes the theoretically expected positive sign and is statistically significant at 10% significance level in one out of six models. It is statistically significant and takes unexpected sign for two out of six models, most probably because of multicollinearity problem.

The coefficient of the CREDIT variable is statistically significant at least at %10 significance level and takes the anticipated positive sign in three out of six models. This result supports the proposition that economies with higher share of private sector and thus lower state sector are able to attract more FDI.

The coefficient of the POPGRO variable is statistically significant and takes the anticipated positive sign in just one model.

The coefficient of the INFLATION variable is statistically significant at least at %10 significance level and takes the anticipated negative sign in two out of six models. This finding hint that any sort of uncertainty in an economy deters FDI entries.

Meanwhile, in terms of robustness, our results are robust in the sense that our primary finding remains valid no matter which proxy is used for infrastructure in our models.

5. Conclusion

This study examines the impact of infrastructure of a country on foreign direct investment level in that particular country by using six infrastructure proxies (i.e., RAILTRANS, AIRTRANS, CELLPHONE, FIXEDPHONE, FXBROADBAND, and CONNECTINDX). The period under study is between 1990 and 2014 and the data are unbalanced data containing 25 transition countries. Each model (i.e., FEM or REM) was chosen by using Hausman test.

The main finding of the study is that countries with higher infrastructure level (in the form of: goods transported via railways, freight via airways, mobile cellular subscriptions, fixed telephone subscriptions, fixed broadband subscriptions, and liner shipping connectivity index) experience higher level of foreign direct investments. This result suggests that countries trying to attract more FDI must improve their infrastructure network. Also, our results are robust in the sense that our primary finding do not alter no matter which proxy is used for infrastructure in our models.

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