Effect of Perceived Corruption on Foreign Direct Investment

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Introduction and Literature Review

In her groundbreaking paper "The Economics of Corruption" in 1975, Susan Rose-Ackerman described corruption as follows:

> *"Although corrupt behavior can arise in a number of different contexts, its essential aspect is an illegal or unauthorized transfer of money or an in-kind substitute. The person bribed must necessarily be acting as an agent for another individual or organization since the purpose of the bribe is to induce him to place his own interests ahead of the objectives of the organization for which he works."*

In this project, we examine the effect of corruption on economic growth. Economic growth has so many contributing factors, we will focus on one which is most likely affected by corruption: Foreign Direct Investment (FDI).

Prior Work

Previous research has established that FDI is a contributing factor in economic growth. The most-referenced paper on this topic is Borenstein et al. (1998), which established that the level of incoming FDI has a significant effect on developing economies and the best effect on the economy where the level of human capital (as measured by education attainment) is the highest.

Because foreign enterprises are assumed to have multiple options of where and how to invest their capital, it is likely that perceived corruption of the host government will have some significant effect on their decision to invest. Enterprise managers make decisions of where to acquire interest in foreign companies based on many factors, including market size, available communications and transportation infrastructure, ease of doing business, and the likelihood of success.

Theoretical questions addressed by previous research involve the relative importance of "helping hand" vs "grabbing hand" effects of corruption; conceptually it was felt that corruption may assist (helping hand) in the navigation of complex and internecine legal processes in some countries. The alternative theory is that corruption would be a deterrent to FDI inflows (grabbing hand) as costs of corruption tend to be unpredictable. As outlined in Shang-Jin Wei's 1997 paper "How Taxing is Corruption on International Investors?" assumption of a negative correlation between the perceived corruption level and FDI is made, and this relationship will be the primary focus of our research.

Our primary references for empirical research are the papers by Mauro (1997), published in the book Corruption and the Global Economy, edited by Elliott, and the 2006 paper by Egger and Winner, entitled "How Corruption Influences Foreign Direct Investment: A Panel Data Study"

The Mauro paper addresses the effects of corruption in three primary areas. First, the author finds a link between corruption and (not specifically FDI) investment GDP ratios (as per data provided in the 1991 Barro paper and IMF). It analyzes cross-sectional data both by ordinary OLS and then by a 2SLS model using linguistic fractionalization as an instrumental variable. It then examines the likelihood that corruption will affect investment composition, by encouraging corrupt officials to invest in projects where kickbacks are larger or more likely and discouraging investment in areas like education where there is less opportunity for large rents.

The most direct model for our work was in a 2006 paper by Egger and Winner and entitled "How Corruption Influences Foreign Direct Investment: A Panel Data Study." Egger and Winner used bilateral stocks of outward FDI as their dependent variable regressed on a measure of corruption and other economic controls. We share common structural characteristics of panel data and the primary independent variable of interest, Corruption Perceptions Index (CPI) as compiled by Transparency

International. However in our paper, we examine a different dependent variable, i.e. net inflows of FDI. We believe this variable is more causal of economic growth than the bilateral outward stocks of FDI examined by Egger and Winner.

The most recent paper that relates closely to our analysis is the 2013 paper by Mather and Singh. They actually use the same dependent variable, net inflows of FDI, and they also use a panel data analysis. In their data selection, however, they choose to look at yearly data over a longer time frame (from 1980 to 2000) for a small number of countries (29); whereas we have chosen two more recent time frames for over 100 separate countries. Their paper also utilizes Transparency International's Corruption Perception index, but they use a different range of control variables that focus on both democratic (civic) freedoms and economic freedoms such as property rights. For the early time periods there was not much fluctuation in the corruption index.

Our Analysis

In our analysis, we use two waves of data. One is from the years 2003/2004 and the other is from 2011/2012. Since the change in the corruption index is very slow, we saw little value in taking measurements every year. We obtained current data and another wave for a year for which data was available for all our explanatory variables. Our dependent (response) variable is log of net flows of Foreign Direct Investment. Direct investment necessitates a certain -long-term commitment and trust in the foreign system as it involves not only cash, but participation in the management of the enterprise. Therefore we felt it would have a greater likelihood to be influenced by perceptions of the governmental actors' reliability and integrity.

We take GDP as our primary control variable, letting it represent the strength of the local market, which is expected to be an attractor of FDI. Other explanatory variables included in our initial model include

metrics representing the ease of doing business; specifically the cost, length of time, and number of steps involved in starting a business in that country. We also included "strength of legal rights" as an explanatory variable believing this necessary for enterprises to have confidence that they can defend their right to prosper in an economy abroad.

Our empirical results support our main hypothesis that the perception of corruption affects the net inflow of FDI, especially when the perception is a very high level of corruption. It can also be concluded that once a certain baseline level of lower corruption was achieved, foreign enterprises were willing to overlook it in making their investment decisions. The significance of our results was not as definitive as we'd like but the direction of the effect was clear and we did obtain significance at the 10% level.

Theoretical Model

According to the New Institutional Economics, especially the theoretical work of Susan Rose-Ackerman (1975, 1997) the economic development of a country relates to the level of corruption in that country via several mechanisms. These include distortion of government investments to opportunities providing high rents and the discouraging of transparency. As corruption is secretive by its nature (being universally illegal) and therefore difficult to measure, it can be indirectly observed by the perception of business leaders worldwide. This perception is likely to affect the behavior of investors outside the country.

Net Foreign Direct Investment: Overall economic development is too broad an effect and is influenced by too many factors to adequately show the effect of corruption, which make it too broad to be an ideal response variable. Therefore the focus of this paper is a metric which most likely to be affected by perceptions of corruption i.e. Foreign Direct Investment (FDI)

Enterprises with capital to invest have multiple options of where and how to invest. Foreign Direct Investment involves investment of not only capital but also the management of the enterprise. An investment in a foreign country assumes risk in scarce capital, investments in technology in the form of know-how and procedures as well as human capital in the form of managers sent to either help set up or run the new enterprise. The stakes are high for the investing enterprise therefore their preferences are unlikely to lead to investment in high risk countries.

One of the problems of corruption is it has unpredictable effects. Wei (2000) found that the costs of corruption were 20 times more onerous than taxation, due to unpredictability. All else being equal, FDI reflects a preference for opportunities with higher potential returns, and the lower risk of loss.

As the level of corruption tends to be highly correlated with other institutional issues; negatively with the prevalence of red tape and positively with the ability of the country to enforce legal contracts, it can be very difficult to identify the contributory power of any one of those effects. Mauro described this effect in his paper published in 1995. Similar results were found in the model created in this project.

The metric for the strength of the justice system is the "strength of legal rights" (**l**egrights) index provided by the World Bank. This index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending.

To indicate the cost of red tape, the metric, *cost in percent of income per capita* to start a new business is used. This is identified as **cost** in the model and is measured by the Doing Business Project, started in 2002 by the International Finance Corporation and the World Bank. The goal of this project is (among others) to "encourag(ing) companies to compete to reduce regulation." Other metrics provided by this project that are considered in this model are **time** needed to start a new business in days and the

number of **procedures** needed to start a new business. These three variables are tightly correlated therefore only one has been incorporated in the model. The cost variable has been introduced in the model as it has the best predictive powers on FDI. The natural log of this variable has been used to correct for extreme positive skewness.

The control variable in this model is GDP. GDP represents the market size of a country. This furthermore indicates potential upside opportunity for FDI. GDP also acts as a control variable for the model as selling a product is always cheaper in the country of manufacture. The data for GDP has been taken from the World Bank website.

The panel data approach has been used to create the model. This has also been the approach for both the Egger and Winner (2006) and Mather and Singh (2013) papers. The Mauro paper (1996) uses cross sectional data regressing GDP per capita and Investment/GDP growth on the same independent variable that has been examined in this paper. This is the transparency international's Corruption Perception Index. Mather and Singh also use a panel model to track a much smaller number of countries over a longer time period (1980 to 2000). Moreover, Mather and Singh use FDI net inflows as their response variable as well as CPI as an independent variable. Egger and Winner, in their paper regress FDI on Transparency International's CPI using panel data for selected, separate years. Their response variable is outward stock of FDI as compared to net inflow of FDI that has been measured in this paper.

A panel data approach has been used in this project to accommodate unobserved variables associated with the various countries. These variables can be related to culture, language and other factors that would likely affect FDI, but not be readily measured in the data. By including multiple measurements from the same countries in the model, an attempt has been made to separate effects due to the

independent variables from the effects due to unobserved country effects.

Data Series:

The dependent variable for this project is Net Foreign Direct Investment (FDI) by year (log). This is the total foreign direct investment inflow into the country less disinvestment. 8 data points have been lost as a part of the conversion from the original 210 observations as the net FDI was less than zero (see the country list in appendix A). This conversion has corrected the extreme skew in the distribution of this variable. The primary independent variable is Perceived Corruption as measured by the Transparency.org's Corruption Perception Index (CPI). Additional independent variables considered are the strength of legal rights (LEGRIGHTS), cost of doing business metrics (COST), and whether the country is in the OECD. GDP is included as a proxy for market strength.

As the primary independent variable changes only gradually, waves of data several years apart have been chosen using the most recent data readily accessible. The study includes 2 waves of panel data, for the years 2003/2004 and 2011/2012, with countries as the panels.

Data is available for many more countries for the later panel than for the earlier, however only those countries have been included for which data is available for both waves in order to eliminate omitted variable bias as the reason for the missing data is likely to be related to the independent variables and correlated with the response, FDI. In other words, the reasons that the data is not available is likely to be similar to the reasons that firms may not think of investing in the country (e.g. the country is small with an inconsequential economy), and therefore the missing data for the earlier time period is likely to bias the results.

Empirical Model, Data and Estimation Technique

Empirical Model

$$lfdinet = \beta_0 + \beta_1 cpi + \beta_2 sqcpi + \beta_3 \lg dp + \beta_4 oecd + \beta_5 legrights + \beta_6 \cos t + \alpha_i + u_{it}$$

Where i= 1 to 109 countries and t= 2003/2004 and 2011/2012

In creating the model both the fixed effects and random effects GLS model for estimation of lfdinet have been considered. In order to determine the appropriate model, the Hausman test has been used to test for a significant difference between the coefficients of the fixed effects and random effects model. The Hausman tests the independence of the omitted effects and the explanatory variables. The test statistic for the Hausman test is W and can be written:

$$W = (\beta_{FE} - \beta_{RE})' \sum^{-1} (\beta_{FE} - \beta_{RE}) \sim X^2 (k)$$

In a comparison of the two models, W is significant at the 1% level of significance. Therefore the fixed effects model has been used for the estimation. From a theoretical standpoint, this makes sense, as it is likely that some of the unobserved variables are likely to not be orthogonal to the independent variables.

Detailed Data Descriptions:

(See Appendix A for a list of countries in this analysis and Appendix B for a scatterplot matrix of key factors.)

Summary table

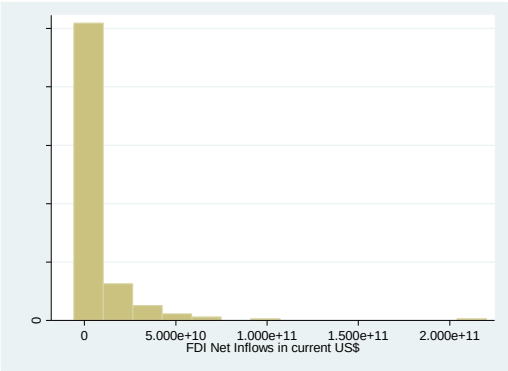
Variable	Obs	Mean	Std. Dev.	Min	Max
lfdinet	210	21.14922	1.97268	15.15051	26.11754
cpi	218	43.55741	22.61693	13	97
sqcpi	218	2406.427	2483.864	169	9409
legrights	213	5.671362	2.338153	1	10
lcost	208	2.651208	1.612406	-1.60944	7.339667
lgdp	218	24.86602	1.869535	20.71434	29.62143

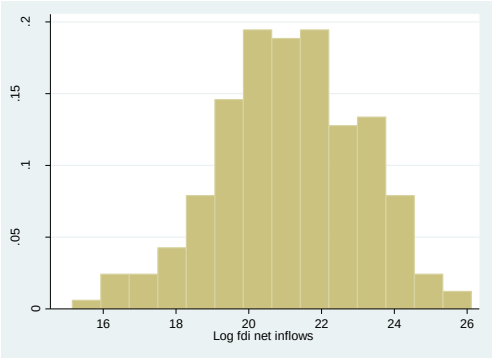
Net Foreign Direct Investment (lfdinet)

(World Bank) This indicator measures net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments.

This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors. Data is measured in current U.S. dollars. The annual data has been collected for the periods of 2003 and 2011 for the countries in the data set.

The log of net foreign direct investment (lfdinet) is used to provide a relatively symmetrically distributed response variable. This resulted in the loss of 8 observations, which exhibited net loss of FDI during one of the years of interest. The improvement in symmetry of the response variable was worth this loss in data points.





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Corruption Perception Index (cpi, sqcpi)

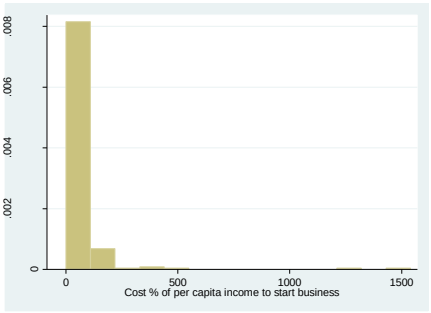
(Transparency International) The Corruption Perception Index (CPI) has been compiled every year since 1995 as an aggregation of several well-respected corruption perception indices worldwide. It has had wide acceptance in the research community and recently has been the most commonly cited corruption index. Although it is not a direct measure of corruption per se, the fact that it measures perception makes it an especially valid as a tool for enterprises deciding whether to invest in a country. We use values from 2003 and 2012. In 2012, it was provided as an index value between 1 and 100, with high values indicating less perceived corruption. In 2003, the values were presented on a scale of 1 to 10 (high values also better), and so were multiplied by 10 before inclusion of this analysis.

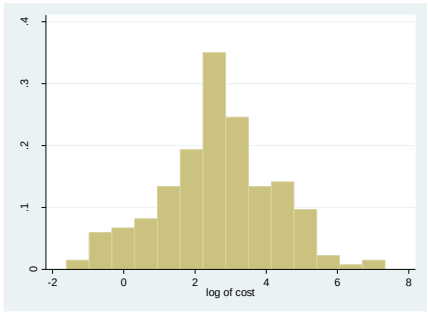
The value of CPI squared was also included in the model. Empirically, the data showed a curvature that begged for a squared term in response. Theoretically, it makes sense that low values of CPI (high corruption) cause enterprises to lower their preference for investment in the country, but once a certain level of “cleanliness” is reached, its power to inhibit investment s reduced. In fact, this is the interpretation made in our final model.

Cost – Cost in % of Income per capita to start a new business (lcost)

(Doing Business Project) The Doing Business Project was started in 2002 by the International Finance Corporation and the World Bank, with the goal of (among others) "encourag(ing) companies to compete to reduce regulation."

The included variable is a measurement of the cost of starting a new business measured as a percentage of the country's income per capita. Data for the "cost in percent of per capita income" for the years 2004 and 2012 were used for each country available. Considered from this source also include "time in days to start a new business" and "number of procedures required to start a new business." The cost of started a business was chosen to represent this factor based in its significance in the model after other factors were accounted for. Based on the extreme skew of the distribution of this data (see histogram, log of the cost (**lcost**) has been used, which restored a fairly symmetrical distribution. Three observations were lost in the log transformation as their original recorded cost was zero.

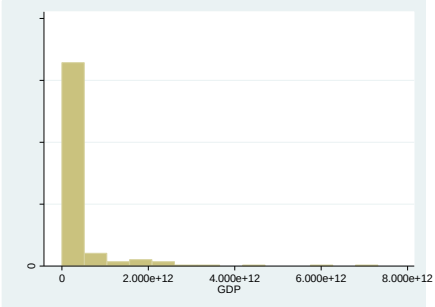


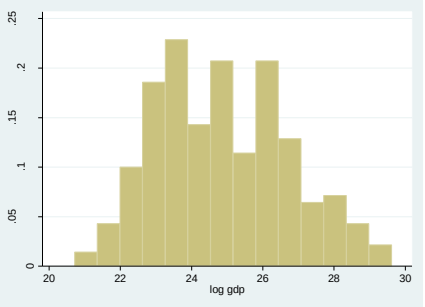


Gross Domestic Product (lgdp)

(World Bank) GDP as measured by the World Bank is, at the purchaser's price, the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of all products. It is calculated without making deductions for depreciation of

fabricated assets or for depletion and degradation of natural resources, as measured in current US Dollars. Dollars figured for GDP are converted from domestic currencies using single year official exchange rates. For the purpose of this project data has been collected for the years 2003 and 2011. Our model uses lgdp, the log of the GDP, as an explanatory control variable.





Strength of Legal Rights (legrights)

(World Bank) Strength of Legal Rights index (0= weak to 10 = strong). This index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. The index ranges from 0 to 10, with higher scored indicating that laws are better designed to expand access to credit. Data from the years of 2003 and 2011 was used. This factor was not found to be significant after inclusion of GDP and CPI.

OECD Member (oecd)

OECD is a dummy variable; 1 for members; 0 otherwise. Only four of the countries studied joined the OECD in 2010; between the first and second wave of our analysis. Being a member of the OECD was not found to be a significant factor.

Correlation matrix

The correlation matrix of these explanatory variables is presented below. All of the correlations are in

the direction expected, with the factors causing problems (cost, procedures, and time) negatively correlated with the factors providing reassurance to investors (cpi and legrights). Cpi and legrights are positively correlated with each other, as are procedures, time and cost.

	Cpi	legrights	procedures	time	cost	lcost	lgdp	lfdinet
cpi	1							
legrights	0.3198	1						
procedures	-0.4663	-0.3809	1					
time	-0.2908	-0.2755	0.5907	1				
cost	-0.2586	-0.1608	0.1643	0.2784	1			
lcost	-0.6351	-0.3314	0.5276	0.4477	0.5529	1		
lgdp	0.4928	0.1325	-0.1529	-0.231	-0.3234	-0.5224	1	
lfdinet	0.4349	0.1549	-0.2514	-0.2666	-0.3075	-0.51	0.8212	1

All the correlations are fairly strong and in the direction (positive or negative) expected. Low corruption, strong legal rights, and higher gdp all correlate positively with a higher net FDI and, as expected, the cost of starting a new business is negatively correlated with net FDI.

Empirical Results

Fixed Effects Panel Analysis Results Table

Log of Net Inflows of FDI	Full Model (t-statistic)		Final Model (t-statistic)	
Corruption Perception Index (CPI)	0.0474 (0.97)		0.0587 (1.25)	
CPI Squared	-0.000882 (-1.74)	+	-0.000937 (-1.90)	+
Log of GDP	1.298 (5.90)	***	1.244 (9.45)	***
Log of Cost to Start a Business	-0.0404 (-0.24)			
Strength of Legal Rights	0.0207 (0.19)			
OECD Member	-0.742 (-.03)			
Constant	-10.94 (-1.98)	+	-10.08 (-3.17)	**
# Observations	200		210	
R-Squared: within	0.552		0.511	
F test that all u_i=0	F(106, 87) = 2.34 Prob > F = 0.0000		F(108, 98) = 2.38 Prob > F = 0.0000	

+ p<.1, * p<.05, ** p<.01, *** p<.001

Initial Model: In the initial model (column 1) log of net inflows of FDI was the dependent variable, CPI, CPI squared, cost to start a business (in log form), strength of legal rights, and a dummy variable for members of OECD countries were the independent variable. GDP (in log form) played the role of a control variable. The results show the direction of anticipated coefficients all as expected (with the exception of being an OECD member) but very little was identified as statistically significant at the 10% level, except for the log of GDP and the square of the Corruption Perception Index(CPI).

Final Model: In the final model (column 2) log of net inflows of FDI was again the dependent variable. GDP (in log form) was again the control factor; and this time the independent variables were limited to

CPI and CPI squared. The same factors (CPI, CPI-squared, and the log of GDP) are statistically significant in the final model and very little was lost in R-squared as a result of removing the insignificant factors (R-squared went from 0.552 to 0.511.)

Results Interpretation: The CPI-squared term indicates is a curvature in the effect of an improvement in CPI. By this model, all else being equal, an increase in a low CPI is likely to lead to an increase in net inflows of Foreign direct investment when the CPI is under 62.3 (as 62.3 is where the positive effect of the predicted coefficient of CPI is equal to the negative effect of the predicted coefficient of CPI-squared).

This result implies that 86 of the 109 countries measured in 2003 and that 85 of the 109 countries measured in 2011 could theoretically increase their inflows of FDI by improving the way the world perceives their levels of corruption.

Analysis: The effect of corruption on economic growth on factors associated with economic growth such as FDI is difficult to tease out of the data due to a high level of correlation with other institutional factors that also affect investment preferences. Countries that have high corruption levels also tend to face significance challenges with institutional factors such as property rights, excessive red tape, and enforcement of contracts.

Higher confidence in results may be accessible with more detailed control factors such as quality of communication and transportation infrastructure.

Conclusions and Further Work

Conclusions

Based on this work we can conclude at a 90% level of confidence that perceived corruption has an effect on levels of net inflows of FDI, at least when corruption is perceived to be relatively high. Countries with very high levels of perceived corruption can expect to attract more FDI through the improvement of their perceived corruption.

Further Work

As our primary independent variable is the perception of corruption, we feel that net inflows of foreign direct investment is an excellent response variable as it is likely to be strongly affected by foreign perception of corruption.

However, corruption is expected to have negative impacts on other factors of the economy, as it channels resources from channels expected to benefit the country to channels expected to benefit the individual agents. It is certain to result in suboptimal allocation of governmental resources and would therefore be guaranteed to degrade economic performance. Although challenging, it would be enlightening to identify other corruption metrics and other responses that may be affected by actual corrupt transactions rather than only perception. As we move forward into the 21st century, more and more data is available from various types of electronic and networked sources. As more data and more types of data are available, access to pertinent data on both the extent of corruption and its effects are likely to become accessible for the analysis of this important problem.

Reference Information

Data Sources

World Bank

GDP:
http://data.worldbank.org/indicator/NY.GDP.MKTP.CD
Net Foreign Direct Investment:
http://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD
Strength of Legal Rights:
http://data.worldbank.org/indicator/IC.LGL.CRED.XQ

Transparency International

Corruption Perceptions Index:
http://www.transparency.org/research/cpi/

Doing Business:

Cost, time, number procedures required to start a business
http://www.doingbusiness.org/data/exploretopics/starting-a-business

OECD:

List of OECD Member countries - Ratification of the Convention on the OECD
http://www.oecd.org/general/listofoecdmembercountries-ratificationoftheconventionontheoecd.htm

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Appendix A Countries included in this analysis:

Albania	Cyprus	Israel	Netherlands	South Africa
Algeria	Czech Republic	Italy	New Zealand	Spain
Angola	Denmark	Jamaica	Nicaragua	Sri Lanka
Argentina	Dominican Republic	Japan	Nigeria	Sudan
Armenia	Ecuador	Jordan	Norway	Sweden
Australia	El Salvador	Kazakhstan	Oman	Switzerland
Austria	Estonia	Kenya	Pakistan	Tajikistan
Azerbaijan	Ethiopia	Kuwait	Panama	Tanzania
Bangladesh	Finland	Latvia	Papua New Guinea	Thailand
Belarus	France	Lebanon	Paraguay	Trinidad and Tobago
Belgium	Georgia	Lithuania	Peru	Tunisia
Bolivia	Germany	Luxembourg	Philippines	Turkey
Botswana	Ghana	Madagascar	Poland	Uganda
Brazil	Greece	Malawi	Portugal	Ukraine
Bulgaria	Guatemala	Malaysia	Qatar	United Arab Emirates
Cameroon	Haiti	Mali	Russian Federation	United Kingdom
Canada	Honduras	Mauritius	Saudi Arabia	Uruguay
Chile	Hungary	Mexico	Senegal	Uzbekistan
China	Iceland	Moldova	Serbia	Vietnam
Colombia	India	Morocco	Sierra Leone	Zambia
Costa Rica	Indonesia	Mozambique	Slovak Republic	Zimbabwe
Croatia	Ireland	Namibia	Slovenia	

As described above, all countries were included in the model where reliable data was available for CPI and the log of net inflows of foreign direct investment for both waves measured (2003/2004 and 2011/2012.)

Appendix B: Scatter Plot Matrix