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Corruption and Foreign Direct Investment. What kind of relationship is there?

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Corruption and Foreign Direct Investment
What kind of relationship is there?

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Abstract/Resumo:
Globalization and technological innovations create investment opportunities for firms worldwide. In fact, while firms pursue foreign direct investment (FDI) opportunities on a global basis, countries compete to attract these flows. Investment decisions by firms depend on complex and distinct factors. In particular, in the case of foreign investment one of these factors relates to the perception that investors have about the level of risk and/or corruption (or transparency) that characterises countries. Recent studies suggest that corruption negatively impacts on FDI and may act as a disincentive to investment.

By using information for 97 countries, concerning *inward FDI performance* and *perceived level of corruption*, this paper intends to analyse how corruption influences on the FDI. Given that a certain level of perceived corruption can, in fact, be subject to different subjective evaluations by investors, the paper uses a fuzzy logic approach in order to determine conceivable clusters in the FDI-corruption space.

The use of fuzzy clustering techniques reveals the existence of two well-defined clusters: one is formed by high-level corruption countries, where, indeed, corruption is negatively correlated, in a significant way, with FDI; the other is formed by low-level corruption countries, where the influence of corruption on FDI is not so evident.

Palavras-chave/Keyword: Corruption, Foreign Direct Investment, Fuzzy Clustering

Classificação JEL/JEL Classification: C49, E22, F21

1. Introduction and Motivation

For a number of reasons, the existence of transparent economic policies is an essential aspect for investors, especially for foreigners. A first reason results from the fact that the inexistence of transparency imposes supplementary costs to the firms, generally associated to the lack of available information about activities or even future intentions of some governmental departments, in special in relation to the policies of privatizations. Corruption also provokes supplementary costs to the firms, namely the ones that result from bribery,[1] despite being impossible to determine its effective economic cost. Thus, the selection of investment in what concerns the place of destination is, sometimes, biased because of elements of non-economic nature, particularly pressures, contacts and rent-seeking alliances. In short, the existence of a steady and actively legal framework against the corruption and the bribery can, in fact, represent a factor of attractiveness for foreign investments.

One second argument on the importance of transparent economic policies to the foreign investment has to do with the fact that those are able to facilitate the processes of cross-border mergers and acquisitions. In effect, the practice of the national entities that watch over for the firms competition, can promote discretionary acts, making impracticable many foreign investment projects based upon acquisitions. See, for instance, *Neven et al.* (1998).

Related to the competition policies is the fact that investors usually demand a steady and transparent legal framework in relation to the protection of the intellectual property rights (IPR). Plainly, taking into account the great importance of the intensity of the technology transfer in the scope of the multinationals activities, this reason becomes intuitive, whereas being also supported by some empirical literature. In effect, *Lee / Mansfield* (1996) and *Smith* (2001) found positive correlation between the strength of IPR protection and

[1] *Kaufmann et al.* (1999), on the basis of estimates obtained through branch offices of multinationals in diverse countries, concluded that the weight of the activities related to bribery in the GDP of countries as Albania, Latvia or Georgia varied between 7% and 15%.

the volume of U.S. FDI, being particularly significant in industrial activities with high intensity in R&D.

One another argument in favour of the transparency of the economic policies is related to its impact in business attitudes. Basically the literature recognises that firms take their decisions about external investment conditionally on their perception on 'fundamentals', which includes different macroeconomic variables as inflation, the perspectives of growth or the situation of the balance of payments.[2] In this context, the existence of clear and predictable economic policies associated with liberalizing regimes of trade and investment are potent (robust) instruments in the way to attract FDI flows (*Drabek / Payne* (2001)).

Finally, there is a basic reason for the association of transparent economic policies and reduced corruption, which results from the fact that the performance of these elements is often becoming accurately monitorised by international entities and rating agencies. In fact, these organizations have been publishing, in an increasing rhythm, country rankings, this information on countries dynamics and economic performances having a real impact on the investors' decisions. The empirical test that we perform in this paper is based on the relationship that is to exist between the country performances in terms of FDI attraction and the perception of the degree of corruption in a given moment of time.

Corruption is commonly considered as the misuse of public power for private benefit, thus affecting all the society, in special the less well-off stratus, and, in a well-known way, hampers business activity and economic development. In this way, corruption provokes a deregulation in the functioning of the market economies, distorts the processes of decision and, by this way, affects the rationality and the economic efficiency. Corruption becomes particularly significant in emergent or less developed economies (*Wilhelm* (2002)), resulting from the inexistence of a preventive legal framework, and having as a consequence, among others, a reduced effectiveness of the received international aid and the efficient allocation of domestic and external resources (*Transparency International* (2000)).

[2] See *Hoekman / Saggi* (1999) for a survey on the literature.

The questions related to corruption were during many years almost completely ignored by the relevant international business literature, not deserving great attention, in particular in the context of the theoretical approaches to the motivations and behaviours of the multinational corporations.[3] However, quite recently, these issues started to be considered an important aspect for the international business community, having been subject to some research (*Gordon / Miyake* (2001) and *Celentani et al*. (2004)).

The so-called OLI *Dunning's* (1988) paradigm constitutes a milestone reference in the theoretical and empirical approaches of the FDI. This paradigm is called as *Eclectic* because it bases the decision of the company in relation to their approach to the foreign markets in the fact that in each situation the company and countries (home and destination) should have, or not, three types of advantages: Ownership (O), Location (L) and Internalization (I). In this context, the firm decides to invest in a foreign country when, simultaneously, it possesses Ownership, Internalization and Location advantages.

The existence of ownership advantages reveals to be a basic condition so that the firm can explore it in any market. Moreover, the choice of the localization is conditional on the existence of structural market imperfections or from specific factor endowments, being particularly relevant for the firm, the risk that it incurs when dislocating to an 'unknown' market. Finally, firms internalize their markets of intermediate goods, whenever the existing costs of transaction in the markets surpass the coordination costs that the company supports for the internal accomplishment of this type of activities.

Later, under the light of the recent transformations in the international scenario, the economic and financial globalization it comes to recognize the necessity of a greater degree of firms competitiveness. Thus, the introduction of the concept of "Capitalism of Alliances", based in the mutual trust, commitments and the contractual obligations between partners, widens the original scope of the OLI Paradigm (*Dunning* (1995)).

[3] As *Boddewyn / Brewer* (1994) recognise.

In this sense, mutual trust may be a decisive instrumental issue for the potential success of the companies. Consequently, the inclusion of corruption issues turned to be considered in an explicit form, given its impacts on the confidence level of the agents. See *Voyer / Beamish* (2004).

The clarifying and analytical potential of the OLI Paradigm has been important to understand the multinationals behaviour, its usefulness being able to be strengthened by the inclusion of the notion of corruption and its impacts on FDI. In fact, taking into account the existence of corruption, which basically affects the Location dimension, the firms will try to reduce the degree of uncertainty associated with its entrance in a foreign market.[4]

Plainly, the investment decisions by firms depend on complex and distinct factors. In particular, in the case of foreign investment one of those factors relates to the perception that the investors have about the level of risk and/or corruption that characterises the countries. Further to the question: *Why is the CPI based on perceptions only?*, the *Transparency International*, itself, recognises that it is difficult to base comparative statements on the levels of corruption in different countries on hard empirical data. This clearly opens the field for an application of fuzzy logic, given its characteristics.

As is well-known, since the seminal paper of *Zadeh* (1965), fuzzy logic has undergone a tremendous growth, both in theoretical and applied fields. Far from being a surprise, despite the delay, a considerable number of applications of fuzzy logic in diverse fields of economics have been made; see, for instance, *Bagnoli / Smith* (1998) on real estate valuation or *Draeseke / Giles* (1999) on underground economy or *Landajo* (2000) on forecasting. The diversity of these applications is indeed a characteristic that indicates the richness of fuzzy logic. As fuzzy logic allows 'intermediate' values to be defined between conventional or crisp evaluations like yes/no, or true/false, the vagueness or subjectivity of concepts which it is believed characterise human thought is, thus, (more) easily taken into account. Hence, some other applications of

[4] See *Rodriguez et al.* (2005) and *Doh et al.* (2003).

fuzzy logic which take into account this characteristic of human reasoning have also been made. See, for instance, *West / Linster* (2003) on game theory or *Caleiro* (2005) on the relationship between confidence and unemployment.

Notwithstanding the above mentioned applications, given that one of the main concerns of fuzzy logic is to capture approximate rather than exact forms of reasoning, and this also characterises many economic situations, such as forming intrinsically subjective measures of risk, confidence, well-being, satisfaction, *etc.*, it is surprising that, to the best of our knowledge, so very few applications of fuzzy logic have been made in modelling how perceived corruption influences the decisions of investors, which are crucial for a certain level of FDI.

Due to incomplete information, economic agents, namely investors, may be characterised by a certain level of willingness to invest given a vague perception of the economic situation which, indeed, is generally measured by a reasonable amount of objective measures. That willingness to invest is a concept which cannot be defined precisely. This means that, when looking at the economic situation, even if all the information provided by those objective measures could be fully exploited, agents may still base their judgements on subjective criteria such as 'high' or 'large', 'normal' or 'mean' and 'low' or 'small' values for those objective variables. If this is the case, a fuzzy logic approach rather than a crisp one is (much) more appropriate. In fact, if one assumes that agents do not possess the ability to acquire, retain and process all the information needed to make crisp decisions as, for example, to sharply classify observed measures of corruption or risk as high, normal or low, and base their willingness to invest on that, then fuzzy logic is a natural way of dealing with this kind of situation in which the source of imprecision is the absence of crisp or rigid defined criteria of class memberships due to states of incomplete or imperfect knowledge.

The rest of the paper is structured as follows. Section 2 presents the methodological aspects related to the

data and the fuzzy logic technique. Section 3 analyses how corruption exerts influence on the FDI. Given that a certain level of perceived corruption can, in fact, be subject to different subjective evaluations by investors, the paper uses a fuzzy logic approach in order to determine conceivable clusters in the space FDI-corruption. Section 4 concludes.

2. Methodological issues

In this section we briefly present the methodological aspects related to the data and to the technique used in the paper.

2.1. The data

In what concerns the data, it will be considered an inward FDI performance index for the period 2001-2003 and a perception corruption index for the period 2000-2002.[5] See the appendix. The Inward FDI Performance Index ranks countries by the FDI they receive relative to their economic size. It is the ratio of a country's share in global FDI inflows to its share in global GDP, that is

$$IND_i = \frac{\frac{FDI_i}{FDI_w}}{\frac{GDP_i}{GDP_w}}$$

where IND_i is the inward FDI performance index of the *i-th* country, FDI_i is the FDI inflows in the *i-th* country, FDI_w is the world FDI inflows, GDP_i is the GDP in the *i-th* country and GDP_w is the world GDP. A value greater than one thus indicates that the country receives more FDI than its relative economic size, a value below one that it receives less (a negative value means that foreign investors disinvest in that period). The index thus captures the influence on FDI of factors other than market size, assuming that,

[5] Given that corruption is expected to exert influence on the investment decision but in a lagged way, this justifies the lag on the periods.

other things being equal, size is the 'base line' for attracting investment. These other factors can be diverse, ranging from the business climate, economic and political stability, the presence of natural resources, infrastructure, skills and technologies, to opportunities for participating in privatization or the effectiveness of FDI promotion.

Concerning the corruption data, in accordance to the *Transparency International* organization, the Corruption Perceptions Index (CPI) ranks the countries in terms of the degree to which corruption is perceived to exist among public officials and politicians.[6] It is a composite index, derived from 15 different polls and surveys from nine independent institutions carried out among business people and country analysts, including surveys of both residents and expatriates, both business people and risk analysts. The index provides a snapshot of the views of decision-makers, who take key *decisions on investment* and trade [italics added].

2.2. The fuzzy logic approach

Given that the purposes of the paper will be mainly achieved by the use of fuzzy clustering techniques, it is illuminating to start with a general discussion of this technique.

Consider U to be a universal set and A being a subset of U in the classical sense, that is $A \subseteq U$. Following the logic of crisp sets, the degree to which an element of U belongs to A is either 0 or 1. In other words, the characteristic function of A, $\mu_A : U \to \{0,1\}$, being defined as $\mu_A(x) = 1$ for $x \in A$, and $\mu_A(x) = 0$ for $x \notin A$, thus discriminates respectively between members and non-members of the crisp set. The generalisation to a fuzzy set is made by relaxing the strict separation between elements belonging

[6] Note that the CPI takes values in the interval [1,10] and that a lower value means a higher level of perceived corruption.

or not to A, allowing the degree of belonging/membership to take more than these two values, typically by allowing any value in the closed interval [0,1]. See, for instance, *Zimmermann* (1991) or *Chen* (1996).

The values then assigned by the membership function of a fuzzy set to the elements in the universal set indicate the membership grade or degree of adherence of each element in the set. Larger (smaller) values naturally indicate higher (lower) membership grades, degrees, or consistency between an element of the set and the full characteristics that the set describes.[7] Hence, using fuzzy logic, one can deal with reasoning like: 'the observed value for the corruption perception index, say 5, can be considered high, normal or low with some degrees of membership'.

In terms of fuzzy logic, 'high', 'normal' or 'low' values (for the variable under question) can be considered to be subjective categories, as economic agents often evaluate those concepts differently. In what follows, it will be assumed that investors consider to be relevant their relative perception of corruption (in accordance to some subjective categories) for their willingness to invest, therefore assuming an approximate or qualitative reasoning.

In the particular case of this paper, we will use this kind of fuzzy logic reasoning to construct clusters in the space (FDI, Corruption). This partition of the space can also be done in, say, a traditional/crisp way. The crisp/hard clusters algorithm tries to locate clusters in a multi-dimensional data space, *U*, such that each point or observation is assigned in that space to a particular cluster in accordance to a given criterion. Considering *c* clusters, the hard cluster technique is then based on a *c-partition* of the data space *U* into a family of clusters such that the set of clusters exhausts the whole universe, that a cluster can neither be empty nor contain all data samples, and that *none of the clusters overlap*.

[7] Although many authors defend that membership defines the degree of adherence rather than the probability of an event, some others consider that the membership function may be considered akin to a subjective probability distribution. See, for instance, *Chang / Stekler* (1977).

Formally, the *hard c-means* algorithm finds a centre in each cluster, minimising an objective function of a distance measure. The objective function depends on the (Euclidean) distances between data vectors u_k (k = 1, 2,..., K) and cluster centres c_i. The partitioned clusters are typically defined by a $c \times K$ binary characteristic matrix **M**, called the membership matrix, where each element m_{ik} is 1 if the kth data point u_k belongs to cluster i, and 0 otherwise. Since a data point can only belong to one cluster, the membership matrix **M** has the properties: (*i*) the sum of each column is one, and (*ii*) the sum of all elements is K.

The *fuzzy c-means* differs from hard c-means because it employs fuzzy partitioning, where a point can belong to several clusters with degrees of membership such that the membership matrix **M** is allowed to have elements in the range [0,1]. A point's total membership to all clusters, however, must always be equal to unity. In this sense, despite that, in formal terms, none of the fuzzy clusters overlap, the fact is that, in general, each data point is assigned to every cluster, although with different degrees of membership. Generally speaking, in visual terms, each data point is then associated to the particular cluster to which its degree of membership is higher.

3. How is FDI influenced by corruption?

In this section we analyse a possible influence of corruption on FDI. Figure 1 plots the data and at the same time shows the results from the fuzzy clustering technique.[8]

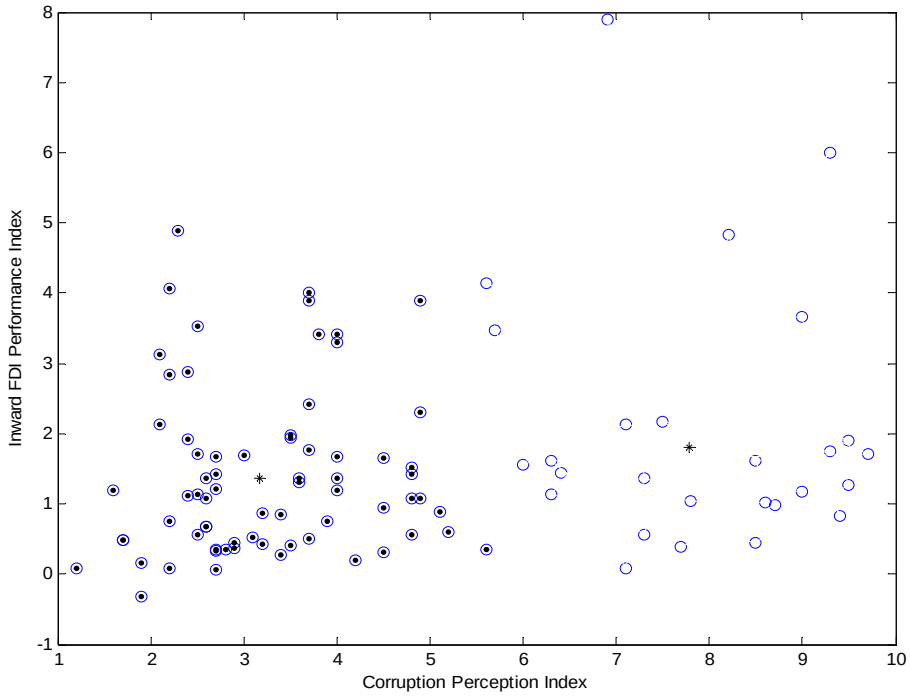
Plainly, there are two well-defined clusters (identified in figure 1 by the dotted circles and empty circles, whose centres are given by the black crosses), one being associated with the higher level of perceived corruption countries and another associated with the lower level perceived corruption countries.[9] In fact, the splitting of the countries clearly reflects the CPI values as it seams possible to separate the two groups of

[8] The fuzzy clustering technique was applied by the resource to the fuzzy toolbox in MATLAB.

[9] Again note that the higher is the CPI index the 'cleaner' is the country.

countries in accordance to a, say, critical level of perceived corruption around 5,6.

Fig. 1 – The fuzzy clustering results

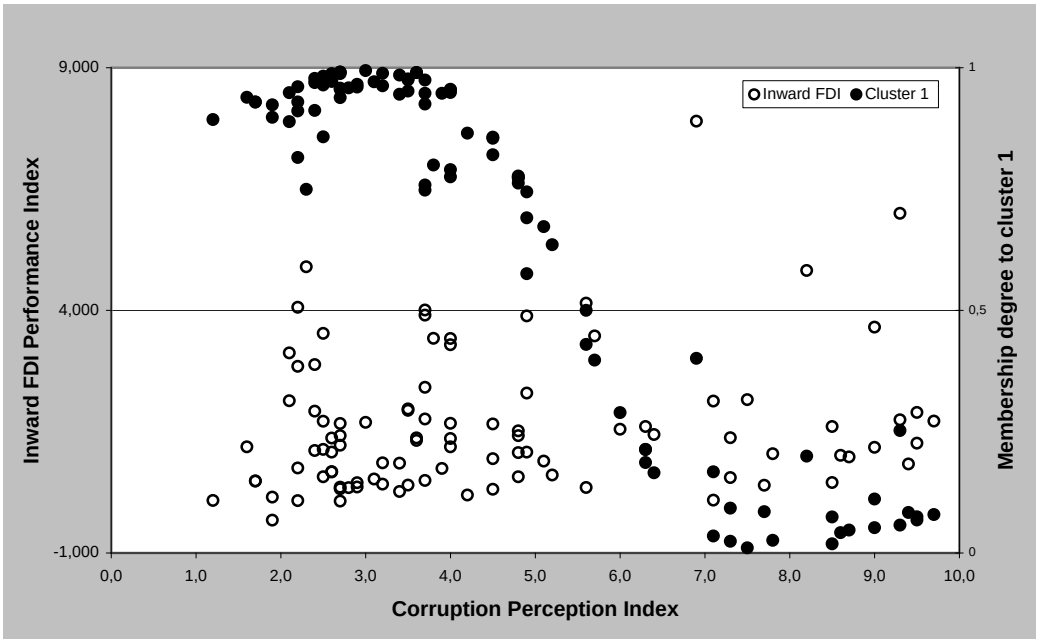


In accordance to the fuzzy clustering methodology, the fact that a particular given is associated to a particular cluster does not mean, in general, that its degree of membership to the other(s) cluster(s) is zero.[10] Figure 2 adds to figure 1 by explicitly showing the membership values to cluster 1 (the one identified by the dotted circles in figure 1).[11]

[10] In fact, the association of a country to a particular cluster simply means that the degree of membership to that cluster is the highest among all the membership values, *i.e.* for all clusters, of that country.

[11] Obviously, the membership degrees to cluster 2 (identified by the empty circles in figure 1) are the complement to 1 of those concerning cluster 1. See the appendix.

Fig. 2 – The membership degrees



Given the results of the fuzzy clustering, a natural way of proceeding is to verify how the corruption influences the FDI in the two clusters. Clearly for the cluster of higher perceived level of corruption, there is a significant influence of this factor on the FDI performance. The estimated slope for a straight line relating the two variables is of the magnitude 0.414 with an associated level of the *t*-student statistic of 9.497. For the cluster of less perceived corruption countries, the influence of corruption on the FDI is clearly not so evident – in fact, the slope of the straight line gets a *t*-student statistic of 0.215 – indicating that for a sufficiently low level of perceived corruption, other factors rather than corruption are certainly (more) relevant for the FDI.

4. Conclusions and directions for further research

To conclude we would like to stress the main lesson from our paper as a policy implication. In order *not* to be considered less attractive for foreign investors and, therefore, be penalised by that, countries do indeed benefit from increased levels of transparency in order to escape from the cluster of countries where perceived levels of corruption are higher. In other words, policy makers should make sure that their policies are transparent enough for potential foreign investors. After escaping from that cluster, the objective of attracting higher levels of FDI has to be crucially obtained by the use of other measures.

In the context of Dunning's work, we could understand the results of our empirical research as supporting the inclusion of corruption in the set of the relevant elements for the location tier. See *Dunning* (1988,1995).

Given that (perceived) corruption reflects a variety of factors – which are clear even in the way the CPI data is obtained – an interesting issue to be further explored is the analysis of the specific factors or components that assume a more significant role on the attraction of FDI flows.

An analysis of the dynamics of the components of corruption or even of corruption itself seems to be a quite plausible improvement as the *direction* assumed by policy makers towards more transparent policies may have a marginal impact on the attraction of FDI much more evident than one may expect by the analysis of the *absolute position* of corruption.[12] Plainly, the more those measures are assumed to be credible by foreign investors, the more that can be the case.

Finally, we consider this paper as a promising starting point for the analysis of the factors that reveal to be essential for FDI, either in an inward perspective or in an outward perspective, both in performance and potential measures. The combination of all these perspectives, in a dynamic way, is to be considered in future studies.

[12] Interestingly, the fact that the *direction* may be more important than the *position* is another reason for making it adequate to use fuzzy logic techniques. See Caleiro (2005).

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Appendix

	CPI	Inward FDI	Membership degree	
	2000-2002	2001-2003	Cluster 1	Cluster 2
Albania	2,5	1,714	0,9796	0,0204
Argentina	2,8	0,346	0,9584	0,0416
Australia	8,6	1,012	0,0418	0,9582
Austria	7,8	1,046	0,026	0,974
Bangladesh	1,2	0,083	0,8932	0,1068
Belarus	4,8	0,570	0,7621	0,2379
Bolivia	2,2	4,062	0,8149	0,1851
Botswana	6,4	1,440	0,1651	0,8349
Brazil	4,0	1,670	0,9489	0,0511
Bulgaria	4,0	3,291	0,7899	0,2101
Cameroon	2,2	0,750	0,9606	0,0394
Canada	9,0	1,177	0,0521	0,9479
Chile	7,5	2,161	0,0107	0,9893
China	3,5	1,969	0,9749	0,0251
Colombia	3,6	1,317	0,9899	0,0101
Costa Rica	4,5	1,659	0,8547	0,1453
Ivory Coast	2,7	1,220	0,9907	0,0093
Croatia	3,8	3,423	0,7996	0,2004
Czech Republic	3,7	3,900	0,7584	0,2416
Denmark	9,5	1,896	0,0681	0,9319
Dominican Republic	3,5	1,938	0,9768	0,0232
Ecuador	2,2	2,845	0,911	0,089
Egypt	3,4	0,265	0,9453	0,0547
El Salvador	3,4	0,849	0,9848	0,0152
Estonia	5,6	4,149	0,4297	0,5703
Ethiopia	3,5	0,399	0,9518	0,0482
Finland	9,7	1,718	0,0791	0,9209
France	6,3	1,606	0,1865	0,8135
Georgia	2,4	2,882	0,9119	0,0881
Germany	7,3	0,554	0,0925	0,9075
Ghana	3,9	0,743	0,9472	0,0528
Greece	4,2	0,193	0,8651	0,1349
Guatemala	2,5	0,570	0,9645	0,0355
Haiti	2,2	0,080	0,9295	0,0705
Honduras	2,7	1,416	0,9912	0,0088
Hong Kong, China	8,2	4,822	0,1996	0,8004
Hungary	4,9	2,296	0,6905	0,3095
Iceland	9,4	0,834	0,0833	0,9167
India	2,7	0,357	0,9577	0,0423
Indonesia	1,9	-0,324	0,8976	0,1024
Ireland	6,9	7,897	0,4012	0,5988
Israel	7,3	1,374	0,0242	0,9758

Italy	5,2	0,605	0,6353	0,3647
Jamaica	4,0	3,419	0,7752	0,2248
Japan	7,1	0,087	0,1673	0,8327
Jordan	4,5	0,941	0,857	0,143
Kazakhstan	2,3	4,897	0,7493	0,2507
Kenya	1,9	0,152	0,9236	0,0764
Latvia	3,7	1,760	0,9747	0,0253
Lithuania	4,8	1,517	0,772	0,228
Madagascar	1,7	0,483	0,9293	0,0707
Malawi	2,9	0,448	0,9658	0,0342
Malaysia	4,9	1,079	0,7439	0,2561
Mexico	3,6	1,373	0,99	0,01
Moldova	2,1	3,124	0,8887	0,1113
Morocco	3,7	2,413	0,9252	0,0748
Namibia	5,7	3,472	0,3974	0,6026
Netherlands	9,0	3,655	0,1112	0,8888
New Zealand	9,5	1,261	0,0747	0,9253
Nicaragua	2,5	3,524	0,8575	0,1425
Nigeria	1,6	1,187	0,9389	0,0611
Norway	8,5	0,452	0,0742	0,9258
Pakistan	2,6	0,668	0,972	0,028
Panama	3,0	1,692	0,9939	0,0061
Paraguay	1,7	0,480	0,9292	0,0708
Peru	4,0	1,358	0,9554	0,0446
Philippines	2,6	0,675	0,9723	0,0277
Poland	4,0	1,188	0,9541	0,0459
Portugal	6,3	1,135	0,2132	0,7868
Romania	2,6	1,367	0,9879	0,0121
Russia	2,7	0,322	0,9555	0,0445
Senegal	3,1	0,525	0,971	0,029
Singapore	9,3	6,000	0,2522	0,7478
Slovakia	3,7	4,008	0,7476	0,2524
Slovenia	6,0	1,550	0,2891	0,7109
South Africa	4,8	1,069	0,7767	0,2233
South Korea	4,5	0,314	0,8206	0,1794
Spain	7,1	2,129	0,0349	0,9651
Sri Lanka	3,7	0,495	0,9473	0,0527
Sweden	9,3	1,745	0,0574	0,9426
Switzerland	8,5	1,606	0,0189	0,9811
Taiwan, China	5,6	0,350	0,5	0,5
Tanzania	2,7	1,668	0,9877	0,0123
Thailand	3,2	0,858	0,9886	0,0114
Trinidad and Tobago	4,9	3,886	0,5755	0,4245
Tunisia	4,8	1,417	0,7747	0,2253
Turkey	3,2	0,418	0,9627	0,0373
Uganda	2,1	2,137	0,9485	0,0515
Ukraine	2,4	1,110	0,9779	0,0221

United Kingdom	8,7	0,980	0,047	0,953
United States	7,7	0,396	0,0851	0,9149
Uruguay	5,1	0,893	0,6726	0,3274
Uzbekistan	2,9	0,360	0,9601	0,0399
Venezuela	2,5	1,134	0,9824	0,0176
Vietnam	2,4	1,923	0,9693	0,0307
Zambia	2,6	1,078	0,9852	0,0148
Zimbabwe	2,7	0,069	0,9384	0,0616

Data sources:
FDI – UNCTAD database; **CPI** – Transparency International database