ON DETERMINANTS OF FOREIGN DIRECT INVESTMENT IN TRANSITION ECONOMIES*

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Abstract

Foreign direct investment (FDI) brings host countries capital, productive facilities and technology transfers, as well as new jobs and management expertise. Thus it is important to understand why in many countries FDI inflow is lower than expected. The goal of this study is to explore some important factors determining flow of FDI into transition countries. In particular, we analyze the legal environment for FDI in some transition economies. Then we model the impact of stability of the economic and legal environment on the pattern of FDI. Our analysis shows that (i) higher variability of basic macroeconomic fundamentals reduces the flow of FDI, (ii) high volatility of fiscal and business regulations makes the inflow of FDI smaller, and (iii) macroeconomic and legal instability leads to adverse selection of the investors. Based on theoretical findings we formulate a clear message to policy makers stating that in order to expect significant flow of long term and non-speculative foreign capital, first of all, a stable economic and institutional environment is needed.

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1. Introduction

Centrally planned economies were ruled over decades by means of the plan, which set output goals for all sectors of the economy. This system, maintained artificially for years, brought all related countries to serious economic crisis. Political and market reforms introduced in these countries in the early 1990s changed the situation drastically. However, they were accompanied by a sharp decline in economic activity. At that time an increasing openness of the transition countries led to significant increases in foreign direct investment (FDI). As mentioned by Resmini (2000) in the early 1990s FDI to Central and Eastern European (CEE) countries increased almost exponentially.

It has been showed that among the developing and transition countries of both Europe and Asia, the fastest growing ones are the biggest recipients of FDI (see World Investment Report 2002: Transnational Corporations and Export Competitiveness). The empirical evidence suggests that for emerging economies, a one percentage point increase in FDI (measured as a proportion of GDP) leads, *ceteris paribus*, to an extra 0.8 percentage point increase in per-capita income (Bergsman, Broadman and Drebentsov, 2000). Moreover, FDI brings at least four things of value: financial capital, management skills, technology, and access to export markets, and therefore helps to sustain growth. Consequently, after the decade of transition, FDI is still at the forefront of economic policy decisions in most of the countries involved in market reforms.

In the analysis presented in this paper we will focus on the links between macroeconomic and legal stability, and the inflow of FDI. These relations seem to be of great importance when multinational enterprises have to choose an investment location, and when several countries offer similar conditions to attract FDI. Furthermore, we intend to show that increased macroeconomic and legal instability leads to adverse selection of the investors and

prove that in order to expect significant inflow of long term, and non-speculative, foreign capital a stable economic and legal environment is needed.

The paper is organized as follows. In Section 2 we discuss the impact of different factors on the flow of FDI with special attention devoted to transition economies. Section 3 focuses on the FDI environment in transition economies. In particular we discuss the development of a legislative framework in two former Soviet Union (FSU) countries: Georgia and Kyrgyzstan. We focus on these as contrary to CEE countries, FSU states are far less successful in attracting potential investors, and the FDI flows to these countries are much less than might be expected (see Holland and Pain, 1998, Resmini, 2000, Cukrowski and Mogilevsky, 2001, Cukrowski and Kavelashvili, 2001). We find that the legal environment for business in the above mentioned countries is subject to frequent and significant changes. In Section 4, we present and analyze a model of FDI decision-making under an uncertain macroeconomic and legal environment. Section 5 concludes with recommendations for policy makers. The Appendix contains formal proofs of all Propositions.

The model presented in Section 4, is closely related to the model analyzed by Sung and Lapan (2000), with some important differences. First, contrary to Sung and Lapan, we assume that the firm is risk averse. Research (Sandmo, 1971, Leland, 1972, Lim, 1980) shows that this is a much more realistic assumption. Second, Sung and Lapan analyze only exchange rate uncertainty, whilst we consider both exchange rate and marginal cost uncertainty. The third difference is to do with the role of fixed costs. Sung and Lapan treat these as sunk costs, which have to be spent before the investment takes place. In our model we treat these costs as setup (recoverable) costs.

In another related paper Goldberg and Kolstad (1995) analyze the implications of short-term exchange rate variability with regard to FDI flows assuming that investors are risk-averse. They use a two-period model of the intertemporal decision making of the producer to

demonstrate how current expectations of future exchange rate variability determine the production levels in the home versus foreign plant. Hence, contrary to our approach, Goldberg and Kolstad assume that the location decision has been already made (there are plants in both home and foreign country); the only choice of the company is how much to produce in each plant. They find that exchange rate volatility decreases the overall production, but the effect on the absolute level of FDI is unclear.

2. Factors determining FDI in transition economies

There has already been a great deal of discussion about the factors that determine the FDI flows towards transition countries. The existing literature includes a large number of surveys and case studies (see, for example Lankes and Venables, 1996, Boros-Torstila, 1999 and Resmini, 2000), and a number of econometric studies (Lansbury *et al.*, 1996, Wang and Swain, 1995, Holland and Pain, 1998, and Woodward *et al.*, 1997). In general, they conclude that the main factors, which have driven FDI in transition countries, have been a need to secure market access, opportunity to participate in large scale privatization process and the degree of political and economic stability. It is widely agreed that FDI takes place when three sets of determining factors exist simultaneously (Dunning, 1993, Rugman, 1998):

- *Ownership specific advantages* (of property rights and intangible assets). These arise from the firm's size and access to markets and resources, the firm's ability to co-ordinate complementary activities, such as manufacturing and distribution, and the ability to exploit differences between countries.
- *Internalization incentive advantages,* which arise from exploiting imperfections in external markets. These include the reduction of uncertainty and transactions costs in order to generate knowledge more efficiently; and the reduction of state-generated imperfections such as tariffs, foreign exchange controls and subsidies.

- *Location specific advantages*, which include differences in country natural endowments, transport costs, macroeconomic stability (see Bailey and Tavlas (1991), Cushman (1985), Goldberg and Kolstad (1995), Sung and Lapan (2000)), cultural factors and government regulations. These help determine which countries are host to multinational enterprises' foreign production.

If only the first condition is met, firms will rely on exports, licensing or the sale of patents, to service a foreign market. In the presence of internalization incentives (e.g. protection from supply disruptions and price hikes, lack of suitable licensee and economies of common governance) FDI becomes the preferred mode of servicing foreign markets, but only if location-specific advantages are present. Within the trinity of conditions for FDI to occur, *locational determinants* are the only ones that host governments can influence directly (World Investment Report: Trends and Determinants (1998)).

Whereas it has not been possible to arrange firms' locational-specific decisions into a uniform theoretical pattern so far, the literature cites a large number of very different factors that impact on business potential and the risks associated with individual locations. They can be grouped into three broad categories: (i) *national policy framework for FDI*, (ii) *business facilitation*, and (iii) *economic motives.* The most important determinants for the location of FDI are economic considerations. They come into full play once an enabling FDI policy framework is in place. Following from the principal motivations for investing in foreign countries, economic determinants can be grouped into three clusters: (i) resource-seeking, (ii) market-seeking, and (iii) efficiency-seeking. Availability of natural resources**,** cheap (unskilled or semi-skilled) labor, creative assets and physical infrastructure promotes *resource-seeking activities*.

Historically, the most important host country determinant of FDI has been the availability of natural resources, for example minerals, raw materials and agricultural

products. Up to the Second World War, about 60% of the world stock of FDI was in natural resources. However, by itself, the presence of natural resources was not sufficient for FDI to take place. Comparative advantage in natural resources usually gave rise to trade rather than to FDI. Investment took place when resource-abundant countries either lacked the large amounts of capital typically required for resource-extraction, or did not have the technical skills needed to extract or sell raw materials to the rest of the world (Dunning, 1993). In addition, infrastructure facilities for exporting the raw materials to their final destination had to be in place or needed to be created (see World Investment Report 1998: Trends and Determinants).

Labor-seeking investment is usually undertaken by manufacturing and service multinational enterprises from countries with high real labor costs. These enterprises set up, or acquire, subsidiaries in countries with lower real labor costs to supply labor-intensive intermediate or final products. Frequently, to attract such production, host countries have set up free trade or export processing zones (Dunning, 1993). Another highly important determinants of FDI are known as *market factors*, which are market size, in absolute terms as well as in relation to the size and income of its population, and market growth. For firms, new markets provide a chance to stay competitive and grow within the industry as well as achieve scale and scope economies. The motivation of *efficiency seeking FDI* is to rationalize the structure of established resource based, or market-seeking, investment in such a way that the investing company can gain from the common governance of geographically dispersed activities. The intention of the efficiency seeking firms is to take advantage of different factor endowments, cultures, institutional arrangements, economic systems and policies, and market structures by concentrating production in a limited number of locations to supply multiple markets. Moreover, in order for efficiency seeking foreign production to take place, the

macroeconomic and political situation has to be stable, cross-border markets must be both well developed and open (Dunning, 1993, Rugman, 1998).

By definition, multinational firms face variability of basic macroeconomic variables (inflation, budget deficit, balance of payments, *etc*.) across countries. As such, volatility of macroeconomic policy creates both problems and opportunities for international firms, requiring them to manage the risk inherent in volatile countries, but also presenting the opportunity of moving production to lower cost facilities.

A particular kind of macroeconomic instability is that of exchange rate volatility. Following the collapse of the Bretton Woods system, exchange rates have fluctuated freely, and their volatility has exceeded prior expectations. The exchange-rate crisis in Russia during 1998 is a clear example of this. If exchange-rate changes merely offset price movements so that real purchasing power parity is maintained, the exchange-rate movements would have little real effects. Nevertheless, there is empirical evidence to indicate that purchasing power parity does not hold for all time periods (see Figure 1), and thus exchange-rate changes can affect the competitiveness of plants in different countries.

Figure 1 about here

However, exchange rate volatility is not the only source of variability of basic macroeconomic fundamentals that affects the flows of FDI. Another important factor is the stability of basic macroeconomic policies (fiscal and social policy), which significantly affects firms' costs. Having other things equal, stability may be a key factor determining not only the flow of foreign direct investment, but also the type of investors (speculative versus long-term investors).

Contrary to the main stream of economic literature on FDI, in the analysis presented in this paper we will focus on the link between macroeconomic and institutional stability and inflows of FDI. These factors seem to be of great importance when multinational enterprises have to choose an investment location, especially when several countries are offering similar conditions to attract FDI.

3. Volatility of institutional environment in transitional economies

Forming a legal base of a market economy, became a priority task in all transition countries from the very beginning of the reform process. Although legal changes accompanying market reforms started at the beginning of 1990's, in the second half of the decade in many transition countries in such important sectors of economic activity as banking and finance, intellectual property rights, international trade, the old communist legislation prevailed. Several FSU countries still did not manage to fill the legal vacuum resulting from the collapse of the USSR. New regulatory acts developed in FSU countries are either prepared by non experienced local legislators, or are replicas of the respective laws of the Russian Federation. Therefore, they do not reflect the specific social, economic and political conditions of new republics. Consequently, it is quite common that already prevailing laws are frequently revised, in short periods of time. As an example, the development of new legislative acts in Georgia in the 1990's[1] is presented in Figure.2.

Figure 2 about here

[1] See Cukrowski and Kavelashvili (2001) for the detail analysis of legislative changes in Georgia.

Deeper analysis of the changes in legislation has been undertaken by Mogilevsky and Khasanov (2001) in the Kyrgyz Republic. The authors estimated the legislative stability in the last decade taking into account the number of amendments introduced into the adopted laws, and the number of laws having become invalid. They constructed a simple index (the *legal environment stability index*) as: $(N_A+N_I)/N$, where N_A is the number of amendments, which were introduced into the law in the succeeding periods; N_I is the number of laws having become invalid; N is the number of the adopted laws. They applied this index to eight sectors of economic legislation: (i) enterprises and business activity, (ii) banks and securities, (iii) tax system, (iv) customs legislation, (v) budget legislation, (vi) foreign economic relations, (vii) trade and antimonopoly legislation, (viii) book keeping and financial control. The analysis was carried out with regard to Laws, Decrees of the President and Resolutions of the Government of the Kyrgyz Republic. The results show that the legislation which directly affected the activity of enterprises and business, was subject to the most frequent changes (Figure 3). Actually every second document was subject to amendments or additions. Practically the same indicators show the situation in the tax legislation, customs legislation and the legislation regulating foreign economic activity.

Figure. 3 about here.

It must be stressed, however, that the new regulations are also far from perfect. In many cases enforcement of legislation is hampered by ambiguity of the legal texts. Legal problems may take a number of forms including: imprecise definitions of terms; imprecise drafting of laws which makes two or more interpretations possible; contradictory drafting in different laws; technical errors; and subsidiary implementing regulations not consistent with

governing law. All of this creates an uncertainty with regard to the prevailing legal environment in these countries, and acts as hindrance to business activity.

To summarize: there have been permanent and serious changes in the legal environment. The most significant amendments have been introduced into legislation, which creates foundations for the development of strategic policies of domestic enterprises and potential investors. Investment regulations are unstable and enforcement of new laws is still problematic.

4. Investment in Unstable Environment

The Model

In this section we present a formal model describing the process of decision-making concerning direct investment in a country with an unstable macroeconomic and legal environment. The purpose of the model is to show the impact of business uncertainty on the decisions of foreign firms concerning FDI, so that, in order to focus directly on the problem we do not include explicitly into the model a number of issues related to underdeveloped infrastructure and banking systems, bureaucracy or widespread corruption, which are undoubtedly taken into account in the process of FDI decision making.

To keep the problem simple, we focus on a single commodity market in a host country. Assume that this particular commodity is not produced in the domestic country, but demand is satisfied by imports. Suppose that the unit price of this commodity, P_{world}, is determined in the world market and is expressed in foreign currency (US dollars). Suppose now, that there exists a foreign firm, which considers the possibility to produce the commodity in a plant, located in the host country. The alternative is to build a foreign plant, located in the foreign country (home country for the foreign firm). Note that we use the following convention: **home** or **host plant** refers to the plant located in the host country for

FDI; **foreign plant** is the plant located in the foreign country (home country for foreign firm). We assume that each plant exhibits decreasing average cost, so that in a deterministic setting only one plant will be built. More specifically: (1) there are fixed costs connected with operating of each plant, (2) marginal production cost is constant in each plant. Therefore, the cost functions are specified as $C(x)=cx+F$ for the home plant and $C_f(x)=c_f x+F_f$ for the foreign plant where c, c_f denote marginal costs, F, F_f are fixed costs and x denotes output. Costs of the home plant are expressed in domestic currency and do not depend on the exchange rate (i.e., we assume that only local resources are used in the production process). Costs of the foreign plant are expressed in foreign currency.[2]

Since the commodity can be sold at the world price, every plant faces perfectly elastic demand and can sell any volume produced at the market price P_{world}. Consequently, in the fully deterministic case, profits created by the home plant, expressed in domestic currency, are determined as

$$\pi(x) = (1/e)\mathrm{P}_{\mathrm{world}}x - cx - F ,$$

where e denotes exchange rate of the foreign currency in the host country (expressed as a number of units of foreign currency for one unit of local currency). Analogously, profits of the foreign plant, expressed in foreign currency are

$$\pi_f(x) = P_{world}\,x - c_f\,x - F_f. \qquad (1)$$

We additionally assume that technical possibilities constraint the capacity of each plant, hence the output produced, x, cannot be greater than maximum capacity, K.

In order to determine the home plant's profits (knowing the demand curve and the price of the commodity unit in the world market) one has to know estimations of exchange rate and production cost, that, in general, depend on a number of macroeconomic indicators

[2] Similar approach is presented by Sung and Lapan (2000) but they define F as a sunk cost which have to be spent before the production takes place.

and legal regulations. In particular, the exchange rate is influenced by the budget deficit, level of foreign reserves, balance of payments deficit, inflation, *etc*. On the other hand, tax codes and other judicial regulations, determine a number of items included in the calculation of the cost of production, such as for example

- costs incurred in the start-up and implementation of production;
- costs incurred in connection with the production process (materials, tooling, current maintenance *etc*.);
- costs for environmental protection measures;
- expenses associated with the management of the production process: mandatory audits, certification of products and business trips (within the limits stipulated by law);
- salaries and wages expenses;
- training and retraining of employees expenses;
- expenses associated with mandatory social security and pension payments and for voluntary social benefits provided to employees (cafeterias, transportation services *etc*.);
- depreciation of fixed and intangible assets;
- costs incurred in marketing and selling products; and
- payments for banking services.

Usually, estimates of basic macroeconomic indicators are based on official forecasts of Ministry of Finance, National Statistical Committee, National Bank, predictions of investment banks, organizations involved in economic research, and own intuition of analysts and decision makers. Typically, all these forecasts differ (often significantly). Moreover, the legal framework in most of the transition economies is not stable. Therefore, the decision concerning FDI is made in an uncertain environment (i.e., based on the number of predictions

and forecasts). In the present model, we assume that in each subsequent period the firm faces only exchange rate uncertainty (resulting from an unstable macroeconomic environment), and uncertainty about the marginal cost of production (resulting from unstable legislation). Since for each forecast there exists a certain probability that it will be the true value, exchange rate and marginal cost of production are considered as random variables, described by certain probability distributions (known at the moment of decision making).

In the simplest case, the firm's expectations concerning the exchange rate and marginal costs of production in the host country, are specified in the form of two probability distributions: exchange rate probability distribution and marginal cost probability distribution. For simplicity we assume that the two random variables under consideration are independent. Moreover, we assume that firms are managed according to the wishes of their owners who are typical risk-averse asset holders, and the decisions in each firm are made by a group of decision-makers with sufficiently similar preferences to guarantee the existence of a group-preference function, representable by a strictly concave von Neuman-Morgenstern utility function.[3]

Making decisions about the volume of output, the risk-averse firm does not maximize profit, but instead it maximizes expected utility from profit (because lower profit with lower risk could be sometimes better for a firm than higher profit with higher risk). Therefore, in making investment decisions the foreign firm has to compare expected utility of profits from the investment considered (expressed in foreign currency) with the cost of this investment (in foreign currency). Formally, we can say that the foreign firm, when contemplating opening the plant in the home country, analyses the value specified by the expression $U(e\pi(x))$, where $e\pi(x)$ are profits from the home plant denominated in foreign currency. When the firm considers opening the plant in its own country, the profits are fully deterministic and given by expression

[3] See Sandmo (1971) for discussion.

(1), hence the utility function value is $U(\pi_f(x_f))$, where x_f is the optimal level of output produced. In order to make a decision in which country the plant should be built, the firm compares the maximum of expected utility $U(e\pi(x))$, with the target value $U(\pi_f(x_f))$. We will further assume that the optimal volume of production in the foreign plant is equal to K, i.e., all available capacity is used. This stems from the plausible assumption that $P_{world} > c_f$. Denote $\pi_f(K)$ by π_f^*, then the target value is equal to $U(\pi_f^*)$.

More specifically, the decisions of the firm concerning the possibility of building the new plant are made in the following sequence: (1) the firm learns about the probability distributions of the exchange rate and marginal costs in the host country; (2) the firm finds the optimal value of production x^*, which maximizes the expected utility $U(e\pi(x))$, for the plant built in the host country; (3) if the level of utility computed in (2) is higher than the target value $U(\pi_f^*)$, the firm builds a new plant in the host country, otherwise the new plant is built in foreign country; (4) the values of e and c are realized.

Basic results

It is clear for the plant built in the host country that the expected utility from profit increases if

- the expected value of the exchange rate decreases (local currency becomes more expensive),[4] and/or
- the expected value of marginal cost of production decreases.

It is not obvious, however, how the expected utility from profit depends (if at all) on the variability of the exchange rate and marginal cost of production.

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[4] Assuming that the exchange rate does not affect the cost of production.

In the analysis which follows we understand increasing the variability of any random variable X as passing from X to a new random variable, defined as $Y=E(X)+a(X-E(X))$, where a is a constant coefficient ($a>1$). This means that the new variable has the same expected value and the same "shape" of distribution function, but larger variance.[5] Based on such understanding of variability change we have the following basic propositions:

PROPOSITION 1. *If the variability of the exchange rate in the host country increases or the variability of marginal costs c increases, then the expected utility from investing in the host country decreases.*

Proof : See Appendix.

From Proposition 1 we can immediately get two important corollaries.

COROLLARY 1. *If the expected variability of marginal costs in home plant is high enough, then the company will choose not to invest in the host country but to build a plant in the foreign country. This is also true when marginal costs in the foreign plant are higher than the expected value of marginal costs of the home plant (expressed in foreign currency).*

Note that Corollary 1 implies that even if the expected marginal costs are lower in the home plant, high variability of those costs may prevent the risk averse company from investing in the host country. Thus, building a foreign plant can be perceived as an "insurance" against marginal cost volatility.

[5] This is consistent with Sandmo (1971). Similarly, $a<1$ reflects decreasing the variability.

COROLLARY 2. *If the exchange rate variability is high enough, the company will not invest in the host country, but to build a plant in the foreign country instead. This is also true when the marginal costs of the foreign plant are higher than expected marginal costs of the home plant (expressed in foreign currency) and when the fixed costs of the foreign plant are higher than the fixed costs of the home plant (expressed in foreign currency).*

Note that Corollary 2, similarly to Corollary 1, implies that the firm can ignore better business opportunities in the host country (expressed by lower marginal and fixed costs), if it expects a high variability of the exchange rate. Therefore, it is vital for the home government to introduce stable macroeconomic environment in order to induce flows of FDI.

We can summarize Corollaries 1 and 2 in the following way:

Economic stability (reduction of the variability of forecasted variables) stimulates the inflow of foreign direct investment to the country, and vice versa, economic instability reduces inflow of foreign direct investment to the country.

Our next result focuses on the link between willingness to invest in the host country and the investor's attitude towards risk (degree of risk aversion). We show that an unstable economic situation, characterized by exchange rate uncertainty (or/and marginal costs uncertainty), leads to the adverse selection of investors, i.e., only firms with lower degree of risk aversion are willing to be engaged in FDI. We define a higher degree of risk aversion in a standard way, as connected with larger value of Arrow-Pratt coefficient of absolute risk aversion r_A. Formally, firm 1 with expected utility function U_1 is more risk averse than firm 2 with expected utility function U_2, if for every value of profit π we have $r_A(U_1(\pi)) \geq r_A(U_2(\pi))$.

PROPOSITION 2. Higher level of risk aversion leads to a lower likelihood of investing in the host country. More precisely:

1. *If a given firm decides to invest in the host country, any less risk averse firm would invest in the host country too.*
2. *If a given firm decides not to invest in the host country (but to built the plant in the foreign country instead), any more risk averse firm would not invest in the host country either.*

Proof: See Appendix.

5. Conclusions and Policy Recommendations

The discussion and presented formal model form a clear policy recommendation: legal and macroeconomic stability is a crucial factor in stimulating FDI flows to the host country. Another important issue is related to the problem of attracting "proper" investors, which are focused not on risky buying/selling operations, but, instead, on stable long term investments. As it has been argued in the model, firms in reality are not neutral towards risk but instead they are risk averse. However, not all firms are identical with regard to risk aversion. In the analysis presented in the paper we show that the likelihood of investment in the country is inversely related to the degree of risk aversion of the potential investor. Consequently, it may happen that the value of the expected utility from future profits could be too small for serious long-term investors (characterized by high risk aversion), but it could be satisfactory for less risk averse firms (or risk loving firms), which are more interested in speculative buying/selling transactions than in long term investment. Hence, the unstable economic situation may result in adverse selection of investors, i.e., it may happen that only firms interested in short run speculative transactions are ready to invest in the host country.

A caveat to this analysis, is that we focused only on two random variables. However, the probability distribution of the exchange rate depends upon a number of macroeconomic variables (including forecasted variables), such as inflation, budget deficit, trade deficit, balance of payments deficit, *etc*. Similarly, the probability distribution of marginal production costs depends upon the expected distribution of tax burdens, social payments, level of wages, corruption *etc.* Our arguments can be generalized to show that increased variability of any of those variables would lead to a decrease in expected utility, and hence of expected FDI inflows.

On the other hand, it is also necessary to take into account other factors that may increase the value of the expected utility from profit, and consequently, that may affect the results of FDI decision-making, such as:

- size of the market (increase in market size can be achieved by reduction of trade barriers, and participation in regional trade/custom unions),
- infrastructure (improvement in infrastructure may reduce production, transportation or communication costs),
- FDI legal framework (increase in transparency and reduction of the possibility of different understanding of legal regulations can reduce corruption, and consequently, cost of the investment as a whole),
- time requirements and complexity of bureaucratic procedures (extensive bureaucratic procedures lead to ineffective utilization of financial resources, and therefore, corresponding changes may decrease the cost of investment).

Finally, it must be mentioned that recent research in the area of FDI under uncertainty shows that there is a strong link between these two phenomena. Although, as presented in this paper, uncertainty in the host market harms the flow of FDI, it may be that uncertainty in the foreign (investor's home market) is a principal motive for FDI in other countries. In particular, as shown by Cukrowski and Aksen (2002), a flow of FDI does not need to be explained by any

specific factor such as location advantage or ownership advantage, but it is a natural process driven by rational behavior of perfectly competitive firms operating in uncertain environment.

Appendix

Proof of Proposition 1

As both the exchange rate *e* and the marginal cost enter the profit random variable $\pi_h(x)$ linearly, the proof is the same for both cases. We write in detail the case of *e*. Let $e_a = E(e) + a(e - E(e))$, for $a > 1$. The profit $\pi_{h,a}(x)$ associated with the new exchange rate is equal $\pi_{h,a}(x) = E(\pi_h(x)) + a(\pi_h(x) - E(\pi_h(x)))$. Therefore Lemma 1 applies and yields, for any production level *x* ,

$$E(U(\pi_{h,a}(x))) < E(U(\pi_h(x))),$$

and therefore

$$\sup_{0 \le x \le K} E\left(U\left(\pi_{h,a}(x)\right)\right) < \sup_{0 \le x \le K} E\left(U\left(\pi_h(x)\right)\right),$$

as claimed.

QED

Lemma 1. Let U be twice differentiable and strictly concave function, and X be any non constant random variable. Then, for positive number a, the expected value $U(E(X) + a(X - E(X)))$ *is a decreasing function of parameter a.*

Proof.

First note that without loss of generality we can assume $E(X) = 0$. Indeed, passing then to the general case is equivalent to using $U_1(s) = U(E(X) + s)$ in place of *U*, and U_1 is also strictly concave. Denoting now $h(a) = E(U(aX))$, we have to show that $h(a)$ is a decreasing function of *a*. Observe that $h'(a) = E(XU'(aX))$, where the prime denotes the first derivative. Taking into account that $E(X) = 0$ and rearranging, the last expression can be represented as

$$h'(a) = E((X - E(X))(U'(aX) - E(U'(aX)))).$$

Now we show that for any two increasing functions *f* and *g* the inequality

(A.1) $$E\left[\left(f(X)-E(f(X))\right)\left(g(X)-E(g(X))\right)\right]>0$$

holds. This will yield the Lemma since, plugging in $f(X)=X$ and $g(X)=-U'(X)$ (note that both are increasing) we find that $h'(a)<0$.

To show (A.1) we take another realization *Y* of random variable *X* (i.e., random variable Y is distributed according to the same distribution as random variable X), with the product probability measure, and note that

(A.2) $$E\left[\left(f(X)-f(Y)\right)\left(g(X)-g(Y)\right)\right]$$

is positive, since either

(i) $X>Y$, and then both factors $f(X)-f(Y)$ and $g(X)-g(Y)$ are positive,

or

(ii) $X<Y$, and then both factors $f(X)-f(Y)$ and $g(X)-g(Y)$ are negative,

So that in either way the product is positive and its expected value as well. It is easy to show that the integral in (A.1) over the diagonal X=Y is equal zero and does not contribute to the expected value.

Rearranging (A.2), and taking into account that Y is another realization *Y* of random variable *X*, we compute

(A.3) $$E\left[\left(f(X)-f(Y)\right)\left(g(X)-g(Y)\right)\right]=2E\left[f(X)g(X)\right]-2E\left[f(X)\right]E\left[g(Y)\right].$$

On the other hand we can rewrite the left hand side of (A.1) as

(A.4) $$E\left[\left(f(X)-E(f(X))\right)\left(g(X)-E(g(X))\right)\right]=E\left[f(X)g(X)\right]-E\left[f(X)\right]E\left[g(X)\right].$$

Since left hand side of (A.3) is positive, expression (A.4) is positive as well, and thus (A.1) is proved.

Q.E.D.

Proof of Proposition 2

According to the Proposition 6.C.2 from Mas Collel *et al*. (1995), higher degree of risk aversion of firm 1, as compared to firm 2, is equivalent to the following implication: for any random variable W and any fixed (riskless) value w_0 *:*

If $E(U_1(W)) \geq U_1(w_0)$ *, then also* $E(U_2(W)) \geq U_2(w_0)$.

If less risk-averse firm 1 decides to invest in the host country, this means that

$\sup_{0 \leq x \leq K} E\left(U_1\left(\pi_h(x)\right)\right) \geq U_1(\pi_f^*)$.

Let x^* be the value of output for which the maximum is realized. Assuming that firm 2 is more risk averse than firm 1, by the implication just cited we have $E\left(U_2\left(\pi_h(x^*)\right)\right) \geq U_2(\pi_f^*)$, so firm 2 will invest in the host country too. This yields assertion 1 of the Proposition. The second assertion follows analogously.

QED

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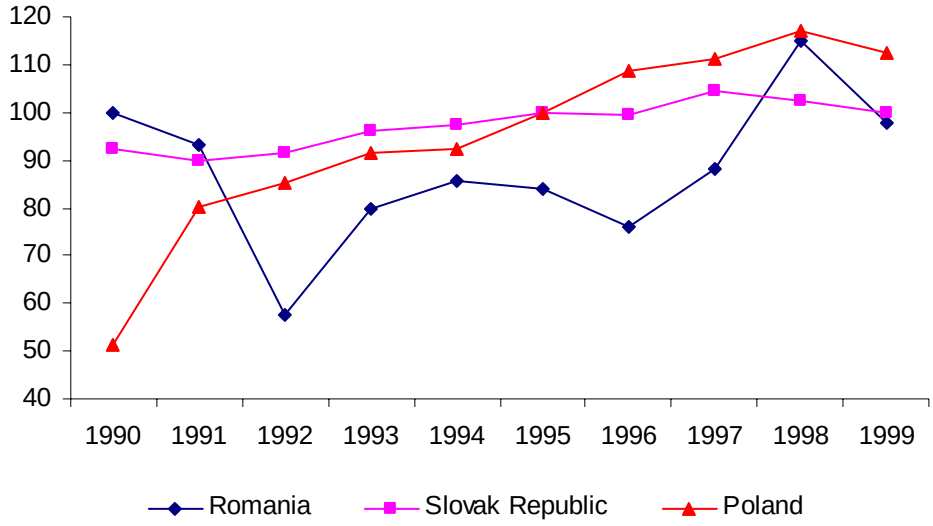
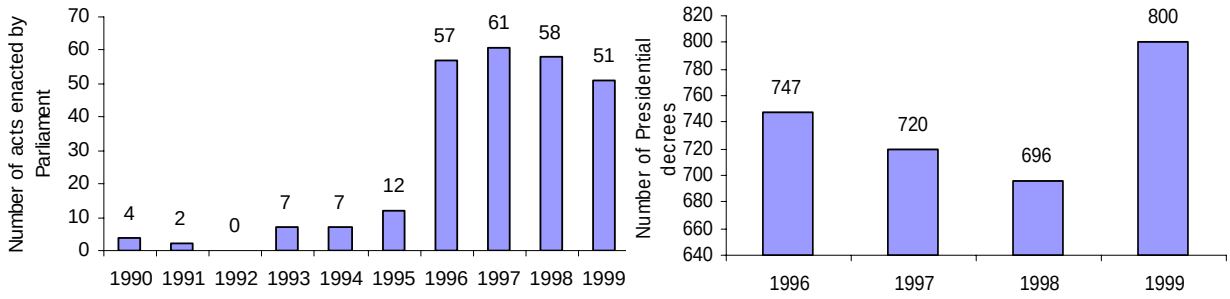


Figure 1. Real effective exchange rates in selected transition countries (1990 = 100) [6].

[6] Real effective exchange rate is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs.



a. b.

Figure 2. Number of new laws and codes approved by Parliament (a) and Presidential decrees (b) in Georgia[7].

[7] In 1999 only until September.

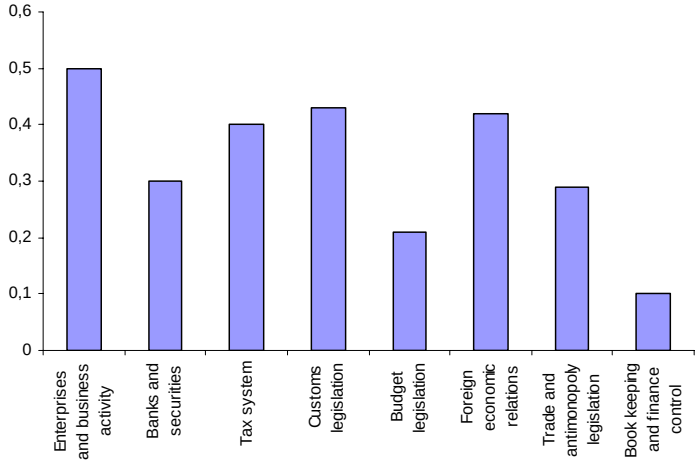


Figure 3. Legal environment stability index by type of legislation in the Kyrgyz Republic.