Foreign Direct Investment in Transition Economies: an Option Approach to Sovereign Risk

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April, 1997

Abstract

At the start of the transition process in previously centrally planned economies the in‡ow of foreign capital was considered one of the main factors making it possible to reduce the economic and social costs of transformation. However, in practice, the role of foreign capital has appeared to be less signi…cant than expected. Relying on the relationship between irreversible investment and the option pricing approach, we show that the link between sovereign risk and investment ‡exibility provides an explanation of capital in‡ow slow-downs and that such an explanation depends crucially on the expected persistence of policies a¤ecting capital mobility.

JEL Classi…cation: F21; P21.

Key words: Transition economics, Capital mobility, Investment irreversibility

1 Introduction

Why did foreign direct investment (FDI) in the Russian Federation account for a mere 0.3 of GDP in 1995, while in Hungary it amounted to 10.7% of GDP in the same year? Why did the Slovak Republic attract less than one fourth of FDI ‡owing into the Czech Republic in 1995? And yet, why did some countries experience a steady growth of FDI while others showed a declining or an alternate trend?[1]

As highlighted in a number of surveys and interviews to managers and investors, in countries in transition, political stability as well as economic openness are generally seen as prerequisites for encouraging FDI.[2] But in Eastern European countries these characteristics typically involve the relatively far-reaching acceptance of a new political and economic system, and the threat of some reversals or even just a slow-down in completing the transition process may act as a strong deterrent reducing drastically the in‡ow of direct investments. The transition processes currently taking place are still fragile as they have not yet reduced the risk of severe internal political change because there still appears to be ignorance about the model of capitalism towards which these transition economies should converge. When the leader of the Russian Communist Party, Mr. Zuganov, says that for Russia collective ownership is the best system for Russia, the very foundations of the capitalist market order based on private property are under threat. Yet, as far as economic openness is concerned, in many transition countries foreign …rms can only lease land from the state, which limits investments as long as the terms of the lease may be abrogated by the state once investment is undertaken. In Russia the legal framework for foreign participation in natural resource sectors still pends[3] on parliamentary approval of the draft law on "production sharing". That is, there is no absolute guarantee against the risk of expropriation, and political stability therefore becomes crucial to potential investors. Tax holidays for foreign investors often do not have a precise

[1] By de…nition, FDI ‡ow is an increase in the book value of the net worth of investments

timetable and/or are subject to repeated, unpredictable changes.[4] Furthermore, capital market regulations and particularly those relating to the right to repatriate pro…ts and investor protection are important for encouraging investment. However, in most countries, including those more advanced in transition, these regulations are weak and poorly enforced, or have not yet been implemented.

This paper analyzes the relationship between the sovereign risk related to the introduction of capital controls by the host government and the di¤erent trends of foreign direct investments in transition countries. Our primary purpose is to give a more satisfactory explanation of the uncertain growth of FDI recently experienced by almost all transition countries. We do this by providing a formal analysis that distiguishes between uncertainty on the goverment's introduction of restrictions on capital out‡ows and the introduction of some limitations on foreign investors' ability to expand their investments in these countries. In particular, for the former type of government's capital controls we do not distinguish between expropriation through nationalisation and a form of "creeping" expropriation through changes in taxation.

There are two strands of literature related to this work. The …rst one concerns the e¤ects of the sovereign risk associated with FDI. Eaton and Gersovitz (1983, 1984) and Thomas and Worrall (1994) analyze foreign direct investment under the threat of potential nationalization. The fomer authors develop a model of reputation, with capital that depreciates completely in a single period, where the threat of expropriation by the host country may induce foreign investors either to refrain from investing in the future or to choose an ine¢cient technology which makes nationalization less attractive. The latter authors …nd, in a in…nite time horizon model, that in order to mitigate the expropriation incentive by the host country investors will underinvest at the beginning of the relationship and increase over time. Finally, Schnitzer (1997) compares two forms of trasferring foreign capital under the

[4] On March 1995 in Latvia the Parliament approved amendments to the foreign investment law even though the tax holiday period foreseen in the previous legislation did not

threat of expropriation: debt …nance (i.e. a combination of a credit and a licensing agreement) and FDI. She shows that even when the FDI is more e¢cient than debt, …nance investors may still refrain from direct investment as the returns from FDI may be adversely a¤ected by a form of "creeping expropriation" such as changes in tax law, speci…c import or export duties, or other charges the investor has to bear.

The second group of studies concern the detrimental e¤ects that uncertainty about the enactment of stimulus policies has on irreverisible investment with stochastic ongoing returns. On this issue Van Wijnbergen (1985) and Rodrik (1991) show that uncertainty about future policy reversals coupled with irreversible investment may act as a tax that may lead to a fall in aggregate investment. This literature relies on the value to delay investment, i.e. the value of waiting for better information on stochastic evolution of the basic asset, as has recently been emphasized by the so-called option valuation approach to investment decisions (Dixit and Pindyck,1994; Abel, Dixit, Eberly and Pindyck,1996).[5]

Before proceeding with the formal analysis, it may be useful to consider some of stylized facts about FDI in Central and Eastern European countries.

In these economies FDI has been growing since the end of the '80s, when the transition began from a socialist, centrally managed economy to a capitalist, market economy. Considering the international ‡ows of FDI in recent years, Eastern Europe and Central Asia follow only East Asia and Latin America in attracting foreign capital: in‡ows of about $13 billion in the area in 1995, with a large increase of 49 percent with respect to the previous year.[6]

Indicating the importance of net FDI for a country's economy as a ratio of GNP, Figure 1 highlights the signi…cant weight of FDI in transition countries. The largest increase between 1994 and 1995 occurred in Europe and Central Asia, growing from 0.8 percent to 2.5 percent of GNP, a relevant increase if compared with those which took place in the other country groups: 0.1

Focusing on the time pattern of the in‡ows of capital into Eastern Europe, we observe in Tab.1 that the surge of capital ‡ows into Eastern Europe in 1995 re‡ects growth in nearly all types of capital. In particular, FDI rose by nearly $6 billion (to $9 billion) due mainly to ‡ows into Hungary and the Czech Republic. We also observe a drop in FDI in 1994 to the 1992 level and then a upsurge in 1995 reaching a level more than double that of 1993.

Tab.1: Net Capital Flows into Eastern Europe, and Baltic States, by type of capital, 1990-95 (billion dollars)

	Eastern Europe[7]						Baltic States			
	1990	91	92	93	94	95	92	93	94	95
Capital Account[8]	-2.1	4.1	2.1	13.5	10.6	31.2	0.1	0.5	0.4	-
of which										
FDI	0.4	2.3	3.1	4.5	3.2	9.1		0.2	0.5	0.4
Portfolio	0.9	1.2	1.0	4.6	3.6	4.7		-	-	-
Med- long-t. fund	-0.1	-0.8	-0.1	2.1	4.3	6.1		0.4	0.4	0.6
IMF loans	0.4	3.7	0.7	-	-	-2.8		-	0.1	0.1
Short term fund	-4.1	-2.8	-1.9	1.2	0.2	2.7		-	-	0.1
Other short-t. cap.	-	-	-	-	2.4	9.4		-	-	-
Errors and omis.	0.1	0.6	-0.6	0.7	0.4	2.3		-0.2	-0.5	-1.0

Source: U.N. Economic Survey of Europe in 1995-1996, p.142.

Portfolio investment has been dominated since the early 90's by the external bond issues of Hungary, while other types of portfolio investment have been small. Medium and long-term funds including bank credits, lending by multinational development banks and various bilateral facilities (including G-24 macroeconomic assistance) have increased as well. Sizeable in‡ow of FDI, portfolio investments and short term funds suggest private sources

slower pace than those into Eastern Europe. The Czech Republic, Hungary, Poland, Croazia, Romania and Estonia attracted net capital for more than 10% of GDP.

Tab. 2: Capital account as share of GDP into selected East European and Baltic countries, 1990-95.

Share of GDP

	90	91	92	93	94	95
Albania	1.2	12.8	11.4	9.1	11.5	3.4
Bulgaria	...	...	10.6	7.8	3.7	3.2
Croatia	...	...	-1.8	3.0	4.3	13.8
Czech R.	-2.8	1.3	-0.5	9.3	6.7	26.1
Hungary	-1.9	7.4	1.2	15.8	7.9	16.9
Poland	-3.3	-1.2	-0.1	1.9	2.0	11.3
Romania	..	2.2	8.1	4.2	3.5	3.4
Slovakia	4.0	6.5	-1.9	5.6	4.6	4.0
Slovenia	-0.3	-1.5	-2.4	-0.3	1.3	1.2
Eastern E.	-1.3	2.2	1.0	5.9	4.2	12.3
Baltic St.	..	..	4.7	6.9	4.5	0.7
Estonia	..	..	-4.6	7.4	9.1	12.5
Latvia	..	..	7.6	-2.1	-2.9	-12.1
Lithuania	..	..	4.6	13.7	6.5	2.2

Source: U.N. Economic Survey of Europe in 1995-1996, p.142.

As shown in Fig.2, the ‡ow of FDI into the Eastern European, CIS and Baltic countries reached a record of $13.7 billion in 1995, compared with only $6.2 billion in 1994. Hungary was the prime destination for FDI with $4.5 billion; the Czech Republic and Poland followed with $2.6 billion and 2.5 re-

However, although the Czech Republic and Hungary attracted FDI ‡ows above 5 per cent of GDP or more (see Fig.3), which is high by international standards, the FDI received by most eastern countries remains comparatively small and below expectation, and characterized by signi…cant quantitative di¤erences among the countries belonging to this area for the period 1990-95. Looking at the trends and past patterns both in absolute …gures and in terms of GDP, while countries like Hungary, Poland, Slovakia and Ukraine experienced almost a continuous increase in FDI, there was a general decline in Croazia and highly cyclical patterns in countries like the Czech Republic, Russia, Slovenia and Romania. The aim of the following sections is to investigate these di¤erences.

Figure 3 about here

The paper is structured as follows. Section 2 brie‡y recalls the debate which emerged in recent years over the determinants of FDI in transition countries. Section 3 then develops a theoretical model for the dynamic of FDI pointing out the value of political stability, economic openness (capital liberalization) and investment irreversibility. Section 4 concludes the paper with some …nal remarks.

2 The determinants of FDI in transition countries

At the start of the transition process the in‡ow of FDI was considered a factor which makes a highly valuable contribution to enterprise restructuring in transition economies: foreigners bring capital, technology, management expertise, and access to new markets. Moreover, the less tangible e¤ects of FDI, including import of new ideas and practices both through improved

debate on the determinants of FDI and then focus on the elements a¤ecting FDI in Central and Eastern European countries.[10]

While the traditional model of olipolistic rivalry explains the behaviour of foreign investors in oligopolistically structured branches, as a reaction to the …rst foreign investor moving as a leader into a given country or region, the so-called OIL theory stresses that the …rm moves abroad when three advantages are satis…ed: it must possess some Ownership, it must be more pro…table and able to Internalize it and, …nally, it must be able to Locate outside the home country. Another branch of theory on FDI highlights multinational …rms - the main direct investors - as an alternative to free trade, creating e¢cient intra-…rm markets for the transfer of goods and services through trade, licensing and direct investment. In this last context, strategic decisions (action and reaction, entry and exit, collusion, etc.) are considered and formalized as determinants of FDI.

Although the strategic context where the theoretical debate addresses FDI ‡ows is di¤erent, the factors of attractiveness for potential investors in transition countries can be summarised in four groups: factors concerning the labour market, factors related to characteristics of the market, production factors and economic growth prospects. In particular:

- Labour costs are signi…cantly low and represent one of the most important motives for making FDI in transition countries, especially in labour-intensive industries. An average wage in Poland is US$250; labour costs in Hungary are about 30% higher, and in Portugal, as much as 3.5 times higher, with Portugal being one of the countries with the lowest labour costs in the European Union. Labour supply in these countries is characterized by skilled and quali…ed workers. Yet, high unemployment allows for the possibility of lowering wages and weakens wage claims by trade unions.

- Locational advantages may explain the preferences of some foreign in-

markets for their products. Related to the purchasing power of most of the transition countries is the Market size: it has a positive trend and growing prospects as a result of economic recovery.[11]

- Natural and agricultural resources characterizing a large number of countries in transition, as well as the presence of unused productive capacities inherited from state-owned enterprises can provide relevant advantages for foreign investors.[12]

- The area's positive economic growth prospects give a further incentive to FDI. Poland was leader among transition countries in 1994 with a 4.5% growth of GDP.

On the other hand, even the barriers preventing potential investors can be summarised in four groups of factors related to: infrastructures, political risk, uncertainty about the regulatory framework (ownership, tax, etc.), and macroeconomic stability.

- The barriers related to infrastructures can be basically identi…ed with poor telecommunications and transport infrastructure, a¤ecting FDI as a sort of added cost on the activity related to the investment, and underdeveloped banking infrastructure, a¤ecting FDI as a rigidiy in recovering the investment itself.[13]

- The barriers related to political risk take on signi…cant weight for foreign investors. In already stable countries, what is required is the

[11] In many empirical analyses, market size has been found to be an important factor in a …rm's decision to locate activites (e.g. Cantwell (1994), Wang and Swain (1995)).

[12] It is interesting to stress here that the design of privatisation programs heavily in‡uences the amount of foreign involvement in privatised …rms. Hungary, the Czech Republic and Estonia have attracted most of their FDI in‡ow in 1995 by o¤ering important state-owned enterprises for sale to foreign investors whereas Russia's insider privatisation approach has kept foreign participation to just 2 per cent of privatised equity. As stressed by

absence of severe internal strife, coup d'etat, etc., while in countries in transition such as post-communist Eastern Europe the requirements extend to the relatively far-reaching public acceptance of the new political/economic system. Moreover, political constraints matter ex-ante to convince voters to start a reform process, and ex-post to avoid reversal of this process[14]. Experience so far in these countries has not reduced the perception (uncertainty) of political changes and there appears to be relative ignorance in modelling the process of transition.

- Uncertainty over the regulatory environment refers to a legal protection of property rights, since foreign and domestic investors are reluctant to invest without adeguate protection[15], and a stable transparent tax regime that minimises distortions to saving, investment and production decisions.[16]

- Finally, macroeconomic stability refers to persistent in‡ation, persistent budget de…cits and current account de…cits (leading to more or less extensive protectionism or other controls). These factors are all regarded with suspicion by foreign investors, and persistent in‡ation undermines pro…t calculations from planned investments by all investors, not only foreign ones.

3 The model

Our purpose in this section is to provide a simple model of direct investment in physical plant by a …rm, a Multinational Company, in an Eastern European

[14] This issue is discussed in Winiecki (1996).

[15] The Baltic countries are the most advanced among the countries of the former Soviet Union in establishing secure property rights in land for foreign investors. In many transition countries, however, foreign investors have no absolute guarantee against the risk of expropriation, and political stability therefore becomes crucial.

[16] In this respect it is relevant to stress that FDI should be treated neither more nor less

country with uncertainty about future reversals of government policy, and to discuss the implication of such uncertainty when it is coupled with irreversible investment.[17]

The government policy under threat of reversal concerns capital liberalization. We jointly consider uncertainty on the government'ss introduction of controls preventing investors from withdrawing capital from a country and the introduction of some limitations on the investor's ability to expand his investment. Relying on the relationship between irreversible investment and the option pricing approach, we show that the link between capital controls and investment ‡exibility provides an explanation of capital in‡ow slowdowns recently experienced by some Eastern European countries, and that such an explanation depends crucially on the expected persistence of policies a¤ecting capital mobility.

In the theoretical analysis which follows, we consider FDI as involving transactions between multinational parent …rms and their subsidiaries.

3.1 Out‡ow controls and option valuation

To simplify the analysis, we use a two-period framework with costly reversibility, as in the work of Abel, Dixit, Eberly and Pindyck (1996), which emphasizes the relationship between irreversible investment literature and the option pricing approach. If a …rm enters the market in period 1 installing capital that it may resell in period 2 (exiting the market) at a resale price lower than the purchase price, and future capital returns are uncertain, the investment decisions involve the acquisition or exercise of two options. That is, the possibility of entry (at a cost) is valued as a call option, while the possibility of exit (even at a loss) is valued as a put option.[18]

Besides the fact that the …rm …nds it costly to disinvest we consider the possibility that exit controls, making it impossible for the foreign investor to sell the asset and reallocate his funds, may be introduced as a result of the government's desire to increase the stock of domestic capital.

As has been highlighted by recent experience in transition countries, foreign investments related to privatisation of state …rms - which represent a very high percentage of the total amount of FDI in these countries - are not protected from the risk of further government intervention. The introduction of new legislation regarding FDI has been delayed on several occasions in different countries. The government may actually have an interest in controlling the management of privatised …rms even after they have been sold to foreign investors, in order to achieve objectives regarding employment, restructuring of industrial sectors and economic growth. In this way the government might intervene, for example, to prevent a foreign investor exiting from the market and closing a …rm (or part of it) following a fall in the company's pro…ts. Although, strictly speaking, this sovereign risk is reserved to describe a restriction on the mobility of all sorts of international investment from a …nancial perspective, for economy of exposition, we refer to adoption of an exit restriction simply as the adoption of a regime of capital controls.

To enter into the details of the model, the …rm's per period revenue function is given by $R(K_t; \mu_t)$ $t = 1; 2$: This function incorporates the optimal choice of ‡exible factors (i.e. labour) as well as the level of …xed factors (i.e. capital). μ can be seen as an index of pro…tability capturing both demand and productivity shocks, as well as the cost of factors of production other than capital.[19] We place standard assumptions on the revenue function to guarantee that the …rm's problem is well behaved:

Assumption 1. $R_K(K_t; \mu_t) \geq 0$ $t = 1; 2$; continuous and strictly decreasing in K and continuous and strictly increasing in μ: Yet, $R(0; \mu) = 0$ and $\lim_{K \to \infty} R_K(K; \mu) = 0$:

We assume that, in each period, the …rm can install the capital it employs in production at the constant unit cost r; while it can resell it, under adverse conditions, at a lower price $r - b$: The fact that $b > 0$ denotes that we have costly reversibility of investment which rules out intertemporal arbitrage in

[19] Assuming that there are no variable costs, when the …rm has K units of capital in

the second period.[20] We can think of b as the e¤ect of capital speci…city (…rm-speci…c or industry-speci…c) or, as often occurs in countries in transition, the consequence of adoption by the …rm of an already second hand technology at the end of its life cycle, or even the e¤ect of an explicit tax should the …rm decide to exit.[21] Finally, we …x the real interest rate so that future pro…ts are continuously discounted at a costant rate °:[22]

As far as the dynamic of capital is concerned we assume that capital accumulation is the standard one:

$$K_2 = K_1 + I_2$$

where K_1 is the stock of capital installed in the …rst period, I_2 denotes investment in period 2 and depreciation is absent. Finally for the pro…tability shock we assume that μ_1 is known and normalized to one while $\mu_2 \acute{} \mu$ is stochastic and the realization is characterized by the cumulative distribution ©(μ):[23]

The timing of the model can be summarized as follows. At the beginning of period 1, the host country's government announces a permanent capital liberalization (free entry and exit) and the …rm, knowing the current pro…tability, decides the level of capital K_1. However, history of past policy and/or current political instability due to an incomplete transition process leads the …rm to attach a probability ¼ to a reversal of policy in period 2.

At the beginning of period 2, uncertainty is resolved and the …nal capital control regime is decided upon. After the goverment has announced whether the …rm is free to exit or is restricted, nature reveals the pro…tability index μ and the investor chooses, in accordance with the announced regime and conditional on K_1, the new stock of capital K_2: If controls are imposed, the

[20] If in the second period the purchase price of capital exceeds the …rst period price, i.e. $r_2 > r_1$;to rule out an intertemporal opportunity that would lead to in…nite investment, we must assume $°(r_2 ¡ b) < r_1$ where ° is the discount factor (see Abel et al. 1996).

[21] Often, as operators (buyers) in second hand markets are unable to evaluate the quality of an item they will o¤er a price lower than the market one. This "lemons" problem, then,

second period stock of capital is constrained to be at least as large as the stock in the …rst period, i.e. $K_2 \geq K_1$:

To what extent does uncertainty about reversibility controls in‡uence the …rm's incentive to invest in this setting? To see this, we start by describing the …rm's action in the second period, given the stock of capital K_1 inherited from period 1, we then step back and show how the marginal pro…tability in the …rst period depends on the …rm's expected action in the second period.

2 Second Period

First of all, by marginal conditions, we can de…ne, for a given stock of capital K_1 inherited from period 1, two critical values of μ:

$$R_K(K_1;\mu_L) = r - b; \quad R_K(K_1;\mu_H) = r \tag{1}$$

After observing the realization of the pro…tability index μ; the foreign investor will try to adjust his stock of capital to the new optimal level that we identify as $K_2^f(\mu)$: However, if capital controls are in place in period 2, the investor may be unable to reach the above solution since the stock of capital must satisfy the constraint $K_2 \geq K_1$: Therefore the optimal solution becomes:

$$K_2(\mu) = \max\left[K_1; K_2^f(\mu)\right] \tag{2}$$

Thus, depending on the inherited stock K_1; capital controls may or may not be binding in period 2 according to the realization of the pro…tability shock μ: In particular, without controls, from (1) we obtain that when $\mu > \mu_H$ it is optimal for the …rm to invest in new units of capital to the point where the marginal return from capital equals the marginal investment cost (purchase price) r: That is, $K_2^f(\mu)$ is given by $R_K(K_2^f(\mu);\mu) = r$: On the other hand, when $\mu < \mu_L$ the pro…tability is so low that the …rm …nds it convenient to sell part of its capital to the point where the marginal return from capital equals the marginal disinvestment cost (resale price) $r - b$: That is, $K_2^f(\mu)$ is given by $R_K(K_2^f(\mu);\mu) = r - b$: Finally, when $\mu_L \leq \mu \leq \mu_H$ it is optimal

² First period

We de…ne $V(K_1)$ as the expected present value of net cash ‡ow accruing to the …rm when the capital stock in period 1 is given by K_1: Taking account of (3) we can write:

$$V(K_1) = R(K_1) + \left\{ \begin{array}{l} \int_{\mu_H}^{\mu_H} R(K_1;\mu)d\Phi(\mu) + \int_{\mu_H}^{1} \{R(K_2(\mu);\mu) - r[K_2(\mu) - K_1]\}d\Phi(\mu) \\ + (1-\theta)\left\{ \begin{array}{l} \int_{\mu_L}^{\mu_L} \{R(K_2(\mu);\mu) + (r-b)[K_1 - K_2(\mu)]\}d\Phi(\mu) \\ \int_{\mu_L}^{\mu_H} R(K_1;\mu)d\Phi(\mu) + \int_{\mu_H}^{1} \{R(K_2(\mu);\mu) - r[K_2(\mu) - K_1]\}d\Phi(\mu) \end{array} \right. \end{array} \right. \quad (4)$$

or rearranging:

$$V(K_1) = V^f(K_1) - \theta \int_{\mu_L}^{\mu_L} \{[R(K_2(\mu);\mu) - R(K_1;\mu)] + (r-b)[K_1 - K_2(\mu)]\}d\Phi(\mu) \quad (5)$$

where $V^f(K_1)$ stands for the …rm's value without capital controls expressed as:

$$V^f(K_1) = R(K_1) + \left\{ \begin{array}{l} \int_{\mu_L}^{\mu_L} \{R(K_2(\mu);\mu) + (r-b)[K_1 - K_2(\mu)]\}d\Phi(\mu) \\ \int_{\mu_L}^{1} \end{array} \right.$$

the …rm's market value in period 1.[24] Further, the second term on the r.h.s. of (5) represents the "capital loss" that accrues to the …rm in case of policy reversal. Hence, the …rst period decision problem is simply given by:

$$K_1 = \arg\max [V(K_1) - rK_1]$$

The …rst order condition for a maximun yields:

$$V'(K_1) = V'^{f}(K_1) + \lambda \left[\int_{\mu_L}^{1} [(r - b) - R_K(K_1; \mu)] d\Phi(\mu) \right] = r \qquad (6)$$

where the term inside the square brackets is positive. Moreover, as by assumption 1:

$$V''(K_1) = R''(K_1) + \left[\int_{\mu_L}^{\mu_H} R_{KK}(K_1; \mu) d\Phi(\mu) + \lambda \int_{1}^{\mu_L} f R_{KK}(K_1; \mu) d\Phi(\mu) \right] < 0$$

there exists, for any given value of r, a unique value of K_1 that satis…es equation (6). Therefore, indicating with K_1^f the stock of capital that the …rm would install without exiting controls (i.e. $V'^{f}(K_1^f) = r$); we can prove the following proposition:

Proposition 1 The probability of exit controls in period 2 (a policy reversal) depresses the ‡ow of investment in period 1. That is, controls that prevent investors from withdrawing capital in the second period act like investment irreversibility:

$$V'(K_1) < V'^{f}(K_1) \quad \Rightarrow \quad K_1 < K_1^f$$

For better understanding of the role played by capital controls and their interaction with investment irreversibility we will use the option decomposition of (5) proposed by Abel et al.(1996). First of all, let us de…ne:

$$G(K_1) = R(K_1) + \int_{1}^{\mu_H} R(K_1; \mu) d\Phi(\mu);$$

$$P(K_1) \acute{} \int_{-1}^{\mu_L} f[R(K_2(\mu);\mu) \,¡\, (r \,¡\, b)K_2(\mu)] \,¡\, [R(K_1;\mu) \,¡\, (r \,¡\, b)K_1]gd©(\mu)$$

$$C(K_1) \acute{} \int_{\mu_H}^{1} f \,¡\, [R(K_2(\mu);\mu) \,¡\, rK_2(\mu)] + [R(K_1;\mu) \,¡\, rK_1]gd©(\mu)$$

The term $G(K_1)$ is the …rm's expected present value of returns during its life-span keeping the stock of capital …xed at the …rst period's stock K_1: This can be interpreted as the …rm's value when capital controls are always (with certainty) in place and the …rm is unable to expand. The term $P(K_1)$ stands for the value of the (put) option to sell capital in period 2 if pro…tability drops below μ_L. It is worth noting that, rearranging the terms, it corresponds to the "capital loss" on the r.h.s. of (5). Finally, the term $C(K_1)$ indicates the value of the (call) option to expand (buy capital) in the second period if pro…tability rises above μ_H:

Now, it is easy to show that (5) can be rewritten as:

$$\begin{aligned} V(K_1) &= G(K_1) + °(1 \,¡\, ¼)P(K_1) \,¡\, °C(K_1) \\ &= V^f(K_1) \,¡\, °¼P(K_1) \end{aligned} \qquad (7)$$

Whereas under free capital mobility the put option increases the …rm's value, accounting for the …rm's ability to resell its capital and hence adjust during adverse periods, the reversibility controls act in the opposite direction reducing the …rm's value. The impact of this reduction is proportional to the value of the put option times the probability that such controls will occur. On the other hand the call option reduces the …rm's value because investing extinguishes the option.

Similarly as in (6), the optimal amount of capital in period 1 when government announces capital liberalization depends on a comparison between marginal bene…ts and marginal costs associated with the investment, also including the probability of a reversibility constraint in period 2 among the

$$P^{0}(K_1) \equiv \int_{-1}^{\mu_L} [(r - b) - R_K(K_1;\mu)]d\Phi(\mu) \geq 0$$

$$C^{0}(K_1) \equiv \int_{\mu_H}^{1} [R_K(K_1;\mu) - r]d\Phi(\mu) \geq 0$$

Again, it is immediate to verify that the value of the marginal put option $P^{0}(K_1)$ is the term inside the square brackets in (6).

Equation (8) emphasizes the role played by the option pricing approach in determining the optimal stock of capital in period 1. Bene…ts are the sum of the marginal returns to capital evaluated at the …rst period assuming that the capital stock does not change $G^{0}(K_1)$; plus the value of the marginal put option $P^{0}(K_1)$: Costs are represented by the purchase price of capital r; the value of the marginal call option $C^{0}(K_1)$; and the marginal put option forgone because of the possible policy reversal. Therefore a comparative statics with respect to ¼ readly shows that:

Corollary 1 Any rise in the probability of free capital reversibility (i.e. 1 ¡ ¼), increases the return on …rst period capital, and hence on the optimal stock K_1 itself.

Moreover, as a higher value of domestic capital in period 1 may lead to a stronger temptation for the government to introduce controls in period 2, let us now introduce:

Assumption 2. The probability of a reversal of policy in period 2 is $¼(K_1)$; with $¼^{0}(K_1) > 0$:

Making use of assumption 2, condition (8) now becomes:

$$G^{0}(K_1) + °P^{0}(K_1) = r + °C^{0}(K_1) + °¼(K_1)P^{0}(K_1) + °¼^{0}(K_1)P(K_1) \quad (9)$$

A sort of self-protection behaviour prevails whereby investors perceive that their actions (investment activities) in period 1 may increase the probability of loss in period 2. That is, the …rm's self-protecting behaviour depresses the ‡ow of investment in period 1 even further.[25]

3.2 Out‡ow and in‡ow controls

So far we have considered the case where capital controls are imposed by the host country's government to prevent reversibility (market exit) by foreign investors. Controls are posed in addition to the degree of …rm-speci…c irreversibility proper to capital. Using the option terminology, such capital controls rule out the put option that would arise if the …rm were able to disinvest.

However, whatever the degree of reversibility allowed, we have assumed complete expandibility on the part of the …rm, an ability which seems to be contradicted by the reality of many Central and Eastern European markets, where for institutional reasons entry is also restricted in many industries by regulations aimed at containing market size. During the privatisation (and restructuring) process some governments chose strategically to privatize enterprises (or industries) by distributing shares directly to management or workers in order to prevent foreign investors active in the same …eld with the necessary …nancial means and technology from occupying the entire market. In‡ow controls are extremely relevant and can be seen in "strategic" sectors, where governments apply manifest protectionist policies against foreigners in order to control their market size and relative position in the market.[26]

In this section we o¤er a simple way of dealing contemporaneously with these two kinds of constraints. The crucial assumption made in this section is on the existence of an upper limit $\hat{K}$ to the aggregate investment that the …rm may acquire during its life. Although, for the reasons given above, the ceiling $\hat{K}$ on the total stock of capital is taken here as exogenous, the …rm

[25] Although the depressing e¤ect goes in the same direction, our results di¤er from those

assumes a probability ¸ that in the second period such an entry restriction (market size constraint) will be in place. However, for the sake of simplicity, we add the following assumption.

Assumption 3. The aggregate investment's upper limit $\hat{K}$ is binding only in period 2. That is, $K_1 < \hat{K}$:

Thus, as for the exit controls, depending on the inherited stock K_1; the market size constraint may or may not be binding in period 2 according to the realization of the pro…tability shock μ: At the beginning of period 2 the …rm learns which exit (disinvesting) and entry (expanding) control regimes will prevail and, according to the revealed pro…tability index μ; will choose the new stock of capital K_2: However, if reversibility controls and market size regulation are imposed, the second period stock of capital is constrained to be at least as large as the stock in the …rst period and will not exceed the upper limit, i.e. $K_1 \cdot K_2 \acute{} K_1 + I_2 \cdot \hat{K}$:

² Second Period

Before considering period 2 capital adjustment, by assumption 1 and considering marginal conditions, we should add to (1) the following critical value of μ:

$$R_K(\hat{K}; \hat{\mu}_H) = r \tag{10}$$

where $\mu_L \cdot \mu \cdot \mu_H \cdot \hat{\mu}_H$. Therefore, indicating with $K_2^f(\mu)$ the second period capital without controls, when μ ¸ $\hat{\mu}_H$ and the entry constraint is in place the optimal capital is:

$$K_2(\mu) = \min \left[\hat{K}; K_2^f(\mu) \right] \tag{11}$$

Finally, putting together (2) and (11) we get a clear picture of period 2 capital adjustment when both reversibility and expandibility restrictions are in place:

To simplify the …rm's …rst period expected present value of net cash ‡ow $V(K_1)$; we introduce the following assumption:

Assumption 4. There exists a perfect correlation between the exit and the entry constraints:

By assumptions 3 and 4 and equation (4), we can then write:[27]

$$V(K_1) = V^f(K_1) - \int_{\mu_L}^{\hat{\mu}} \{[R(K_2(\mu);\mu) - R(K_1;\mu)] + (r-b)[K_1 - K_2(\mu)]\}d\Phi(\mu) \tag{13}$$

$$+ \int_{\hat{\mu}}^{\mu_H} \{[R(\hat{K};\mu) - R(K_2(\mu);\mu)] - r[\hat{K} - K_2(\mu)]\}d\Phi(\mu)$$

where $V^f(K_1)$ again stands for the …rm's value without controls. Recalling

[27] Formaly we should write:

$$V(K_1) = R(K_1) + \begin{cases} \int_{\mu_L}^{\mu_L} R(K_1;\mu)d\Phi(\mu) \\ = \int_{\mu_L}^{\mu_L} R(K_1;\mu)d\Phi(\mu) \end{cases}$$

$$+(1-\Phi)\int_{\mu_L}^{\mu_L} \{R(K_2(\mu);\mu) + (r-b)[K_1 - K_2(\mu)]\}d\Phi(\mu)$$

$$+\int_{\mu_L}^{\mu_H} R(K_1;\mu)d\Phi(\mu) + \int_{\mu_H}^{\mu_H} \{R(K_2(\mu);\mu) - r[K_2(\mu) - K_1]\}d\Phi(\mu)$$

$$\int_{\mu_H}^{1}$$

that $\hat{K} = K_1 + \hat{I}_2$; the first order condition for a maximun at period 1 is:

$$V'(K_1) \equiv V'_f(K_1) \equiv \left[\int_{\hat{\mu}_L}^{\hat{\mu}_H} [(r - b) - R_K(K_1;\mu)]d\Phi(\mu) \right] + \left[\int_{\hat{\mu}_H}^{1} [R_K(\hat{K};\mu) - r]d\Phi(\mu) \right] = r; \quad (14)$$

where the terms inside the square brackets are both positive.[28]

Paralleling proposition 1, now exit and entry controls in period 2 have countervailing effects on the flow of investment in period 1. While controls preventing investors from withdrawing capital in the second period act like investment irreversibility, controls on market size encourage expandibility in period 1. The overall effect depends on whether the marginal loss of irreversibility from outflow controls is larger than the marginal benefit from inflow controls.

To better illustrate the role played by both controls we resort to the option analogy. As well as $G(K_1)$, $P(K_1)$ and $C(K_1)$, let us now define:

$$CC(K_1) \equiv \int_{\hat{\mu}_H}^{1} \{-[R(K_2(\mu);\mu) - rK_2(\mu)] + [R(\hat{K};\mu) - r\hat{K}]\}d\Phi(\mu)$$

which is equivalent to the third term on the r.h.s. of (13). While $C(K_1)$ indicates the value of the option (call) to expand in the second period if

[28] Moreover, as:

$$V''(K_1) = R''(K_1) + \int_{\hat{\mu}_H}^{1} R_{KK}(K_1;\mu)d\Phi(\mu)$$

pro…tability jumps without limit above μ_H; the term $CC(K_1)$; represents the value of the call option the …rms lose if they are unable to invest beyond the constraint $\hat{\mu}_H$: Making the usual substitutions we are able to rewrite (13) in the following form:

$$\begin{aligned} V(K_1) &= G(K_1) + °(1 ¡ ¼)P(K_1) ¡ °C(K_1) + °¸CC(K_1) \\ &= V^f(K_1) ¡ °¼P(K_1) + °¸CC(K_1) \end{aligned} \tag{15}$$

It is worth noting that whereas the put option contributes to reducing the …rm's value accounting for the probability of reversibility controls in period 2, the term $CC(K_1)$ reinforces the …rm's value. This occurs because the introduction of an entry control lowers the value of waiting to invest. That is, it weakens the negative e¤ect of the overall call option $C(K_1)$. The optimal amount of capital in period 1, when controls are not in place, depends on a comparison between marginal bene…ts and marginal costs associated with the investment:

$$G^0(K_1) + °P^0(K_1) + °¸CC^0(K_1) = r + °C^0(K_1) + °¼P^0(K_1) \tag{16}$$

where $G^0(K_1) > 0$; $P^0(K_1) ¸ 0$; $C^0(K_1) ¸ 0$ and:

$$CC^0(K_1) ´ \int_{\hat{\mu}_H}^{1} [R_K(\hat{K};\mu) ¡ r]g d©(\mu) ¸ 0$$

Direct inspection veri…es that the marginal value $CC^0(K_1)$ is equal to the second integral in equation (14).

When the ceiling on investment is the result of deliberate government policy in the attempt to capture the scarcity rents that such a limit may generate the …rm is induced to speed up investment in period 1. On the other hand, controls that prevent investors from withdrawing capital in the second period act like investment irreversibility. By condition (16) which of

the …rm's investment at period 1 shows that:

$$K_1 \geq K_1^f \quad \text{if} \quad \Delta(K_1^f) \geq 0$$
$$K_1 < K_1^f \quad \text{if} \quad \Delta(K_1^f) < 0$$

To illustrate the properties of the above results and, in particular, getting some qualitative ideas of the impact exercised both by the aggregate investment's upper limit $\hat{K}$ and the cost of reversibility b; we give here some numerical solutions of the option value di¤erence $\Delta(K_1^f)$: To keep the example as simple as possible, let us …rstly assume a constant elasticity revenue function: $R(K;\mu) = \mu K^{\alpha}$; $0 < \alpha < 1$ and a uniform distribution for the pro…tability shock, that is $\mu \in [0;1]$ and hence $\phi(\mu) = \mu$: Substituting into $\Delta(K_1^f)$ and taking account that the optimal stock K_1^f depends on both $\hat{K}$ and b; after some calculation Δ simpli…es to:

$$\Delta(\hat{K};b) = \frac{r}{r-b} - \frac{\frac{r}{\alpha}\hat{K}^{\alpha-1}}{\beta(1-\frac{r}{\alpha}\hat{K}^{\alpha-1})^2}\frac{r-b}{\alpha}[K_1^f(\hat{K};b)]^{\alpha-1}$$

The choice of parameters is made in the interest of simplicity: the cost of capital r is set at 0:1; $\alpha = 0{:}5$; and $\gamma = \beta$: Finally, we get $b \in [0;0{:}1]$ and $\hat{K} \in [K_1; K_{sup} = 0{:}04]$; where K_{sup} is obtained imposing the upper value $\mu = 1$ on the marginal condition $R_K(K;1) = r$: As $K_1^f(\hat{K};b)$ is not known, if the marginal condition without controls $V'^f(K_1^f) = r$ is not resolved beforehand, the above $\Delta(\hat{K};b)$ cannot be evaluated either. However, the following analysis presents arguments that are able to clarify the essential characterstics of $\Delta(\hat{K};b)$ without needing $K_1^f(\hat{K};b)$: First of all, it can be shown that:

$$\lim_{\substack{\hat{K} \to K_1 \\ b \to 0}} \Delta(\hat{K};b) \gtrless 0 \quad \text{for reasonably small values of } K_1$$

$P(K_1)$ reduces its e¤ect so that exit capital controls are also weakened. When the …rm is free to expand, i.e. $\hat{K} \to K_{sup}$ the call option $C(K_1)$ reinforces its e¤ect. By the above considerations, in Figure 6 we draw $¡(\hat{K}; b)$ for the parameters considered and set $K_1^f = 0{:}01$:

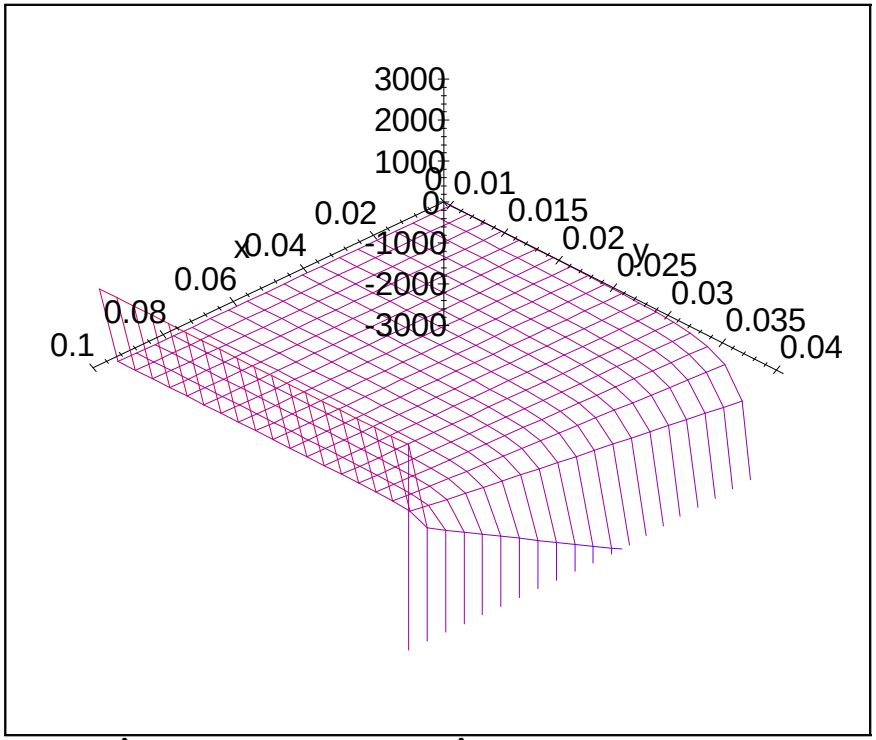

Figure 4. $¡(\hat{K}; b)$ for $b \in [0; 0{:}1]$ and $\hat{K} \in [0{:}01; 0{:}04]$; and $¡(0{:}01; 0) = ¡3$

Finally, this section concludes paralleling corollary 1 with:

Corollary 3 Any rise in the probability of free capital reversibility (i.e. $1 ¡ ¼$) increases the optimal stock K_1, while a rise in the probability of capital expandibility (i.e. $1 ¡ \ $) reduces the optimal stock K_1;

4 Final remarks

Foreign investors' concerns are related to political and economic stability, openness, laws and regulations that are fairly enforced, and ready access to inputs at reasonable prices. All these factors are heavily in‡uenced by policy choices. Investors also look at the size and growth of domestic markets, which economic policy can in‡uence, and closeness to major international markets, which it cannot.

We show in a simple two-period model that these elements can help explain the di¤erent trends in FDI in Eastern European countries. We study the probability that the expectation of a reversal policy a¤ects FDI patterns. This probability is particularly related to sovereign risk and uncertainty of outcomes which characterise the transition toward the acquisition of market instruments in previously centrally planned economies and which has been con…rmed by the experience so far in these countries.

The analysis is developed on the basis of recent models of investment under uncertainty which considers the relationship between irreversible investment and the option pricing approach. Our model shows that controls preventing investors from future withdrawing of capital from a country act as a deterrent to present investments while controls on future investment expansion, reducing, if not actually eliminating the future rents, reinforces the current investment. Both these e¤ects are able to explain why some transition countries have experienced a high initial investment which was not sustained over time and, moreover, show that such an explanation depends crucially on the expected persistence of policies a¤ecting capital mobility.

Further research should consider more ‡exible behavior by the host country. Often, the adoption of a regime of capital controls today may be seen by investors as a signal of future persistence of policies. In this case, as suggested by Bartolini and Drazen (1996), governments can use policies affecting capital mobility to signal that future policies are likely to be more favourable to foreign investors. Another direction for further investigations could consider joint ventures between foreign investors and the host country

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Figure 1: Net FDI as a ratio of GNP, 1990-1995, percent.

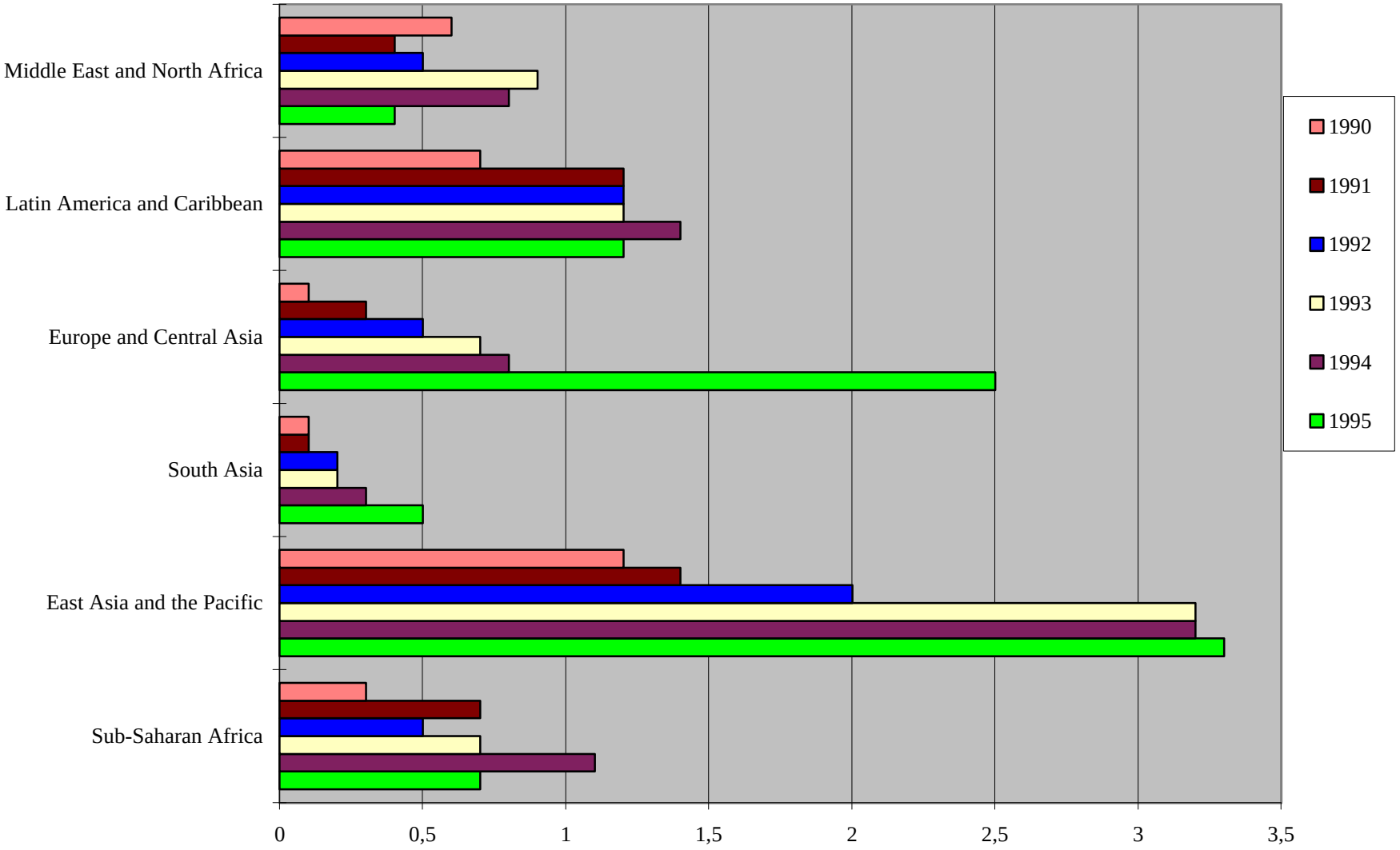

Figure 2: FDI in Eastern Europe - amount of annual inflows (USD mn)

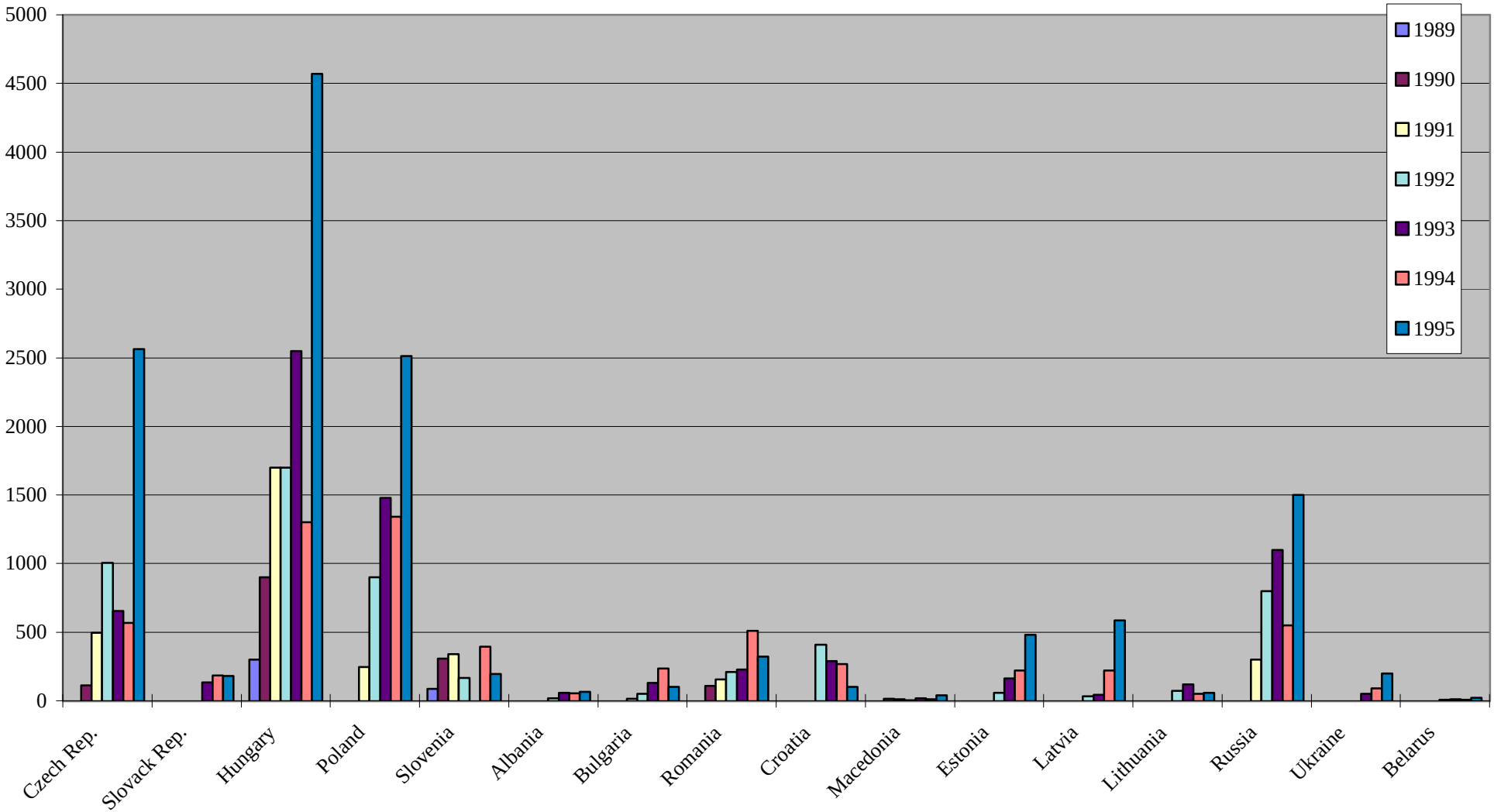

Figure 3: Amount of annual inflows of FDI as a percentage of GDP for selected Eastern European countries (USD mn)